A Hindcast Study of Iceberg Drift on the Labrador Coast

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A HINDCAST STUDY OF ICEBERG DRIFT ON THE LABRADOR COAST

by

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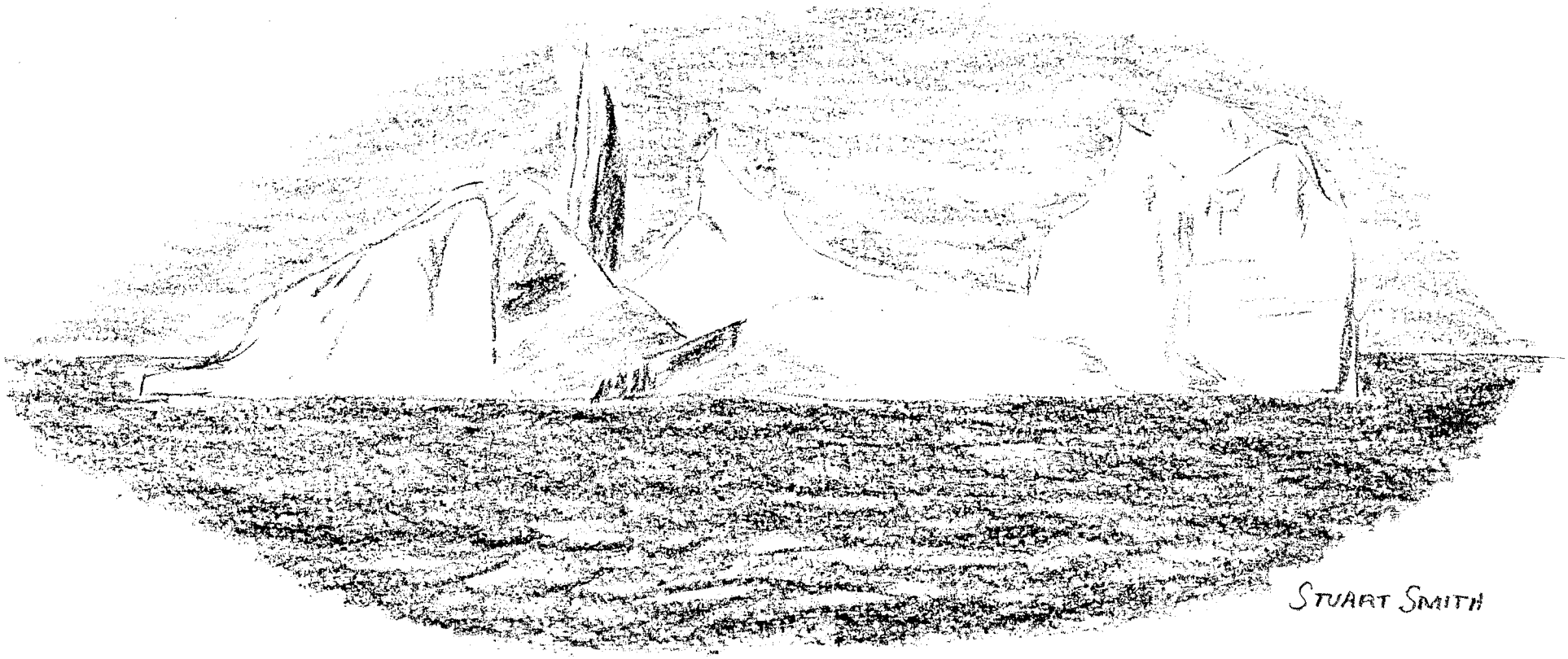

Frontispiece. Iceberg by S.D. Smith

ABSTRACT

Banke, E.G. and S.D. Smith, 1984. Iceberg Drift Modelling Results. Can. Tech. Rep. Hydrogr. Ocean Sci. 49: vi + 161 p.

A hindcast model simulates the movement of icebergs under the influence of winds, currents and Coriolis force. Air and water drag coefficients are optimized to give the best fit to the tracks of thirty-seven icebergs observed near drilling rigs off the coast of Labrador. Winds and currents appear to be of comparable importance in influencing iceberg drift velocity. The effect of towing is investigated for twelve towed tracks. In only four of the cases did towing appear to increase the distance from the rig at closest approach, as compared to the free drift without towing. The time required for even the largest icebergs to approach an equilibrium drift velocity after a step change in winds and currents is demonstrated to be only a few hours, and smaller icebergs closely approach equilibrium drift in less than an hour. The hindcast drift model is also used to estimate the bottom drag forces required to stop an iceberg in the observed scour distance identified by sidescan sonar.

RÉSUMÉ

Banke, E.G. and S.D. SMith, 1984. Iceberg Drift Modelling Results. Can. Tech. Rep. Hydrogr. Ocean Sci. 49: vi + 161 p.

Un modèle de prévision a posteriori permet de simuler le déplacement des icebergs sous l'influence des vents, des courants et de la force de Coriolis. On a optimisé les coefficients de résistance dans l'air et l'eau pour obtenir le meilleur ajustement graphique quant aux trajets de trente-sept iceberrgs observés près de plates-formes de forage situées au large des côte du Labrador. It est apparu que les vents et les courants avaient une incidence d'égale importance sur la vitesse de dérive des icebergs. On étudie l'effet du remorguage sur douze trajets de remorquage. Dans quatre instances seulement, il est apparu que la distance minimale entre la plate-forme de forage et l'iceberg augmentait pendant le remorquage, par rapport à la dérive libre sans remorquage. Il a été démontré que, même dans le cas des plus gros icebergs, la vitesse de dérive se rapprochait d'un équilibre en quelques heures seulement après une brusque variation des vents et des courants, et dans le cas de petits icebergs, se rapprochait étroitement de cet équilibre en moins d'une heure. On utilise ausi le modèle de dérive avec prévision a posteriori pour calculer les forces de frottement au fond, nécessaires kpour arrêter un iceberg sur la distance d'affouillement observée, telle qu'enregistrée par le sonar à balayage latéral.

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INTRODUCTION

Exploration activity in iceberg-infested waters off the east coast of Canada has brought new urgency to the problems of tracking and predicting iceberg movement. There is a need to predict these motions in the vicinity of drillships, over distances of a few tens of kilometers and time intervals of a few hours to two days. Development of dynamic iceberg drift models is a step toward a forecasting capability. In the present report we present the results of modelling of thirty-eight iceberg drift tracks in a hindcast sense using a dynamic iceberg drift model developed at the Bedford Institute of Oceanography (Smith and Banke, 1981, 1983). The modelling was conducted primarily to reach conclusions on a number of questions relevant to forecasting of iceberg drift:

a) suitability of operational data for hindcast modelling of iceberg drift tracks.
b) quantity of data required to estimate drag coefficients from drift tracks.
c) effect of rotating wind drag direction relative to wind direction.
d) variability of drag coefficients of icebergs, as estimated by hindcast modelling.
e) relative influence of winds and currents in causing iceberg drift.
f) effectiveness of actual towing of icebergs, as opposed to modelled tracks with tow force deleted.
g) estimates of bottom-scouring forces during an observed grounding event.

In order to reach these conclusions, the report also documents:

i) selection process to decide which tracks to model.
ii) sources of data.
iii) programs used.
iv) drift, wind and current data for selected icebergs.

Throughout this report our attitude will be that we wish to explore the potential feasibility of modelling iceberg drift. The data which we are using have the advantages that they represent a wide selection of icebergs and that they have been taken in areas of potential offshore development. However, these data were not intended for drift modelling and were not subjected to the quality control which we might have desired. This study, using publicly available data, is being followed by a phase in which we shall obtain higher quality data at a limited selection of sites for a small number of icebergs. In view of the unknown quality of the data we will be encouraged by successful examples but not discouraged if we are sometimes unable to simulate an observed drift track.

A. ICEBERG DRIFT MODEL DESCRIPTION

Our model uses routine hourly observations of winds, currents, and iceberg position taken at drilling rigs. An iceberg is assumed to drift under the influence of wind and water drag, $\vec{F}_a$ and $\vec{F}_w$, with an acceleration, $\vec{a}_c$, accounting for the combined effects of the earth's rotation and the pressure gradient force due to sea surface slope,

$$\vec{a} = (\vec{F}_a + \vec{F}_w + \vec{F}_t)/M + \vec{a}_c \qquad (1)$$

M is the mass and a the acceleration of the iceberg. An optional towing force $\vec{F}_t$ can be included. The terms in eqn. 1 are simplified to allow them to be computed from available data while still adhering to physical principles. Appendix 6 lists the computer programme ICE 3.

Wind Drag

The wind drag is assumed to be a quadratic function of relative wind velocity, $\vec{u} = \vec{U} - \vec{V}$ where $\vec{U}$ and $\vec{V}$ are the wind and iceberg velocities. Both surface drag and form drag are included,

$$\vec{F}_a = (\tfrac{1}{2}\rho_a C_a A_a + \rho_a C_s A_s)\,|u|\,\vec{u} \qquad (2)$$

where A_a is the sail area in a vertical plane and A_s is the surface or plan area. Typical values of the form drag coefficient C_a for irregularly shaped objects at high Reynolds numbers are of the order of 1, e.g. Hoerner, 1965 and the surface drag coefficient C_s is set to 0.002 (Banke et al., 1976). The form drag is far more important for the chunky-shaped icebergs found off the Labrador coast but for large, flat ice floes or tabular icebergs, with the surface area exceeding about 250 times the sail area, the surface drag would be the larger term.

In the applications to follow we will adjust the form drag coefficient C_a to control the strength of the wind forcing. The final value of C_a selected can compensate for errors in estimating the sail area and also for variations in wind speed with height from the waterline to the peak of the iceberg, as opposed to the wind speeds at the height of measurement. There is no allowance made at present for directional changes in the wind with height, nor for sail-shaped icebergs which might produce a component of "lift" so that the direction of wind force can differ from the wind direction.

Water Drag

The water drag force is modelled in the same way as the wind drag. The water velocity is assumed to be averaged over the draft of the iceberg. Large variations in current with depth are often found in coastal waters, but in the examples to follow the current at only one depth is used. We use the water velocity relative to the ice velocity $\vec{w} = \vec{W} - \vec{V}$ in a quadratic drag law

$$\vec{F}_w = (\tfrac{1}{2}\rho C_w A_w + \rho C_x A_s)\,|w|\,\vec{w} \qquad (3)$$

where C_w is a form drag coefficient and C_x is a surface drag coefficient for the under side of the ice. As in the case of air drag, form drag is dominant for icebergs off Labrador. The keel area A_w is assumed to be four times the sail area (eg. Ice Engineering, 1983) unless the draft of iceberg is known.

In calculating water drag, we vary the drag coefficient C_w to allow the modelled drift track to best fit the observed track, while C_x is set to 0.002. Variation of C_w can account for errors in estimating keel area, and for variation of current speed with depth. We have not attempted

to alter the direction of the water drag to allow for possible directional effects of iceberg keel shape, nor for variation of current with depth.

The influence of surface wave forces on an iceberg is not explicitly included in this model. If the waves are in the same direction as the wind, adjustment of the wind drag term can in effect include the wave forces.

Coriolis acceleration and surface slope

The Coriolis acceleration of a freely drifting object in a rotating coordinate system is

$$\vec{A}_c = -2\Omega\hat{k} \times \vec{V} \sin \phi$$

where $\hat{k}$ is a unit vector directed vertically upward, $\Omega = 7.27 \times 10^{-5}$ rn s^{-1} is the earth's rotation, and ϕ is the latitude.

The combined influence of the Coriolis acceleration and the pressure gradient acceleration due to sea level gradients which are in geostrophic balance with the local currents is

$$\vec{a}_c = -\vec{f} \times \vec{V} + \vec{f} \times \vec{W}$$
$$\vec{a}_c = \vec{f} \times \vec{w}$$

where the Coriolis parameter is $\vec{f} = 2\Omega\hat{k} \sin \phi$, since $\vec{w} = \vec{W} - \vec{V}$. If an iceberg is drifting with the water ($\vec{w} = 0$), its tendency to accelerate down the surface slope balances out its Coriolis acceleration so that $\vec{a}_c = 0$.

No adjustments are made to the estimated mass in optimizing the fit of the modelled iceberg track to the observed track. An increase in mass would have the same

effect on the acceleration and on the computed drift track as a reduction in both air and water drag by the same ratio. Errors in estimating the mass of the iceberg, and those due to neglecting the "added mass" of the water in the wake which moves with a fraction of the velocity of the iceberg itself, are compensated by adjusting both air and water drag coefficients. If the mass has been underestimated, for example, low values of air and water drag coefficients are automatically selected to give the correct accelerations.

Towing force

To simulate the effect of towing an iceberg, an additional force can be included. For this to be realistic we must have made realistic estimates of the other forces and the mass. Choices of the air and water drag coefficients which are not physically realistic may result in incorrect simulations of towing velocity even if they successfully model free drift of an iceberg.

Computation

The initial data include wind, current, iceberg velocity, position (range and bearing), latitude and number of hours to be tracked. The origin is the drillship location, and the modelled position at time zero is the initial radar fix. A force balance is used to compute acceleration (eqn. 1), and update velocity and position.

$$\vec{v} = \vec{v} + \vec{a}\,\Delta t$$
$$\vec{x} = \vec{x} + \vec{v}\,\Delta t$$

The time step should be chosen so that fractional changes in velocity are small, $\Delta t \ll Mv/F$ for computational accuracy. A

time interval t = 6s was chosen initially, but for most of the icebergs studied a 30s time step was found to be adequate and in some cases we have been able to lengthen t to as much as 120 s to improve computational efficiency without significantly changing the results. The position is plotted at 10-minute intervals. One or more modelled tracks are plotted, each with an identifying symbol every hour and a heavier symbol every 12th hour.

Between hourly observations the wind and current are interpolated linearly in time. Computed and observed positions are compared hourly, and the root mean square value of the distance between these is called the rms error. The observed track is plotted with square symbols at each observation joined by straight lines, and the squares are filled in at every 12th hour.

Selection of Ca and Cw

Program ICE 3 (Appendix 6) is the basic drift model, with user-selected drag coefficients. Two versions of a program to select the best values of Ca and Cw have been developed. One version, ICE 4 computes drift tracks for all possible combinations of Ca and Cw, in steps of 0.1, between selected limits. The rms errors between modelled and observed positions are computed for each pair of Ca and Cw values, and are printed on a grid in Ca, Cw space. The track with minimum rms error is selected for plotting, along with a plot of the observed track. While it is instructive in some cases to study the sensitivity of modelling error to variation of the coefficients, this procedure consumes more computer time than is necessary. A second version of the program, ICE 5 (Martec, 1982), is designed to converge more rapidly on the best pair of coefficients, again within specified limits. In this

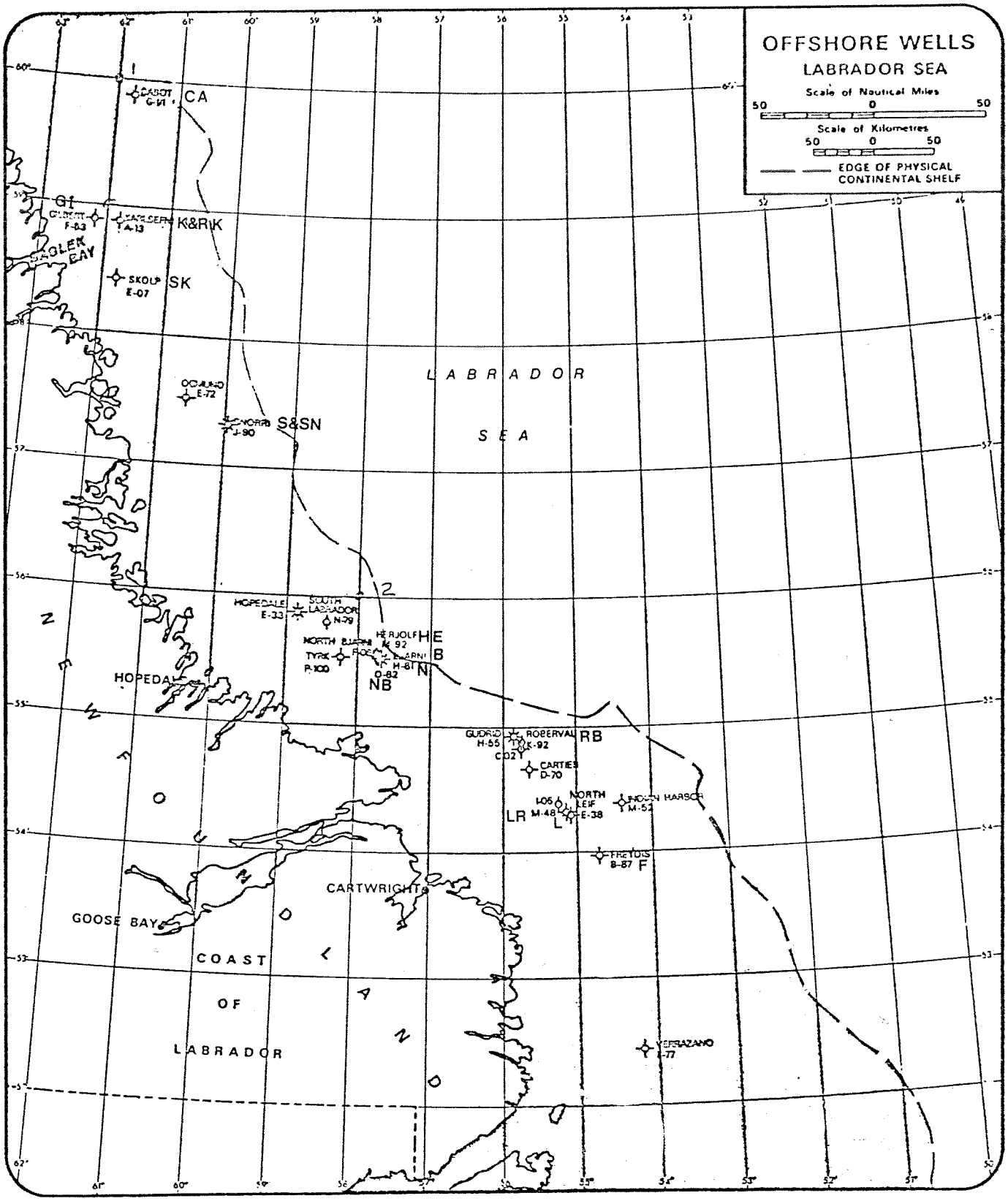


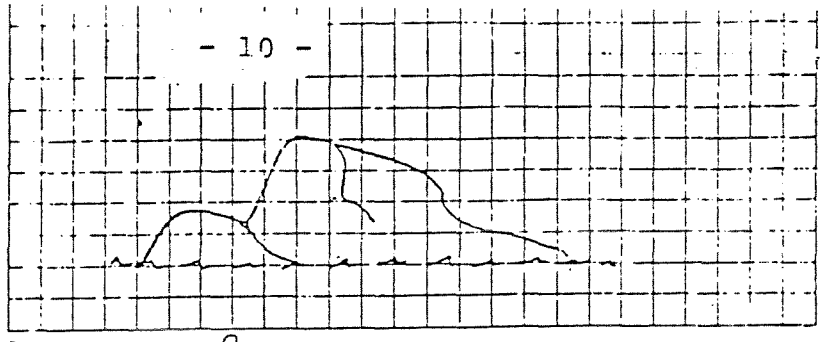
FIGURE 1

OFFSHORE WELLS LABRADOR SEA

Source:

version the drift track computation has been made into a subroutine, which is called with values of Ca and Cw specified by the main program. The program starts with user-specified values of Ca and Cw (eg. 0.5, 06) and calls the subroutine four times with the specified values, with each value incremented upward by 0.1 separately and together, so as to define a square in Ca, Cw space (eg. Ca = 0.5, 0.6; Cw = 0.6, 0.7). The point with minimum rms error is selected (eg. Ca = 0.6, Cw = 0.7) and three additional points are selected to define another square (eg. Ca = 0.6, 0.7; Cw = 0.7, 0.8) diagonally adjoining the first square. If a new minimum rms error has been found, a new diagonally adjoining square is defined. If no new minimum error is found, tracks for the two remaining neighbouring points (eg. Ca = 0.7, Cw = 0.6; Ca = 0.5, Cw = 0.8), and if no new minimum is found then the process is complete. If a new minimum is found the process continues until a pair of Ca, Cw is found with all surrounding values (differing by $\pm$ 0.1) giving larger rms error, or until selected upper or lower limits in Ca, Cw space have been reached. A grid is printed showing rms error in Ca, Cw space as in ICE 4, but only values which have been selected during the above process are filled in, and again the best track is plotted along with the observed track. While ICE 4 typically runs about 120 tracks to cover an area in Ca, Cw space, ICE 5 typically converges on a minimum with 10 to 20 trials.

Date 8-8-76
Iceberg Number CA036
Latitude
Longitude
Type SPHERICAL
Height 8·9 m
Length 26·6 m
Estimated Mass 20,000 TONS



Scale: 1 square = 2 metres

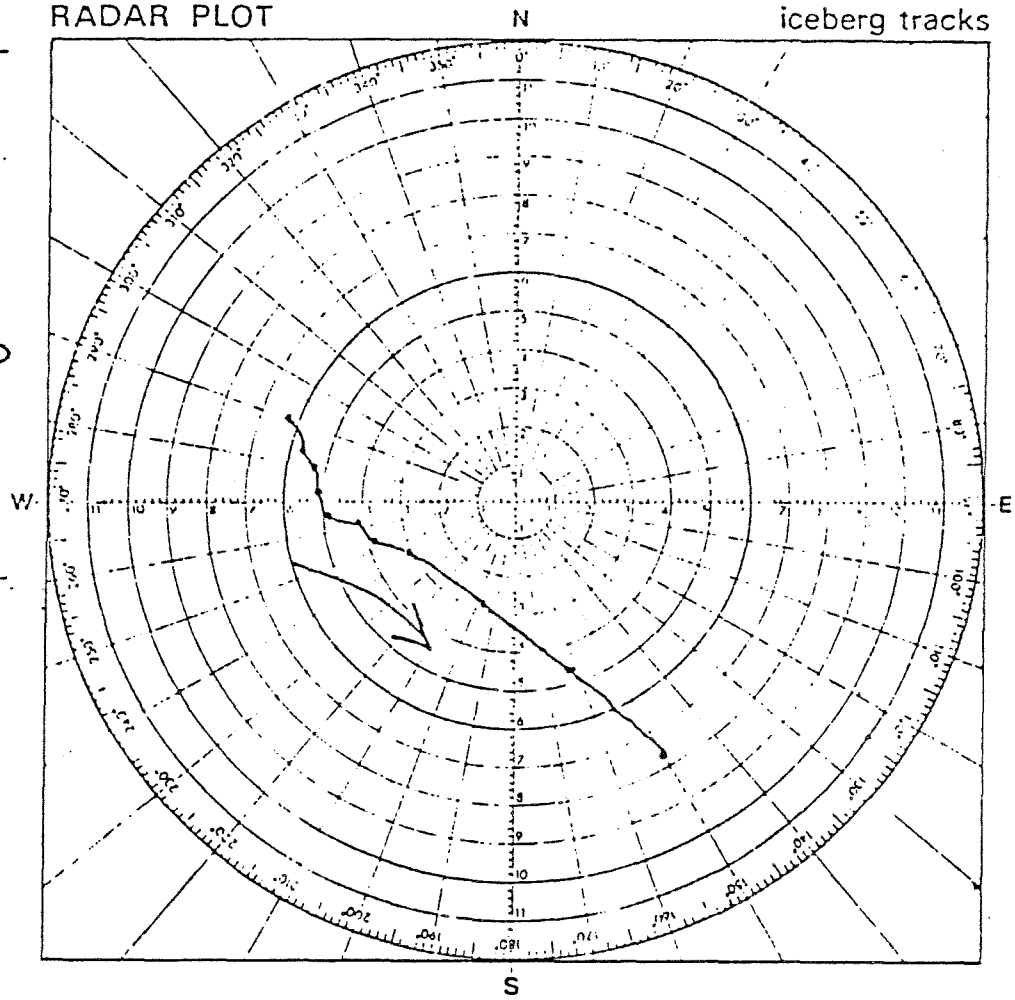
ICEBERG LOG PETREL

IDENTIFICATION No. CA036

DATE/TIME	Range Nautical Miles	Bearing Relative True N.
8-8-76		
1630 (0)	6.3	290 *
1700	5.7	284
1730 (1)	5.4	280
1800 (2)	5.1	273
1900 (3)	4.9	267
2000 (4)	4·2	262
2100 (5)	3·9	254
2200 (6)	3·1	244
2300 (7)	2·8	198
2400 (8)	4·6	162
9-8-76 0110	7·7	150

UNDER TOW

RADAR PLOT



NOTES:

* Seen earlier but no trace on radar

SEE TOW LOG & SIZE LOG

← NO TRACE

FIGURE 2

TYPICAL RAW DATA

B. ICEBERG DRIFT MODELLING PROJECTS

Banke and Smith (1974), from experiments in the towing of growlers in 1971, estimated water drag coefficients in the order of 1. Smith (1981) developed a dynamic iceberg drift model in the early 1970's but at the time no suitable iceberg drift data were available and the model was not tested until 1980. In the meantime observers on drilling rigs operating off the coast of Labrador monitored iceberg drift tracks in the vicinity and measured winds and currents at the rigs. In 1980, the model was implemented on the B.I.O. Cyber 171 computer as Program ICE 3. Seven tracks investigated in 1980 (Smith and Banke, 1983) constitute group I of the present report. In 1981 Martec Ltd. (1982) modelled a further six drift tracks which constitute group II of the present report. The search for suitable iceberg drift data was undertaken manually.

In 1982 a contract was awarded to Martec Ltd. to model additional iceberg drift tracks. To assist in the selection of tracks suitable for modelling, a computer-assisted search was undertaken by accessing a data set of 1,344 iceberg tracks compiled on magnetic tape by Sea Ice Forecast Central in Ottawa from industry reports for the period 1973 to 1979 (Table 1). As a result of the search, an additional 34 potentially suitable iceberg drift tracks were identified. Of these, 21 icebergs were modelled successfully including one iceberg (K007) which was already modelled in group I. A further 5 drift tracks were selected manually and successfully modelled. These 25 drift tracks constitute group III of the present report. The criteria and selection procedure will be described in Section D.

NAME OF VESSEL: [illegible] - 12 -

POSITION	Latitude: [illegible]	Date: 8 8 76
	Longitude: [illegible]	Time Zone: [illegible]

DAILY OBSERVATIONS LOG

Time (Local)	WINDS: Mean Hourly Speed (kts)	WINDS: Speed from Calibration Instrument	WINDS: Mean Wind Direction	WAVES: Significant Wave Height	WAVES: Maximum Height (3 hours)	WAVES: Mean Zero Crossing Period	WAVES: Swell Height	WAVES: Swell Period	WAVES: Swell Direction	CURRENTS 15m. Speed (kts)	CURRENTS 15m. Direction (Towards)	CURRENTS 50m. Speed (kts)	CURRENTS 50m. Direction (Towards)
0100	16		290							1·42	210	1·30	140
0200	22		270							1·15	180	1·32	150
0300	26		300	1·3	2·5	5·2				1·10	170	0·92	150
0400	20		300							0·67	220	0·60	180
0500	20		300							·47	250	·47	230
0600	15		310	1·6	3·0	5·5				·45	250	·34	270
0700	18		310							·37	260	·35	320
0800	18		310							·23	260	·35	330
0900	15		300	1·3	2·4	6·5				·19	080	·28	350
1000	27		300							·49	170	·53	060
1100	30		300							·87	140	·83	050
1200	30		300	1·4	2·5	5·7				1·11	120	1·13	120
1300	30		300							1.25	120	1.32	120
1400	28		290							1.25	150	1.29	140
1500	32		300	1.6	3.0	6.3				1.06	170	0.98	140
1600	30		300							0.81	200	0.84	170
1700	34		295							0.49	210	0.60	190
1800	32		290	2.3	4.5	5.5				0.47	240	0.55	210
1900	28		280							0.22	260	0.46	260
2000	28		280							·17	360	0·34	280
2100	35		260	2·9	5·5	5·3				0·30	060	0·15	090
2200	21		270							0·55	100	0·4	060
2300	23		250							1·00	160	0·6	80
2400	20		250	2·0	3·8	5·5				LOST —		170	0·5

Y 0 Left for Hour 0 Ca03.

Hour

Hour

6 HOUR LOG

G.M.T.	Local Time	Visibility Code	Weather Code	Barometric Pressure (M.B)	Pressure Trend Code	Air Temp. Wet °C	Air Temp. Dry °C	Clouds 8ths	Clouds Types	Clouds Height of Lowest	Sea Temp. °C
0600	800	98	01	196·4	4	3·3	3·9	5	[illegible]	4	3·0
1200	0900	97	03	198·3	2	3·4	3·6	8	CL 6	3	2 6
1800	1500	97	01	1005.0	2	4.0	5.5	8	CL 8	4	2.2
2400	2100	98	03	1006·3	0	3·4	4·5	4	[illegible]	4	2·3

FIGURE 3 TYPICAL RAW WIND AND CURRENT DATA

C. DATA DESCRIPTION

Observations of iceberg drift 50 to 110 km off the coast of Labrador (Fig. 1) have been made available (see Acknowledgements). The iceberg positions were observed hourly by radar, to a resolution of 0.1 nautical mile (0.2 km) in distance and one degree in direction. At a range of 10 km the resolution in position is about 0.3 km, and apart from all other uncertainties this is a limit on the possible modelling accuracy.

Winds and currents were measured hourly at drill rigs which were at distances of 3 to 40 km from the icebergs. Winds at offshore sites are generally believed to be uniform over this distance, and if properly measured should be quite satisfactory for modelling purposes. We do not have information on the rigs' heading relative to the wind. If a rig does not head into the wind, substantial errors in the wind vector (up to 50% in extreme cases, depending on anemometer location) may be caused by air flow distortion. We do not adjust for variations of wind speed with height, but these are compensated by our optimization of the air drag coefficient.

The currents were measured at a fixed depth of 50 m, unless otherwise noted, and read at hourly intervals. The possible variations of current between the rig and the iceberg location are of considerable concern. The distance over which currents remain constant is dependent on the site.

Garrett (1984) has reported velocity coherence lengths of the order of 10 km using simultaneous hourly observations of iceberg drift off Labrador; this suggests that our use of

TOWING LOG 12

...g Logs are to be completed by the Ice and Meteorological ...er on the drilling rig for each towing operation, and each ...the towing vessel is called on stand-by. The accompanying ...ng chart is to be detailed with berg positions prior to and ...g the tow.

E: 8-8-76 → 9-8-76

LLING RIG: PETREL

LOCATION: Latitude: 59 deg. 50 min. N

Longitude: 61 deg. 45 min. W

BERG IDENTIFICATION: CA 036

WING VESSEL: ORKNEY SHORE

WING SYSTEM USED: 60TN PAYPACK

IMATED ICEBERG SIZE:

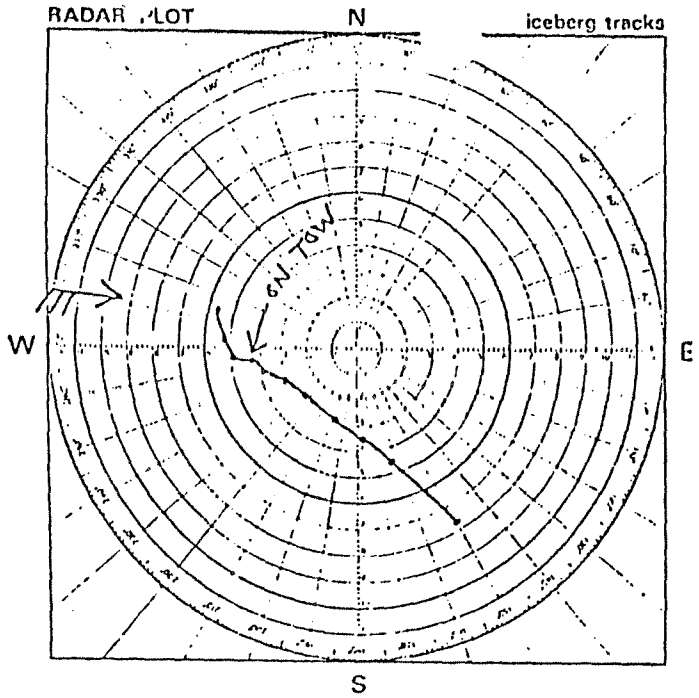
Mass: 20,000 tons

Waterline Length: 26.6 m.

Height: 8.9 m.

Initial Range of Detection: 6.3 n. miles

BERG SKETCH:



INITIAL CONDITIONS: Wind Speed: 28 KNTS Wind Direction: 280° (Direction from which wind is blowing)

Significant Wave Height 2.9 m.

TIME THAT VESSEL IS INSTRUCTED TO TOW: 1815

TIME THAT TOW COMMENCED: 2020

TIME THAT ICEBERG RELEASED: 0110

TIME OF COMPLETION OF REQUIRED MAINTENANCE AND STOWAGE —

TES & COMMENTS ON TOWING OPERATION BACK TO BACK TOW FROM CA 035. 2020 ON TOW AND SLIPPED OFF. 2110 ON TOW 2130 SLIPPED OFF. 2220 ON TOW, MINIMUM POWER. TOWING TO THE SOUTH. GOOD PROGRESS. 0110 TOW DROPPED TO GO ONTO CA 037. DIFFICULT SEA CONDITIONS. THREE PEOPLE KNOCKED OVER BY SEAS ON DECK. A SUCCESSFUL TOW FINALLY. STRAIGHT ON TO CA 037.

DATE	TIME	Range Nautical Miles	Bearing Relative True N.	CHRONOLOGY & COMMENTS
8-8-76	1700	5.7	284	
	1800	5.1	273	
	1900	4.9	267	
	2000	4.2	262	ON TOW / LOST
	2100	3.9	254	ON TOW / LOST
	2200	3.1	244	
	2230	2.8	229	ON TOW —
	2300	2.8	198	
	2330	3.45	178	
	2400	4.6	162	
	0110	7.7	150	TOW DROPPED.

Prepared by the Marex Publications Unit

FIGURE 4

TYPICAL TOWING LOG

current data is best limited to cases in which an iceberg is not much farther than 10 km from the rig.

The raw data were recorded on the rigs as follows:

1. Iceberg drift log. Range and bearing from the rig are usually recorded hourly (Fig. 2). A sketch of the iceberg and a plot of the track are usually included.

2. Hourly wind and current data measured at the rig (Fig. 3);

3. Iceberg tow log if towing occurred (Fig. 4). Usually hourly towing loads and headings are shown and occasionally a sketch of the iceberg is included.

The data are available at several government laboratories, including the Ice Forecast Central, Atmospheric Environment Service, Ottawa, and the C.O.G.L.A. (Canadian Oil and Gas Lands Administration) Office, Energy Mines & Resources at B.I.O. (Bedford Institute of Oceanography) Dartmouth, N.S.

The tape compiled by the Ice Forecast Central contains iceberg drift data for 1344 icebergs during the period 1973-1979 for the well-sites shown in Table 1. The format is as shown in Fig. 5. Wind and current data, (as per Fig. 3) were not included on the tape and manual searching of the C.O.G.L.A. files was required to obtain these data.

Raw data for the 37 icebergs were extracted from the archives by the procedure outlined in Appendix 7.

Number	Well Name	Water Depth (Meters)	Latitude	Longitude	Duration of Occupancy Year.Month.Day	Days on Station	Number of Observed Icebergs	Number of Towed Icebergs	Number of Icebergs Observed/Towed Per Day	Mean Mass 10^6 Metric Tonnes ± S.T.D. and Number of Observations ()
1	Gilbert F-53	183	58° 52' 26.00"	62° 8' 23.00"	79.9.10 to 79.10.15	35	21	7	0.60/0.20	1.24 ± 1.56 (1[illegible])
2	Karlsefni A-13	175	58° 52' 15.03"	61° 46' 42.8"	75.8.12 to 75.9.25	48	25	6	0.52/0.13	.326 ± .646 (5[illegible])
3	Karlsefni A-13 RE	175	58° 52' 15.03"	61° 46' 42.8"	76.9.13 to 76.10.25	42	30	13	0.71/0.31	2.62 ± 6.67 ([illegible])
4	Skolp E-07	166	58° 26' 24.60"	61° 46' 9.50"	78.7.22 to 78.9.30	70	70	18	1.00/0.26	2.32 ± 3.69 ([illegible])
5	Snorri J-90	141	57° 19' 44.52"	59° 57' 44.37"	75.7.28 to 75.10.9	73	57	16	0.78/0.22	1.30 ± 3.0 (24
6	Snorri J-90 RE	141	57° 19' 44.52"	59° 57' 44.37"	76.8.31 to 76.9.8	8	13	4	1.63/0.50	1.81 ± 4.01 (6
7	Hopedale E-33	560	55° 52' 24.34"	58° 50' 52.45"	78.8.9 to 78.10.1	53	68	5	1.28/0.09	2.40 ± 3.23 ([illegible])
8	Tyrk P-100	118	55° 29' 49.00"	58° 13' 50.00"	79.7.18 to 79.8.26	39	173	31	4.43/0.80	0.997 ± 1.16 (35)
9	Herjolf M-92	145	55° 31' 53.30"	57° 44' 52.53"	76.8.28 to 76.11.23	87	29	7	0.33/0.08	1.07 ± 1.84 ([illegible])
10	Bjarni O-82	155	55° 31' 48.00"	57° 42' 34.00"	79.7.30 to 79.10.22	84	110	27	1.31/0.32	2.05 ± 3.15 ([illegible])
11	Bjarni H-81	139	55° 30' 29.35"	57° 45' 5.52"	73.8.29 to 73.10.14	46	28	4	0.61/0.09	1.71 ± 2.85 ([illegible])
12	Bjarni H-81 RE	139	55° 30' 29.35"	57° 45' 5.52"	74.10.3 to 74.10.25	22	10	0	0.95/ -	0.5 (1)
13	Gudrid H-55	299	54° 54' 30.00"	55° 52' 32.00"	74.7.14 to 74.10.2	80	222	20	2.78/0.25	4.25 ± 7 (45)
14	Roberval K-92 RE	269	54° 51' 35.52"	55° 44' 35.76"	79.7.4 to 79.10.3	91	157	49	1.73/0.54	.996 ± 1.43 ([illegible])
15	Leif M-48	165	54° 17' 45.92"	55° 7' 20.17"	73.8.1 to 73.8.29	28	33	2	1.18/0.07	.961 ± .752 ([illegible])
16	Leif E-38 RE	165	54° 17' 29.87"	55° 5' 52.17"	73.7.25 to 73.8.1	7	12	1	1.71/0.14	3.97 ± 5.67 ([illegible])
17	Indian Harbor M-52	198	54° 21' 51.34"	54° 23' 51.81	75.8.21 to 75.10.23	63	13	0	0.21/ -	0.7 (1)
18	Indian Harbour M-52 RE	198	54° 21' 51.34"	54° 23' 51.81	76.9.5 to 76.11.6	62	13	7	0.21/0.11	0.36 ± .55 (8)
19	Freydis B-87	197	53° 56' 13.39"	54° 42' 30.75"	75.7.3. to 75.8.8	36	28	8	0.78/0.25	1.437 ± .332 ([illegible])
20	Verrazano L-77	183	52° 26' 37.67"	54° 11' 51.14"	76.9.1 to 76.9.29	28	2	2	0.07/0.07	.151 ± .311 ([illegible])
21	Hare Bay E-21	239	51° 10' 22.00"	51° 4' 27.00"	79.6.14 to 79.10.18	126	10	2	0.08/0.016	1.15 ± 2.40 ([illegible])
22	Bonavista C-99	329	49° 8' 5.19"	51° 14' 25.13"	74.6.26 to 74.10.3	100	185	24	1.85/0.24	1.78 ± 1.77 ([illegible])
23	Bonavista C-99 RE	329	49° 8' 5.19"	51° 14' 25.13"	75.6.12 to 75.8.12	58	36	10	0.62/0.17	1.28 ± 2.69 (13)

TABLE 1

WELL SITE DATA

D. DATA SELECTION

Iceberg tracks potentially suitable for modelling were selected on the basis of meeting four criteria:

1. Information on iceberg size or mass is included;
2. Mass is greater than 100,000 tonnes (smaller icebergs would be more strongly influenced by upper-layer currents, which were not known);
3. A minimum of eight hours of drift data is available;
4. Closest range is 3 nautical miles or less.

The selection procedure consisted of:

1. Computer assisted search of AES data tape to identify icebergs meeting criteria 1-4 (Fig. 6).

2. Manual checking of drift track logs and for availability of complete wind and current data

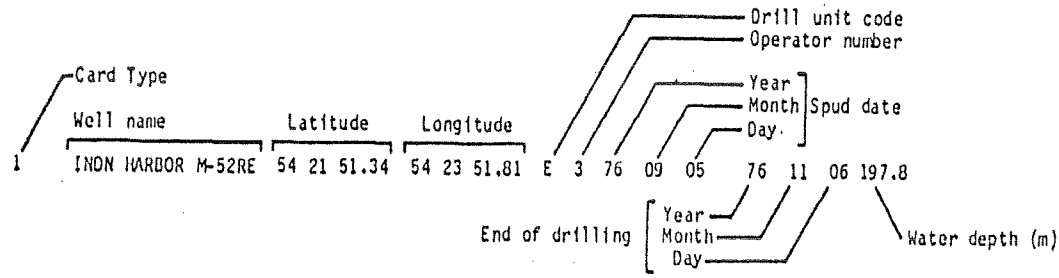
3. Visual inspection to identify and eliminate those cases for which wind and current vectors were incompatible with the iceberg drift vector.

a) Results of Data Selection

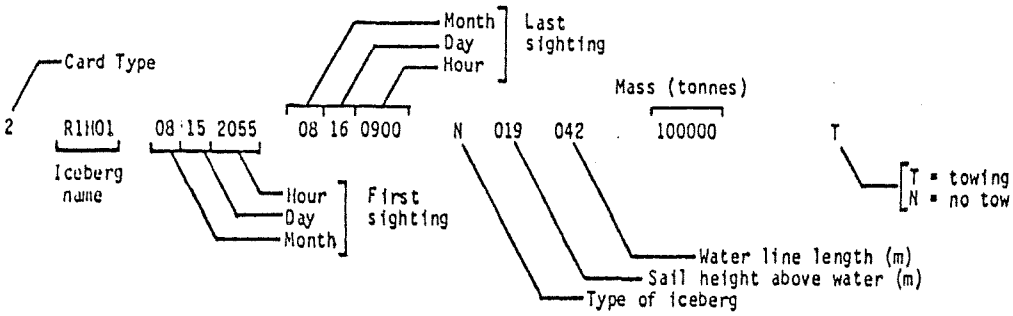
A list of the 1344 iceberg drift tracks, including range and bearing information, obtained from Atmospheric Environment Service, is kept in a binder in the Ocean Circulation data room at B.I.O.

Drillsite header cards and 544 selected iceberg identification cards (criteria: minimum 8 hours of data and

HEADER CARD:



ICEBERG I.D. CARD:



ICEBERG DATA CARD:

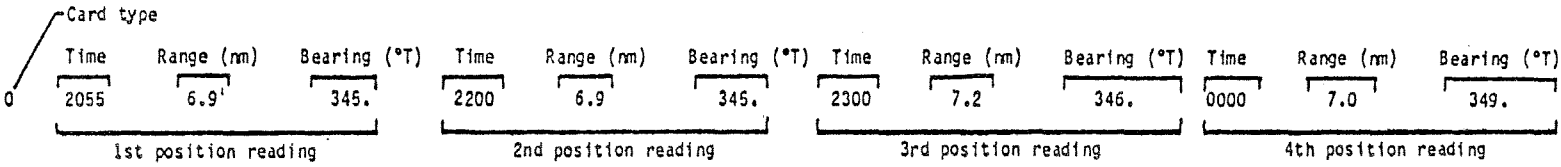


FIGURE 5

FORMAT FOR AES ICEBERG DRIFT DATA TAPE

mass or size information available) are also kept in a binder in the Ocean Circulation data room at B.I.O. The remaining iceberg tracks are unsuitable for modelling because they contain either too few observations or no record of iceberg size.

The 63 icebergs listed in Appendix 1 were selected from the 544 Tracks as potentially suitable for modelling studies by the following criteria:

Mass: $>$100,000 tonnes
Closest Range: Within 3 nautical miles of rig.

For icebergs with dimensions of length L, width W, and height H, which contained no estimates of mass, the mass was computed by assuming that the part above the water had a cone shape with an elliptical base with major and minor axes L and W. The volume of such a cone is

$$V = \pi LWH/12$$

and the total mass in tonnes was taken to be

$$M = \rho_i \rho V/(\rho - \rho_i) = 9.0V$$

assuming that the density of sea water is 1.03 tonnes/m^3 and the density of ice is 0.92 tonnes/m^3. The mass estimate is very sensitive to the assumed density of ice. Icebergs contain a certain amount of air entrained in the ice. Allowing for 5% of entrained air would reduce the density of ice to 0.87 and this would reduce the estimated mass by 33%.

Those icebergs for which wind or current data (usually the latter) are missing are identified by an M at the end of the

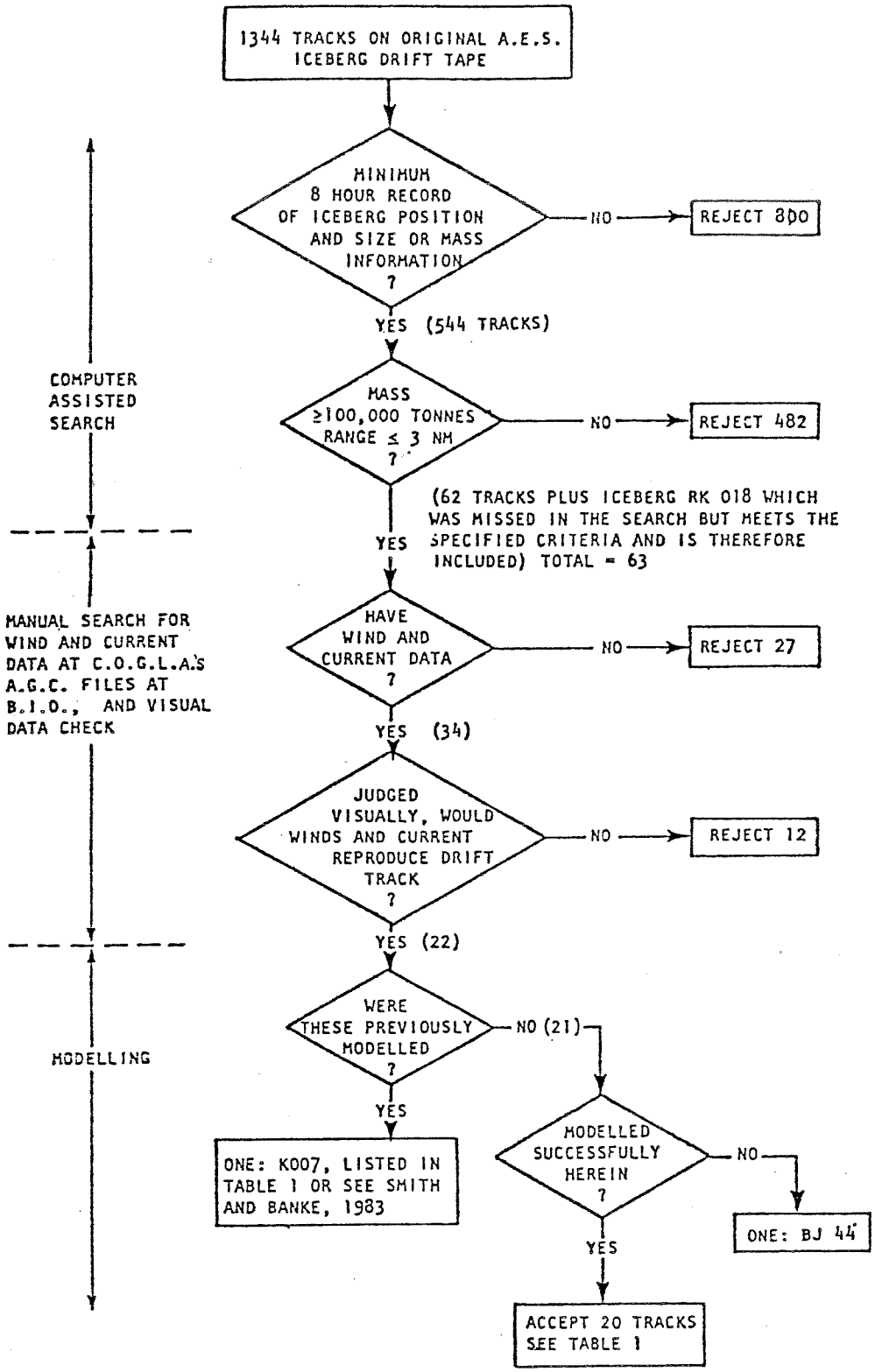


FIGURE 6

SCHEMATIC OF COMPUTER-ASSISTED SEARCH OF AES ICEBERG TAPE

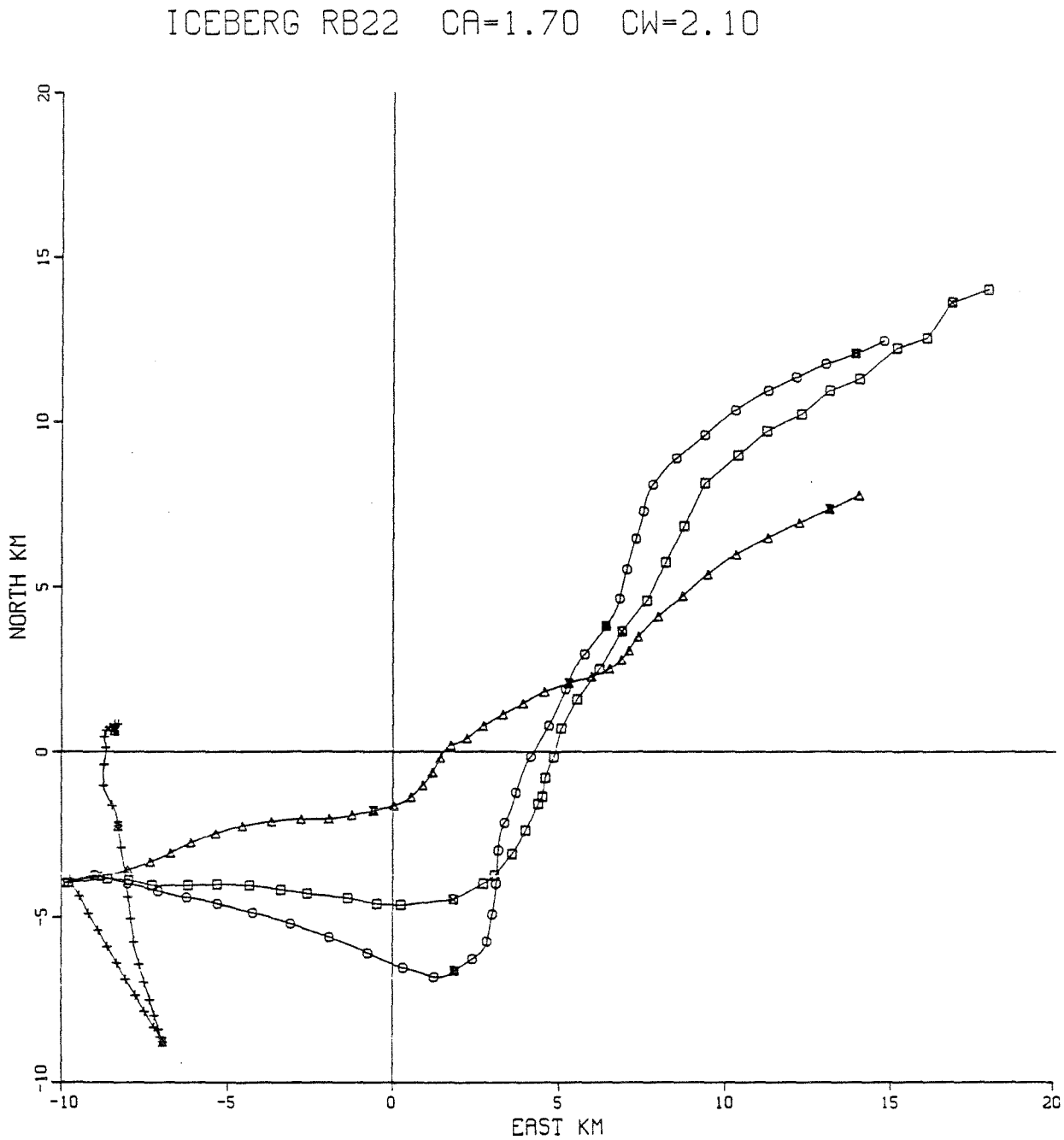
line in Appendix 1. Those considered acceptable for modelling studies are marked by an A and listed in Table 2, while those rejected because the observed winds and currents clearly would not explain the observed drift are identified with an R. Tracks previously modelled are identified with a P. In addition to the 20 icebergs, a further 5 icebergs selected without computer assistance are also listed in Table 2. One of these (B55) met our criteria but the relevant data were not on tape; two others (RB04 and GI41) were tracked in 1980 and so were not on the tape; and the remaining two (CA 104 and HE04) did not pass within 5 km of the drillship.

b) Typical Results of Hindcast Modelling

The drift track of iceberg RB 22 (Fig. 7) was selected as an example of our hindcast modelling, because a relatively long period (37 hours) was modelled and because towing was included. RB 22 was a medium-sized iceberg, with a mass of 1.1 million tonnes. The water line length was 220 m and the width was 161 m at the water line while the sail height was reported as 31 m. The above water cross-sectional area was 3800 m^2 and the cross-sectional area below water was taken as four times the above water-area (15,200 m^2).

The best fit to the actual drift track including the 12 hours of towing is obtained with a high air drag coefficient (Ca = 1.7) and a high water drag coefficient (CW = 2.1). The current (Fig. 8) contributed approximately 28 km to the drift while wind-induced drift amounted to approximately 10 km (Fig. 9).

The tow load applied was reported as 90 tonnes towards 180°. A modelled towing force of 40 tonnes towards 147° (180° magnetic) allowed the model to reproduce the observed track,



LEGEND:

- ACTUAL TRACK
- MODELLED TRACK
- CURRENT DRIFT
- WIND DRIFT & TOWING

FIGURE 7

DRIFT TRACK OF ICEBERG RB22

while ninety tonnes would have displaced RB 22 far to the south of the observed track. The 40 tonne towing diverted RB 22 by about 5 km SSE in total. The direction of drift was altered only about 30° by towing because the tow direction partly opposed the currents and the wind during hours 7 to 12. Fig. 9 shows the free drift with towing forces removed. Fig. 9 indicates that the drillship would have had to move if the iceberg had not been towed; the closest approach to the rig was 5 km instead of 0.2 km. Even better results might have been achieved with a tow directed towards 110°; the total drift speed during towing would have been increased and after the point of release at hour 12 the entire track would have been further east, increasing the range of closest approach at hours 17 to 19.

There were light winds to the south during the first seven hours changing to winds towards the north and becoming brisk after the 12th hour (Fig. 8). The wind drift contributed substantially to the change in direction after hour 12 which might have been assumed to be due mainly to the release of the towing force. The currents were towards the NE with a speed of 25 cm/s and these too contributed to the above noted change of direction. The combination of towing towards the south and the NE currents resulted in the berg being located 5 km SSE of the rig at hour 12. After release, RB 22 drifted NE under the influence of winds from the south and currents towards the northeast.

The modelled track (Fig. 7) fits the actual drift track, including the towed portion, with an rms error of 1.94 km in the hourly positions. Visual inspection indicates a close fit beyond hour 15 but during the first 15 hours the modelled track lies up to 2 km south of the actual drift track. Even our reduced estimate of the towing force (40 tonnes)

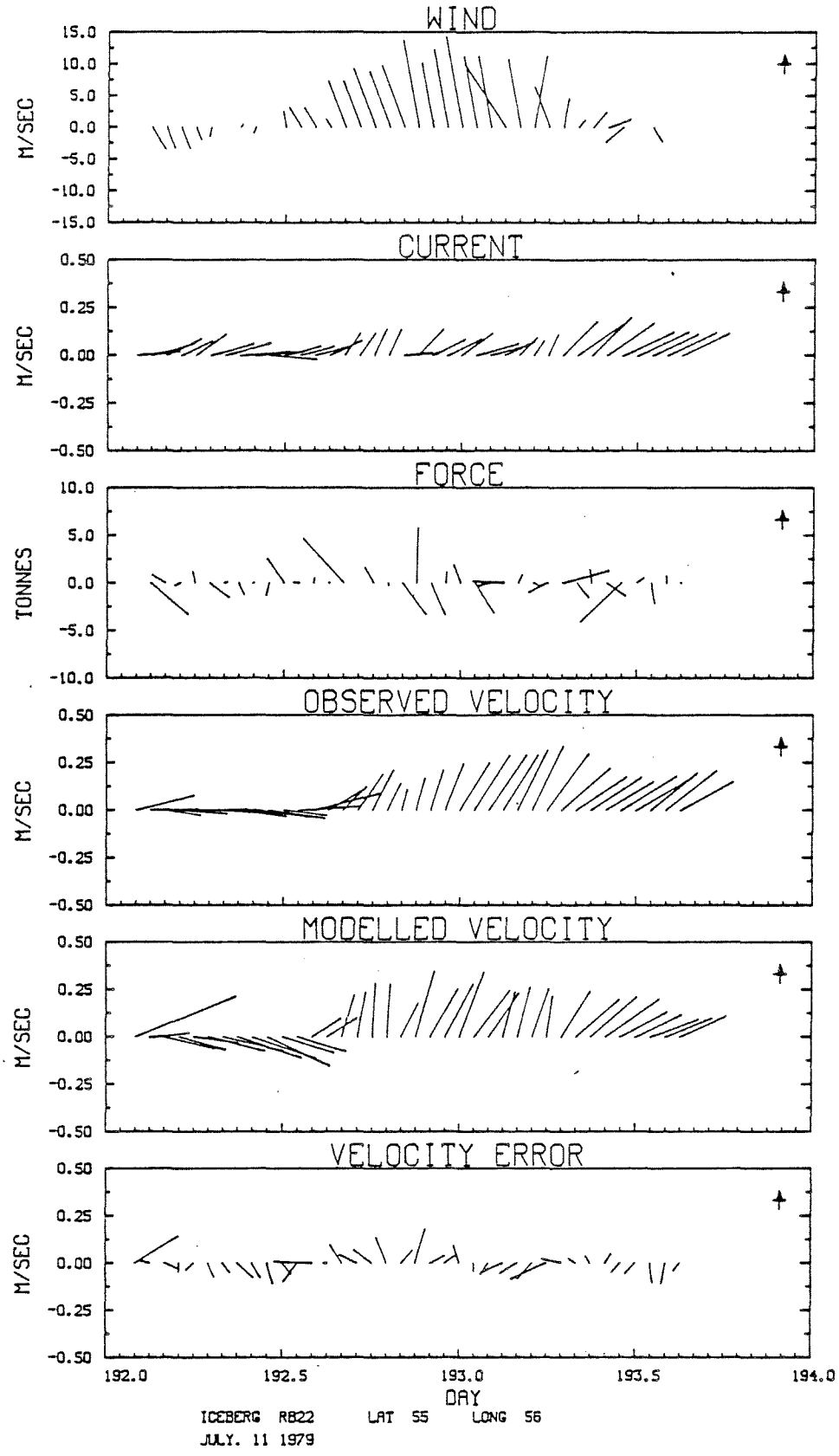
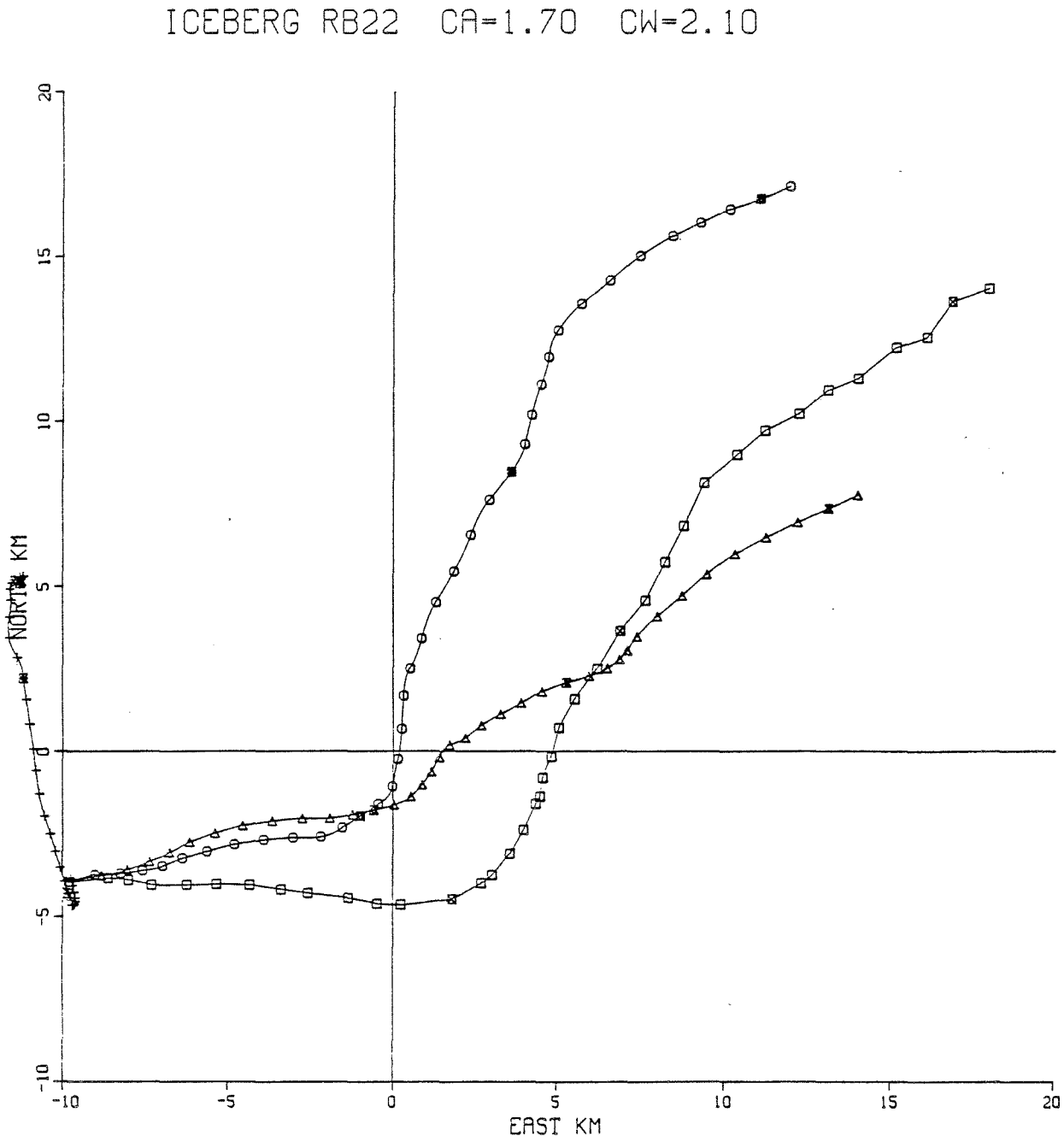


FIGURE 8

STICKPLOT FOR ICEBERG RB22

overestimates the drift toward the south during the first 12 hours. The wind and water drag coefficients used for the best fit, 1.7 and 2.1, are almost twice as large as we would expect (1.0) for irregularly shaped objects, and so if the towing force has been accurately reported our estimates of cross-sectional area above and below the water line may be far too low. If the currents at the iceberg (Fig. 8) were 10 to 20% stronger but in the same direction then the modelled track would extend farther toward the NE, the rms fit could have been much better, and it might not have been necessary to adjust the towing direction. The uncertainties due to variation of currents with depth and position are at least this large.

The drift track of iceberg G 201 is an example of one which could not be reproduced using the winds and currents collected at the drill rig. In this case the reported winds and currents are generally towards north to north-east, and the drift is generally towards the south to south-east (Fig. 10). The dashed lines indicate hourly current vectors and the solid lines indicate hourly wind vectors. Clearly the drift opposed the given winds and currents.



LEGEND:

- □——□ ACTUAL TRACK
- ○——○ MODELLED TRACK
- △——△ CURRENT DRIFT
- +——+ WIND DRIFT

FIGURE 9

DRIFT TRACK OF ICEBERG RB 22 WITH TOWING FORCE REMOVED

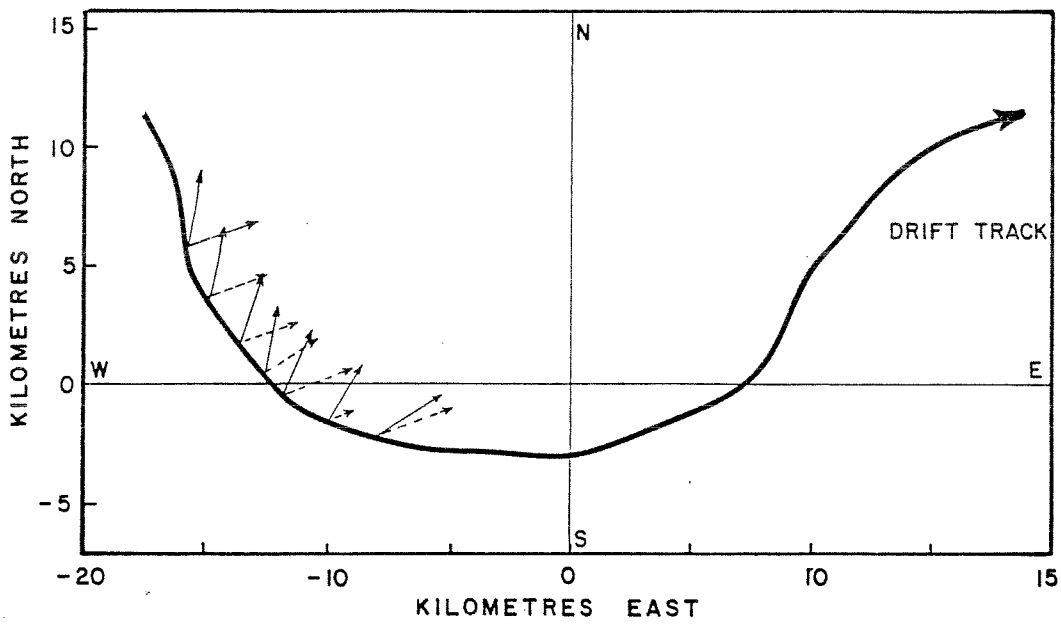
E. CONCLUSIONS

a) Suitability of Operational Data for Hindcast Modelling of Iceberg Drift Tracks.

The raw data for 38 iceberg drift tracks are stored in the Ocean Circulation data room at the Bedford Institute. Of the drift tracks in Appendix 1 which met the criteria specified in section D, wind and current data were on file for only 34 of the 63 tracks. Visual inspection of wind and current vectors and the actual iceberg drift vectors revealed that for 13 of the 34 icebergs wind and current vector combinations were too far removed from the actual iceberg drift vector for our modelling to effectively duplicate the actual drift track.

The A.E.S. data tape listed a total of 1344 icebergs observed drifting in the vicinity of drill rigs off the coast of Labrador from 1973 to 1979. Based on our criteria, only 21 of 1344 icebergs or 1.6% were modelled successfully. These tracks include K007 which was modelled in group 1 (Table 3) and the first 20 icebergs in Group 3. The other 17 icebergs in Tables 2, 3, and 4 were modelled successfully as well although their drift tracks did not meet all the criteria. All had wind and current data but many did not come within the three nautical miles specified in the computer-assisted search.

Experience with modelling the icebergs in groups 1 and 2 assisted in establishing the criteria used in selecting the first 20 icebergs in Group 3. The other 5 icebergs in group 3 were selected because of interesting drift tracks, and visual comparison of wind and current vectors indicated compatibility with the iceberg drift vectors. Two of these icebergs were



LEGEND:

⟶ - CURRENTS 1cm = 20 cm./sec.

- - - → - WINDS 1 cm = 10 m/sec

Figure 10. Drift Track of Iceberg G201 with Hourly Wind and Current Vectors.

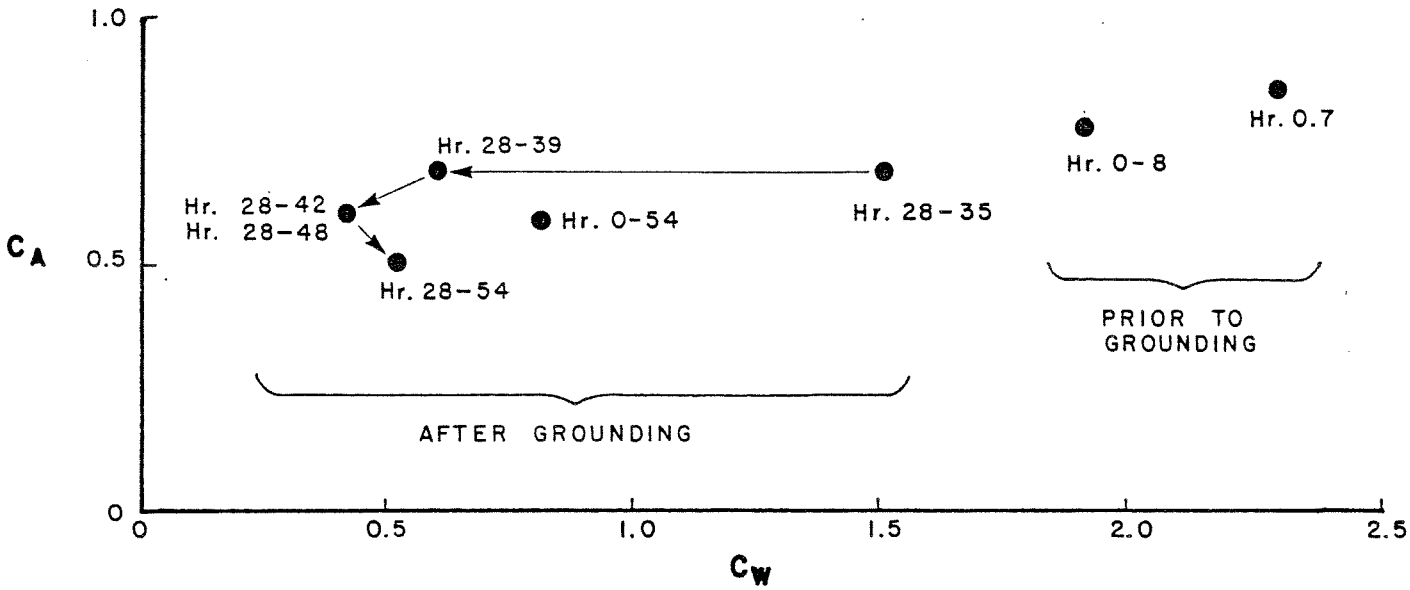


Figure 11. Dependence of Optimum Ca and Cw on Portion of Drift Track for Iceberg K007.

observed in 1980 which leaves a total of 37 - 2 = 35 icebergs during the period 1973 - 1979. For these icebergs 36 drift track segments were modelled successfully for the period of 1973 to 1979. This represents 4% of the 1344 icebergs listed on the AES iceberg tape. Assuming that the 13 iceberg drift tracks which were eliminated by visual inspection could not have been modelled successfully, the modelling success rate for icebergs which meet our criteria is 21/34 or 62%.

We conclude that the vast majority of iceberg drift data collected at drill rigs during drilling operations are not suitable for our iceberg drift model. However for those icebergs with complete data sets and which meet our criteria, modelling is successful in a majority of cases.

b) Quantity of Data Required to Estimate Drag Coefficients from Drift Track.

We computed optimum values of Ca and Cw for various portions of the data set for iceberg K007 to see whether optimum Ca and Cw were constant for a particular iceberg or whether they were dominated by noise.

In Fig. 11 and Table 5, optimum Ca and Cw values are given for various periods during the track of iceberg K007. K007 was aground during hours 9 to 28 and high Cw values, 2.3 and 1.9 are associated with the period before grounding (hours 0 to 7 and 0 to 8). After K007 started moving again Cw is 1.5 for hours 28 to 35, but for later periods the Cw values lie between 0.4 and 0.6. It appears possible that a change in underwater shape during the grounding may have influenced the values of Cw. The iceberg was close enough to the drillship for currents to be similar at both locations. Ca values do

TABLE 2

ICEBERG DIMENSIONS & MASS OF 38 SUCCESSFULLY MODELLED DRIFT TRACKS

Iceberg	Hours Model-led	Observed Minimum Range (km)	Water Line Length (m)	Water Line Width (m)	Height (m)	Sail Area (m)	Calculated Keel Area (m)	Mass (Tonnes)	Location N	Location W	Date of Observa-tion
K007	54	1.85	230	-	85	17,000	37,000	25,000,000	58°52'	61°47'	15/10/76
F018	22	7.78	68	-	26	1,020	4,080	175,000	53°56'	54°43'	07/07/75
F025	24	13.90	153	106	40	5,660	22,644	3,000,000	53°56'	54°43'	18/07/75
K016a	9	20.37	175	-	54	9,450	37,800	6,000,000	58°52'	61°47'	22/08/75
K016b	36	18.15	175	-	54	9,450	37,800	6,000,000	58°52'	61°47'	23/08/75
K024	18	8.70	70	-	15	600	2,400	50,000	58°52'	61°47'	07/09/75
S012	23	23.15	250	-	75	18,750	50,000	7,000,000	57°20'	59°58'	06/09/76
K026	18	4.30	53	-	23	600	2,400	170,000	58°52'	61°47'	14/09/75
N039	11	5.74	57	96	48	5,000	20,000	2,000,000	55°30'	57°42'	03/09/73
CA009	11	2.22	10	-	4.5	45	180	2,000	59°50'	61°45'	01/08/76
CA035	7	7.13	22	-	7	154	616	3,000	59°50'	61°45'	08/08/76
CA036	8	5.46	26.6	-	8.9	237	947	20,000	59°50'	61°45'	08/08/76
CA062	9	0.80	18	-	3	54	216	2,000	59°50'	61°45'	13/08/76
B55	13	5.00	175	-	20	2,625	17,000	9,000,000	55°30'	57°30'	26/09/73
BV34	48	5.19	195	25	40	5,400	21,600	5,000,000	49°08'	51°14'	30/06/74
BV47	13	2.11	65	55	15	780	3,120	134,000	49°08'	51°14'	03/07/74
CA104	17	24.63	335	-	68	23,000	92,000	20,000,000	59°50'	61°45'	21/08/76
GI7	44	4.82	224	181	70	14,000	56,000	5,000,000	58°52'	62°08'	29/08/79
GI41	40	2.37				1,500	6,000	200,000	58°52'	62°08'	20/08/80
G43	33	1.15	610	58	160	6,000	24,000	2,500,000	54°54'	55°52'	26/07/74
HE04	30	26.11	80	30	-	1,968	11,070	210,000	55°32'	57°45'	27/08/76
NB12	33	3.89	190	-	42	7,200	28,800	6,500,000	55°31'	57°42'	30/07/79
NB19	15	1.52	133	-	24	4,000	16,000	2,200,000	55°31'	57°42'	03/07/79
NB38	18	7.41	218	-	51	8,000	32,000	10,000,000	55°31'	57°42'	21/08/79
NB68	24	2.96	67	-	35	1,340	5,360	500,000	55°31'	57°42'	24/08/79
RB04	26	1.96	94	26	4	240	960	25,000	54°52'	55°45'	07/07/80
RB22	37	4.63	220	61	31	3,800	15,200	1,100,000	54°52'	55°45'	11/07/79
RB30	27	3.98	90	-	30	1,800	7,260	370,000	54°52'	55°45'	12/07/79
RB126	18	4.17	100	-	10	800	3,200	400,000	54°52'	55°45'	17/08/79
F022	30	5.37	89	-	26(20)	1,780	7,120	400,000	53°56'	54°43'	10/07/75
K013	16	2.19	120	120	15	1,800	7,600	800,000	58°52'	61°47'	21/08/75
LR1	28	3.33	126	105	38(20)	2,520	10,080	2,000,000	54°17'	56°05'	28/07/73
L6X	46	5.46	143	132	64(40)	5,720	22,880	1,814,353	54°17'	55°06'	07/08/73
RK018	15	2.59	240/331	171/220	55(77)	12,000	48,000	12,000,000	58°52'	61°47'	01/10/76
SK024	50	5.80	84	-	17	1,200	4,800	300,000	58°26'	61°46'	07/08/78
SK042	46	6.83	155	147	17	2,250	9,000	500,000	58°26'	61°46'	09/10/78
SK045	39	4.07	67	-	14	900	3,600	150,000	58°26'	61°46'	13/08/78
SN09	13	2.59	80	-	33(20)	1,600	6,400	300,000	57°20'	59°57'	04/08/75

not vary appreciably with record length, remaining at 0.7 $\pm$ 0.2 for the entire track.

c) Effect of Rotating Wind Drag Direction Relative to Wind Direction

In order to improve the fit of modelled drift tracks to the actual drift tracks, we have experimented with rotating wind drag direction relative to the wind direction reported by the rig. Wind or current forces may deviate from the direction of winds or currents relative to icebergs which have sail or keel-shaped structures. Subsequently, more detailed current measurements in the vicinity of icebergs off the coast of Labrador (Smith, 1983) have shown that there are often variations of current direction with depth which cast doubt on the representativeness of currents measured at only one depth.

The modelled track of GI 7 was toward NNW while the observed track was toward the north (Fig. 12), and the rms error was 12.25 km. Air and water drag coefficients at the lower limit of 0.1 were chosen by the optimizing process, allowing the Coriolis force to exert its maximum clockwise deflection in an attempt to match the observed drift direction. Our original intention in allowing variation of Ca and Cw was to allow adjustment of the relative amount of wind drift. In this case the directions of the winds and currents are not compatible with reproducing the observed drift, although the length and shape of the observed drift track are essentially correct. We therefore experimented with systematically altering the reported wind and current directions, optimizing the air and water drag coefficients as before in each case. Clearly clockwise rotations were required and we have explored a range of clockwise rotations

TABLE 3

ICEBERG MODELLING RESULTS

	Iceberg	Best Fit Ca	Best Fit Cw	RMS. Error In Position (km)	Rotation Angle of Currents (°)	Rotation Angle of Winds (°)	RMS. Drift Error (km)
GROUP I	K007	0.6	0.8	1.24	37	0	0.39
	F018	0.1	2.4	0.78	37	0	0.44
	F025	0.4	0.8	0.97	37	0	0.67
	K016a	0.1	0.1	0.99	37	0	0.71
	K016b	1.0	1.0	15.13	37	0	1.39
	K024	0.6	0.6	10.63	37	0	1.47
	S012	1.0	0.3	1.26	-143	-23	1.01
GROUP II	K026	0.6	0.6	1.08	0	180	0.60
	N039	0.5	0.6	0.41	37	15	0.37
	CA009	0.6	0.6	0.80	0	0	0.38
	CA035	0.9	0.4	1.23	0	0	0.76
	CA036	0.5	0.2	1.05	0	0	0.70
	CA062	0.9	2.4	0.80	15	0	0.49
GROUP III	B55	1.0	0.2	1.44	35	0	0.68
	BV34	0.7	0.5	3.86	27	180	0.09
	BV47	0.1	0.4	0.27	0	0	0.68
	CA104	0.1	1.3	1.24	54	-17	0.03
	GI7	0.1	0.1	12.25	0	0	0.21
	GI41	2.0	0.6	4.80	38	-38	0.73
	G43	1.7	0.1	7.00	32	0	0.38
	HE04	0.7	0.5	1.55	-22	22	0.59
	NB12	0.2	0.4	3.19	34	0	0.59
	NB19	0.8	2.4	1.10	-15	15	0.38
	NB38	2.0	0.5	0.78	0	0	0.37
	NB68	0.6	0.3	2.02	35	0	0.17
	RB04	0.2	0.1	5.65	0	33	0.21
	RB22	1.7	2.1	1.94	-5	0	0.05
	RB30	0.2	0.1	5.60	0	0	0.15
	RB126	2.0	1.6	0.95	37	0	0.05
	F022	0.5	1.7	0.97	0	0	0.33
	K013	0.6	0.7	1.20	-15	15	0.60
	LR1	0.2	1.3	1.50	0	0	0.72
	L6X	0.6	1.0	1.80	60	-60	0.68
	RK018	1.0	1.1	1.24	0	0	0.43
	SK024	0.3	0.2	2.26	0	0	0.72
	SK042	2.0	1.2	4.10	20	-15	0.67
	SK045	0.2	0.6	2.44	0	0	0.55
	SN09	0.3	0.2	2.54	-32	0	0.69

from 10 to 25° in 5° increments using 32 hours of the track, starting at hour 12 (Fig. 13). This in effect has extended the fitting procedure to four free parameters, with a best rms fit of 1.75 km (Fig. 14) obtained by rotating both winds and currents 20° clockwise and using optimized air and water drag coefficients of 0.4 and 0.1, respectively. This has resulted in the wind drift being considerably increased relative to the current drift, and the low value of the water drag coefficient is probably not physically realistic.

For a number of other drift tracks, systematically altering the reported wind and current directions resulted in improved fits. For example, the 22° rotation of winds and currents for iceberg HE 04 which shows a minimum rms error of 1.55 km in Table 3 was derived through a series of rotations of 0, 15, 18, 20, 22, 25, 30 degrees. In this case we have minimized rms error by varying three parameters, with Ca varying from 0.1 with no rotation to 0.7 with 22° of clockwise rotation of the wind. The optimum value of Cw changed from 0.1 with no rotation to 0.5 for 22° clockwise rotation of currents (Table 6).

A total of 25 of the 37 iceberg tracks in Table 3 required rotation of winds or currents to effect close fits of the modelled to the observed drift track. In 7 of these the rotation used was a value which would convert currents from magnetic to true coordinates, a conversion which may not have been consistently applied to the data used. A 180° rotation of winds was required in two cases. For most of these tracks, only one or two sets of rotation angles were selected to obtain a good fit to the observed drift track, but the consequences of applying a range of rotation angles were not explored in detail.

TABLE 4

ICEBERG DRIFT DATA

Iceberg	NET DRIFT DURING PERIOD OF MODELLING: Observed (Km)	Observed Towards (°True)	Computed (Km)	Computed Towards (°True)	Wind Drift (Km)	Wind Drift Towards (°True)	Current Drift (Km)	Current Drift Towards (°True)	Actual Mean Drift Speed(m/s)	Computed Mean Drift Speed(m/s)
K007	33	244	35	241	22	262	17	219	0.26	0.27
F018	8	274	8	281	2	318	7	275	0.10	0.10
F025	12	329	13	334	9	003	7	296	0.13	0.14
K016a	9	195	10	194	2	244	10	191	0.28	0.31
K016b	30	198	8	204	--	---	--	---	0.23	0.06
K024	19	235	7	175	--	---	--	---	0.29	0.11
S012	32	171	31	170	33	163	6	286	0.39	0.37
K026	17.8	226	18.9	223	12	199	11	246	0.27	0.29
N039	15.3	146	14.7	146	12	126	7	193	0.39	0.37
CA009	10.3	90	9.5	104	6	90	7	115	0.26	0.24
CA035	23.5	120	22.0	120	17	100	12	160	0.93	0.87
CA036	20.9	131	22.0	135	21	136	9	183	0.78	0.76
CA062	14.6	120	14.7	117	2	119	14	117	0.45	0.45
B55	15.2	189	16.1	202	13	200	10	125	0.33	0.35
BV34	30.7	076	24.0	062	32	243	53	62	0.18	0.34
BV47	9.0	069	8.9	068	4	50	8	78	0.19	0.19
CA104	14.2	277	11.5	280	3	330	10	275	0.23	0.19
GI7	57.8	345	52.2	324	23	356	37	314	0.37	0.33
GI41	33.8	305	35.6	321	30	326	11	309	0.23	0.25
G43	22.0	243	10.0	270	11	297	10	243	0.16	0.09
HE04	29.4	055	33.8	052	18	58	12	45	0.27	0.31
NB12	26.6	272	28.5	260	18	294	17	232	0.23	0.24
NB19	14.4	018	13.7	357	11	26	8	352	0.27	0.26
NB38	9.1	201	10.0	168	7	252	11	128	0.27	0.25
NB68	29.7	163	26.3	163	22	168	9	159	0.35	0.31
RB04	25.8	221	21.8	211	17	236	10	163	0.26	0.23
RB22	38.0	057	37.0	056	16	17	27	65	0.29	0.28
RB30	36.0	040	28.3	032	12	317	26	48	0.37	0.29
RB126	18.3	325	17.3	326	9	338	10	310	0.28	0.27
F022	17.0	359	17.0	000	11	3	7	352	0.03	0.03
K013	22.0	230	21.0	230	9	190	17	253	0.08	0.08
LR1	18.0	038	20.0	037	10	2	17	316	0.04	0.04
L6X	23.0	244	18.0	233	10	266	14	190	0.05	0.04
RK018	15.0	201	14.0	196	8	170	8	230	0.10	0.09
SK024	30.7	204	42.0	210	34	191	19	305	0.17	0.24
SK042	29.5	280	35.8	290	15	232	27	295	0.18	0.22
SK045	42.0	252	42.0	253	30	267	22	178	0.30	0.30
SK09	6.3	347	8.7	321	7	353	6	308	0.14	0.19

We conclude that varying Ca and Cw is not always sufficient for hindcast modelling of iceberg drift tracks from operational data; variations in wind and current directions must be included in about half of the cases.

d) Variability of Drag Coefficients of Icebergs, as Estimated by Iceberg Drift Modelling

Optimum Ca and Cw values for 38 drift tracks are plotted in Fig. 15. Cases lying outside the dashed lines reached a limiting value (0.1 or 2.0 for Ca, 0.1 or 2.4 for Cw) without finding a minimum rms error in the drift track, although in some of these cases the rms error was acceptably small.

Minimum rms errors were found for each combination of Ca and Cw lying inside the dashed lines in Fig. 15. For these cases the mean values are Ca = 0.66 $\pm$ 0.39 (Standard Deviation) and Cw = 0.73 $\pm$ 0.49 (Standard Deviation). The scatter observed indicates that we have not succeeded in finding universal drag coefficient values. Much of the apparent variability of the drag coefficients is believed to result from deficiencies in the data, and from the fact that our optimizing procedure tends to adjust directional errors through the Coriolis term in the model by selecting very high or very low drag coefficients.

e) Relative Influence of Winds and Currents in Causing Iceberg Drift

The net iceberg drift distances as actually observed, and as modelled, are presented in Table 4, along with wind-induced drift and drift due to currents only. Wind drift is computed using the optimum drag coefficients and setting currents equal to zero. Current drift is computed by using optimum drag

TABLE 5

Optimum Coefficients for Segments of K007 Drift Track

HOURS	HOUR	Ca	Cw	rms error (km)
8	0 - 8	0.8	1.9	0.42
9	0 - 9	0.9	2.3	0.41
8	28 - 35	0.7	1.5	1.25
12	28 - 39	0.7	0.6	1.14
14	28 - 47	0.6	0.4	1.13
16	28 - 44	0.6	0.4	1.09
26	28 - 54	0.5	0.5	1.35
54	0 - 54	0.6	0.8	1.25

Table 6. Effect of Rotating Winds and Currents for Iceberg HE-04 with Ca and Cw Selected for Minimum rms Error in Each Case.

Rotation Angle	Ca	Cw	rms Error (km)
0	0.1	0.1	4.10
15	0.3	0.2	1.78
18	0.6	0.4	1.63
20	0.5	0.3	1.64
22	0.7	0.5	1.55
25	0.6	0.4	1.89
30	0.6	0.4	2.79

coefficients and setting currents equal to zero. Current drift is computed by using optimum drag coefficients and setting the wind speed to zero. Wind drift (pluses) and current drift (triangles) are plotted in Figures 7, 9, 12, 13, 16, 17 and 18, and in Appendix 3. The wind drift also includes towing effects; the towed icebergs are therefore ignored in the following evaluation of relative wind and current drift. Current and wind drift were not calculated separately for K026 which leaves 23 tracks for drift comparison.

Of the 23 drift tracks, wind drift exceeded current drift for 7 icebergs; current drift was larger for 13 icebergs, and the wind induced drift was approximately equal to the current induced drift for 3 icebergs.

The total displacement by wind for twenty three tracks is 285 km and by currents 327 km. This is a sufficiently large sample for us to conclude that both winds and currents must be considered in modelling iceberg drift. Conversely, the drift rate of icebergs cannot be assumed to be an indicator of currents alone, nor of winds alone. The drift rate might be used to estimate one if the other were measured and its influence accounted for.

f) Effectiveness of Towing of Icebergs, as Compared to Modelled Tracks with Tow Force Deleted

Towing of icebergs is generally undertaken to protect a drill rig against potential collisions. Towing alters the speed and direction of drift in order to prevent the iceberg from coming dangerously close and to expedite its passage to a safe downstream location. A tow rope is pulled around an iceberg at the waterline and connected to the tow vessels'

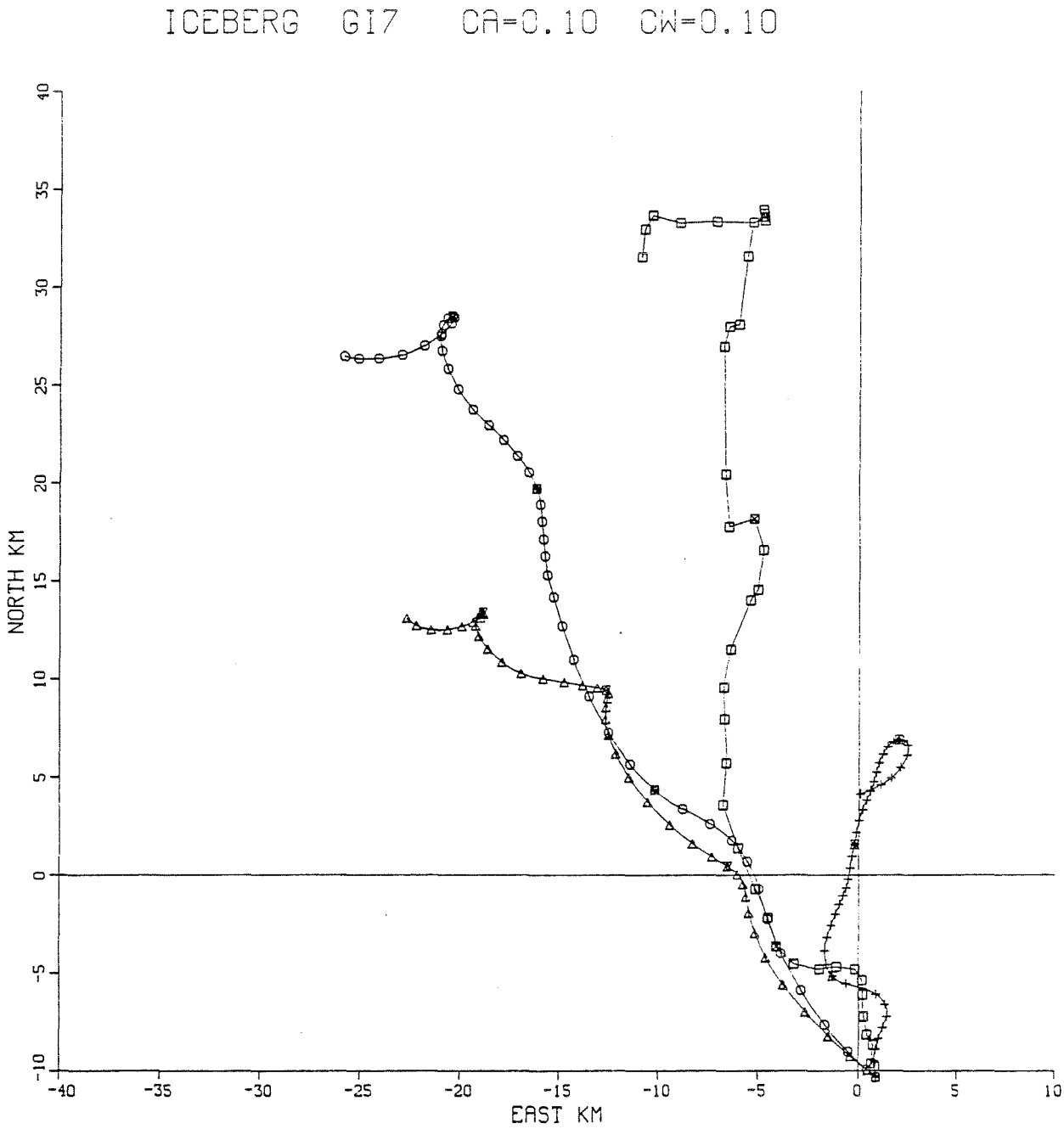


FIGURE 12

DRIFT TRACK OF ICEBERG GI7 WITH NO ROTATION OF WINDS AND CURRENTS AND RMS ERROR OF 12.25 Km

steel hawser. Towing loads and directions are monitored onboard the tow vessel and the actual towed drift is logged by noting hourly range and bearing from the stationary drill rig.

In order to assess towing effectiveness the iceberg drift model was run on twelve towed tracks with the towing force removed. Optimum drag coefficients derived with towing force included (Table 3) were used. The modelled track is the free drift track which would have occurred if towing had not been executed. The objective of towing is to prevent an iceberg from closely approaching a drill ship, and so in this study the effectiveness of towing is assessed as a gain or loss in minimum range. If towing succeeded in increasing the minimum range compared to the minimum range of the free drift track then a positive change in minimum range is noted in Table 7. Minimum range is not the only consideration in towing operations; other factors such as towing duration, vessel deployment and availability, and fuel consumption may be of greater importance, and the ultimate requirement is simply to avoid collision or interruption of drilling operations.

In six cases a loss of minimum range resulted from towing as compared with the minimum range in free drift with towing removed. As an example, Fig. 16 indicates a minimum range of 2.7 km for the towed track of the 500,000 tonne iceberg, NB68. The tow force was 20 tonnes applied towards 195°. Running the drift model with this force removed resulted in the free drift track which had a minimum range of 6.7 km. In this case a 4.0 km loss of minimum range appears to have resulted from towing. Apart from other considerations towing is judged not to have been effective in this case.

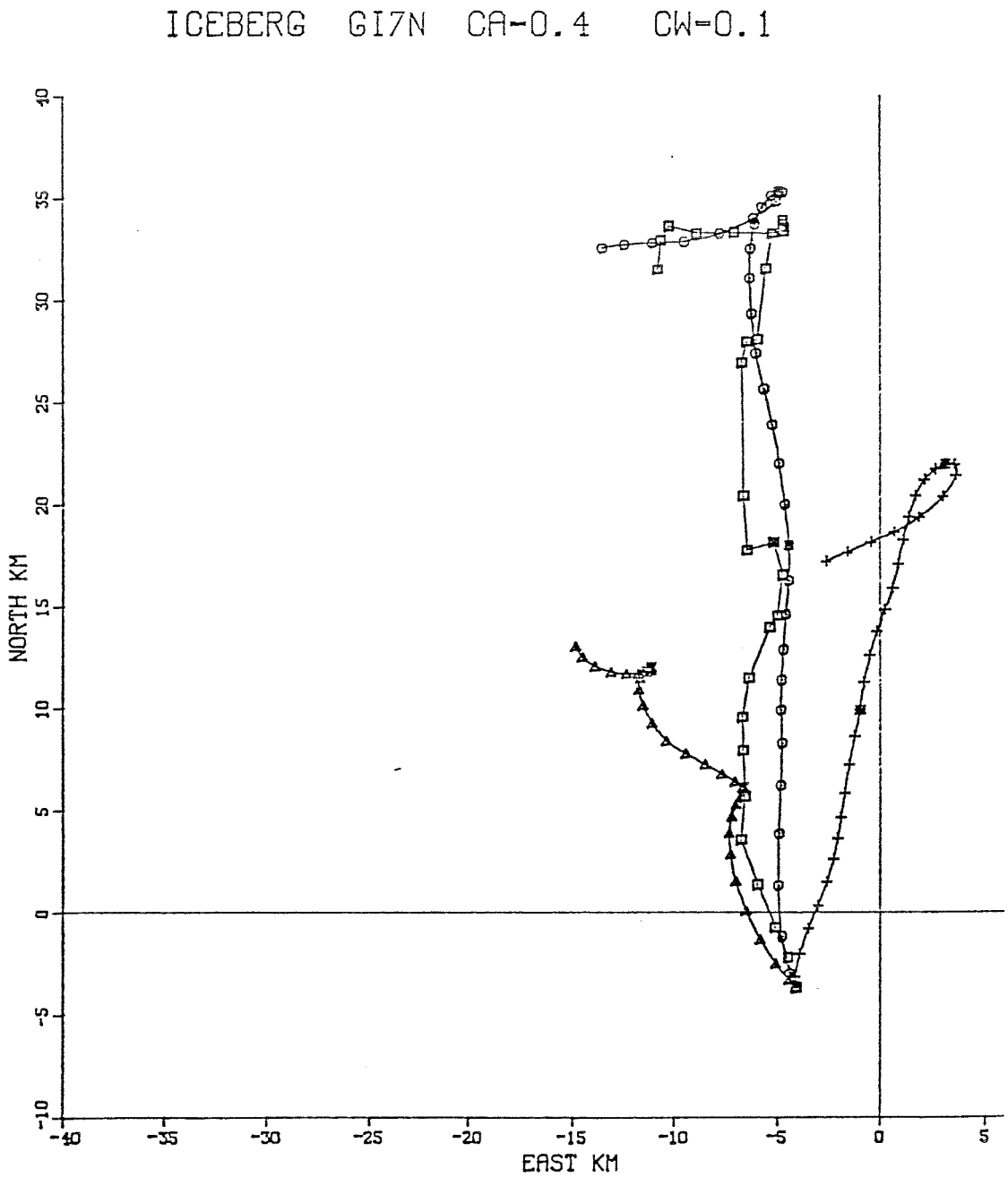


FIGURE 13

DRIFT TRACK OF ICEBERG GI7N SHOWING IMPROVED FIT OF MODELLED DRIFT TRACK WITH 20° CLOCKWISE ROTATION OF WINDS AND CURRENTS

In two cases the minimum range was not altered by towing, while the remaining four tows achieved a gain in minimum range. For example, towing the 3,000 tonne iceberg CA 035 towards 75 to 90 degrees with a tow force varying from 4 to 9 tonnes resulted in a net gain of 2.1 km (Fig. 17). Towing the 20,000 tonne iceberg, CA 036, towards south-south-west resulted in a gain of 5.4 km minimum range compared to the collision (zero minimum range) which would have resulted without towing (Fig. 18). It may be argued that this result was sufficiently valuable to justify a number of less essential towing efforts, since if towing had not occurred iceberg CA 036 would have forced the drill rig off location. Towing of iceberg RB 22 of 1,100,000 tonne mass with a tow force of 40 tonnes towards 147° resulted in a 4.43 km gain in minimum range (Fig. 7). Towing in this case again eliminated the necessity of moving a rig, since free drift without towing would have resulted in a minimum range of only 0.17 km. (Fig. 9). Drift tracks of the remaining 8 icebergs from Table 7 are shown in Appendix 4.

In terms of minimum range only it can be seen that towing succeeded in increasing the distance of closest approach in only 4 out of 12 cases, indicating that at the time the forecasting knowledge was not sufficient to make the most effective decisions as to which bergs should be towed or in which direction. The average distance of nearest approach was only marginally increased, from 4.2 to 4.5 km. In spite of this uncertainty, towing of two of the icebergs avoided the necessity of moving drill rigs. In the case of larger icebergs such as RB22 the choice of towing direction is critical since towing has a relatively small effect on the drift and it appears that since towing in general had a random effect, the correct choice of direction in this case may have been fortuitous.

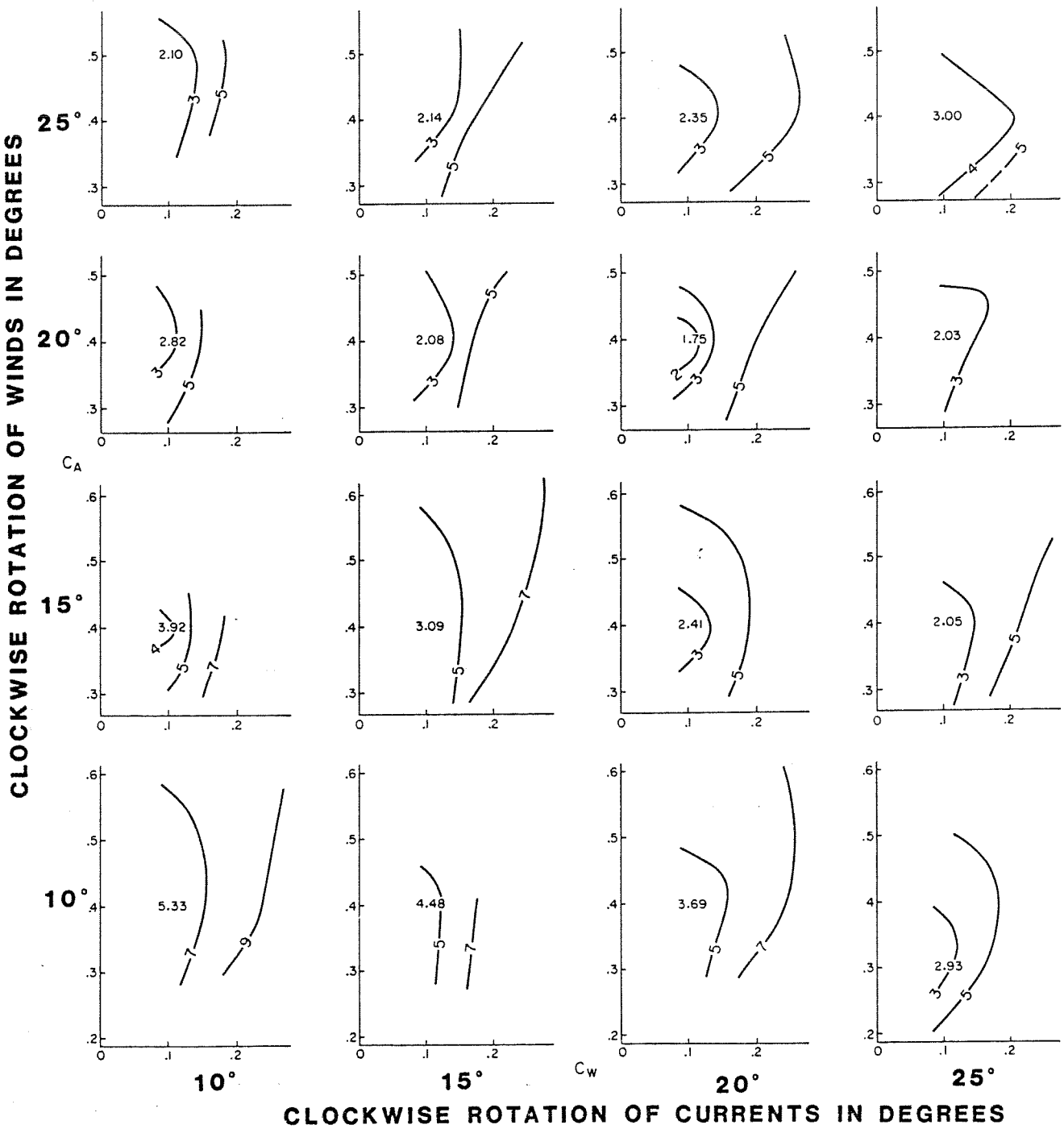


FIGURE 14

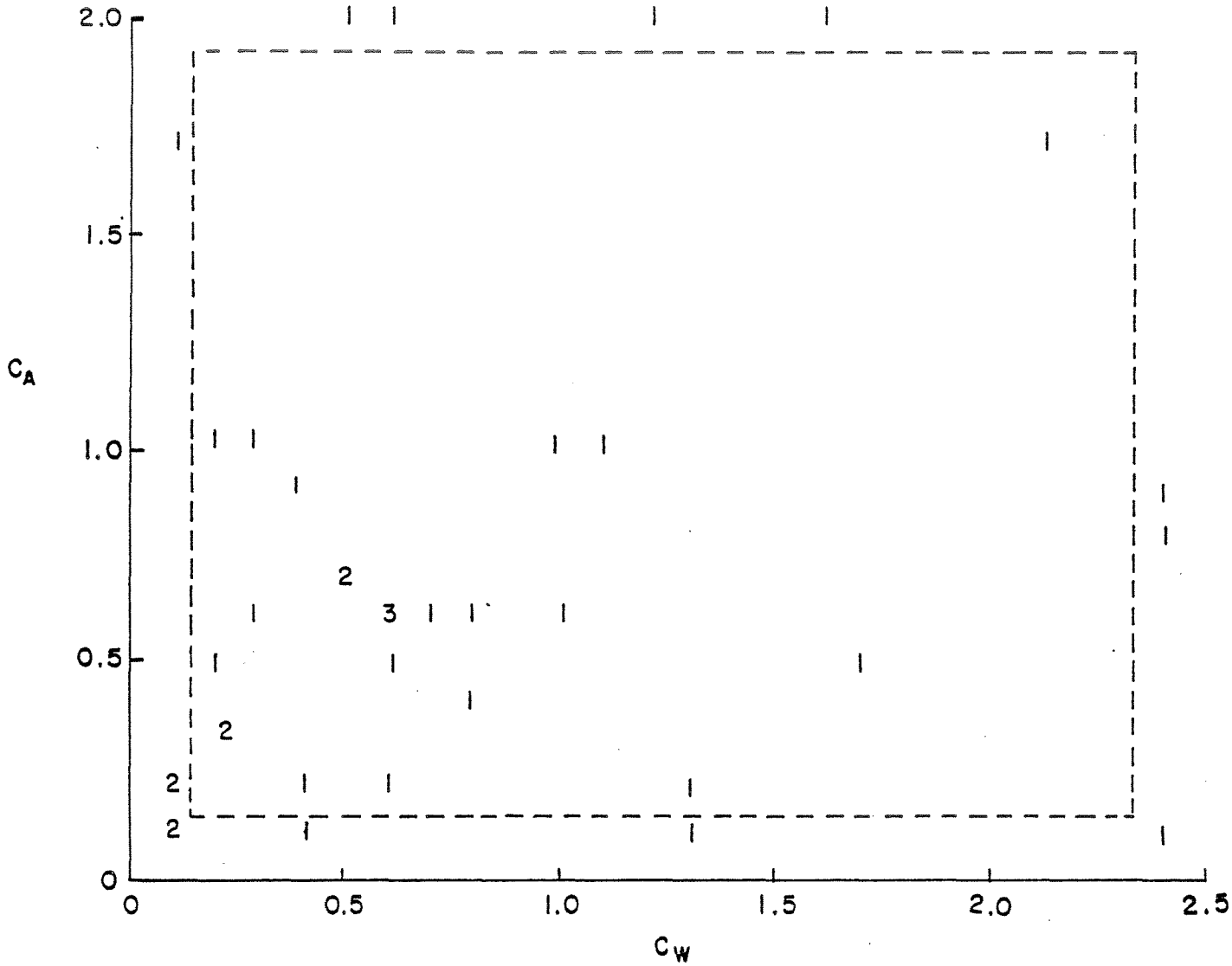
CLOCKWISE ROTATION OF WINDS AND CURRENTS AND RMS POSITION ERROR LINES FOR ICEBERG GI7

g) Bottom Scouring Force During the Grounding of an Iceberg

The drift track of iceberg K007 was reported in October, 1976, from the drillship Pelican at the Karlsefni A-13 wellsite (58°52'15"N, 61°46'42°W) off the coast of Labrador. The estimated mass was 25 x 10^6 tonnes, with a waterline length of 230 m, a width of 180 m, and a height of 85 m above the waterline. This iceberg was stationary from 1900 on October 15 until 1400 on October 16, and so it evidently went aground between 1800 and 1900 on October 15 and the velocity at that time can be determined from the drift during the previous hour.

Smith and Banke (1983) noted that there was a low tide at about 1645 and a high tide at about 1215 on October 16, and so the iceberg went aground shortly after low tide and re-floated shortly after high tide. They modelled 54 hours of the drift track of iceberg K007 starting at 0100, October 15, 1976, and found that an air drag coefficient of 0.6 and a water drag coefficient of 0.8 allowed the dynamic model to represent the observed 33 km drift track with an rms error of only 1.25 km. They simply set the velocity to zero in the model during the period when the iceberg was observed to be stationary.

A sidescan sonar survey in the vicinity of Karlsefni A-13 in 1982 showed a large scour track 800 to 1200 m long in the location of the reported grounding of iceberg K007, and in the approximate direction of its travel. Since this was one of the largest icebergs observed in this area, since the scour is large and untouched by subsequent cross-scours, and since this major scour was not seen in an earlier sidescan survey of the same area, this has been identified as the scour of iceberg K007 (C.F.M. Lewis, personal communication).



NOTE: 1,2,3 IS THE NUMBER OF VALUES AT EACH C_A -C_W COMBINATION

FIGURE 15

C_A/C_W DISTRIBUTION FOR ALL DRIFT TRACKS

The relatively uniform width and depth of the scour support the assumption of a constant bottom drag force throughout the scouring event. The net retarding force can be estimated from the initial momentum (mass M x velocity V) and the length X of the scour track,

$$F = MV_o^2/2X$$

For a mass of 2.5×10^{10} kg with an initial velocity of 0.246 m/s (model velocity after 7 hours of drift), a net retarding force of 96, 77, or 64 tonnes is required for a stopping distance of 800, 1000, or 1200 m, and the stopping time is $T = 2X/V_o$ = 1 hr 48.4 min, 2 hr 15.5 min, or 2 hr 42.6 min respectively. Using drag coefficients from Smith and Banke (1983), the air and water drag forces can be estimated during the period when the iceberg was aground (Table 8), and these are comparable to the net decelerating force estimated above.

TABLE 8 Environmental Forces on Iceberg K007

	Time	Wind-Speed m/sec)	Air Drag (tonne)	(deg)	Current Speed (cm/s)	Current Drag (tonne)	(deg)	Vector Sum (tonne)	(deg)
Stop	0900 Oct 15	9.2	57	235	12	22	240	79	236
Start	0400 Oct 16	10.2	70	200	16	40	270	92	224

The towing force in the model has been adapted to represent the acceleration during scouring by applying a constant, arbitrary force which acts opposite to the direction of travel. The initial velocity prior to scouring is taken to be 0.246 m/s at the 7th hour of the modelling period. (The iceberg was stationary from the 9th hour, and we have

TABLE 7

Iceberg Towing Effectiveness

Iceberg	STATED Tow Force (tonnes)	STATED Tow Direction (towards°)	MODEL Towing Force (tonnes)	MODEL Direction (°True)	Duration (Hours)	Towing Displacement (km)	Towing Displacement (°True)	MINIMUM RANGE (km) As Actually Towed	MINIMUM RANGE (km) As Predicted With Tow Removed	Range Effect of Tow (km)
F018	30	330	10-20	0	7	4.1	360	7.0	7.1	- 0.1
K026	22	Not Stated	22	190	6.5	8.2	200	4.3	6.2	- 1.9
CA 035	Not Stated	75 - 90	4-9	75-90	4	5.6	99	6.8	4.7	2.1
CA 036	Minimum Power	Not Stated	4-15	150	5	11.0	158	5.4	0	5.4
B55	10 - 30	180 - 230	10-30	180-230	7	12.8	236	4.6	4.9	- 0.3
GI7	Not Stated	225 - 270	30	225-270	4	12.0	55	5.0	5.0	0
NB12	45 - 90	270 - 290	40	270-290	15	12.1	336	3.9	1.8	2.1
NB19	Not Stated	360	80	360	5	1.7	73	1.4	1.75	- 0.35
NB68	20	240 - 210	20	195	6	10.0	210	2.7	6.7	- 4.0
RB22	90	180	40	147	10	7.0	117	4.6	0.17	4.43
RB 126	Not Stated	360	40	350	2	2.0	13	4.2	4.2	0
SK 045	Not Stated	270	15	270	7,4,5,2	24.0	268	4.2	9.4	- 5.2

estimated that about 2 hours are required for it to stop). Fig. 19 shows the modelled tracks for a number of forces and the distance travelled, or the distance in 3 hours if the force is insufficient to bring about a complete stop, as a function of bottom drag force. A bottom drag force of 100 tonnes (0.98×10^6 Newtons) gives the best approximation to the observed scour distance. Fig. 20 shows the scour length as a function of bottom drag force.

An uncertainty of $\pm$30% in the estimated mass of the iceberg would affect the retarding force by $\pm$20 tonnes. The air and water drag coefficients estimated by Smith and Banke (1983) could vary by $\pm$0.2 respectively (with an increase from 1.25 to 1.50 km in the rms error in modelling the observed track) and these would affect the force balance by $\pm$10 tonnes and $\pm$5 tonnes, respectively. Allowing also for uncertainties in the winds and currents themselves, in the length of the scour track, and in the initial velocity, the bottom drag force is subject to an error of perhaps $\pm$50 tonnes or $\pm$50%.

The ability to identify a scour with an iceberg grounding event and to model the forces associated with this event has offered a unique (perhaps fortuitous) opportunity to obtain a quantitative understanding of the scouring process.

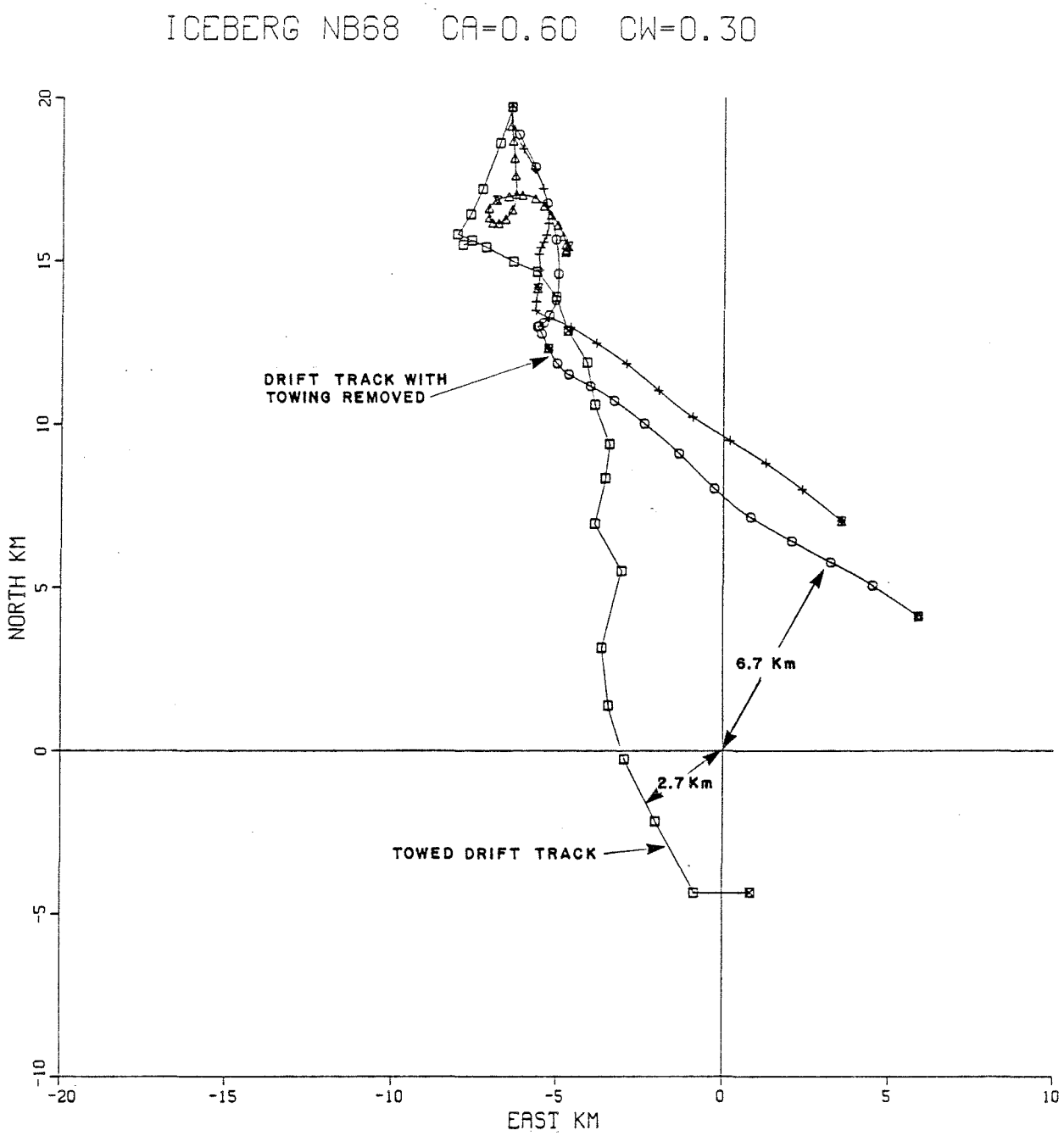


FIGURE 16

EXAMPLE OF 4.0 Km LOSS IN MINIMUM RANGE DUE TO TOWING TOWARDS 195° WITH A 20 TONNE TOW FORCE

F. SUMMARY

The dynamic iceberg drift model ICE 3 of Smith and Banke (1983) has been extended to automatically select optimum air and water drag coefficients either by trying all possible coefficient values in a selected range (ICE 4) or by an iterative method (ICE 5), and input and output data can be displayed as stick plots (STKICE) as well as drift tracks. The model was developed using 6s time steps, but tests have shown that for medium-size icebergs computational efficiency can be improved without affecting the results by lengthening the time step to 30s, and for larger icebergs, time steps up to 120s can be used.

A data tape containing hourly positions of 1344 icebergs relative to fixed drill rigs off Labrador was searched to identify 63 drift tracks which were potentially suitable for testing of drift models, meeting the following criteria: mass or size information available, and mass $>10^5$ tonnes; at least 8 hourly positions reported; and track approaches within 3 nautical miles (5.56 km) of drillship. Of these only 34 had complete wind and current data available, among which 21 were modelled successfully, while in 13 cases the winds and currents reported at the drillship were judged to be inconsistent with modelling of the observed drift. While we worked with a small subset of the original data, the selection process allowed us to test the iceberg drift model using publicly available data gathered to meet operational and regulatory requirements and not originally intended for scientific analysis. An ideal data set for hindcast modelling would include the profile of currents in the immediate vicinity of an iceberg of known size and a series of measurements of this type is planned.

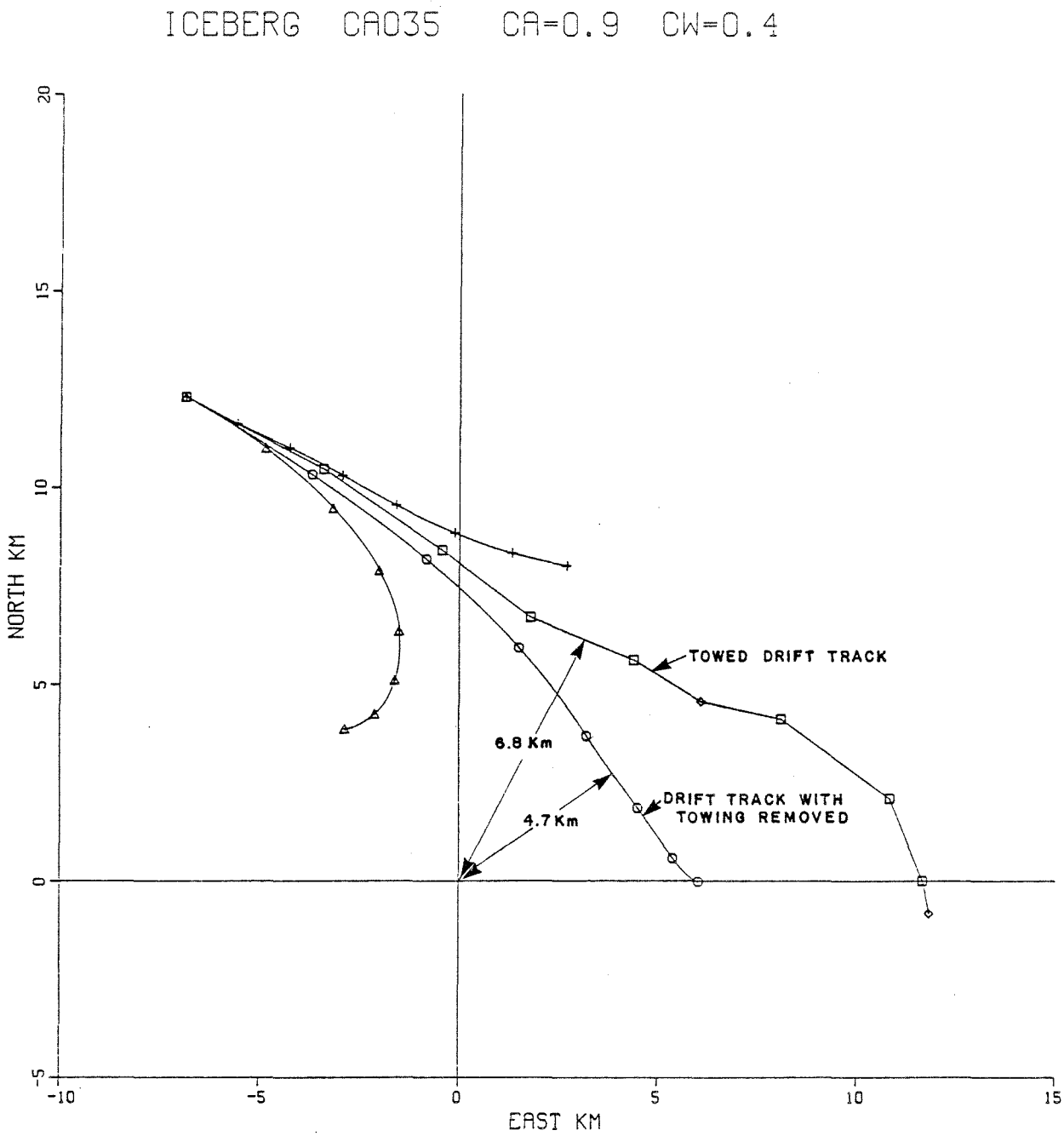


FIGURE 17

EXAMPLE OF A 2.1 Km GAIN IN MINIMUM RANGE DUE TO TOWING TOWARDS 75°-90° WITH 4 TO 9 TONNE TOWING FORCE

From the drift track of iceberg K007 it was found that 8 hours of drift data are sufficient to establish optimum values of air and water drag coefficients, but that the water drag coefficient changed substantially following a grounding event.

In addition to optimizing the choice of air and water drag coefficients, it was found in more than half of the cases investigated that constant offsets in the wind and/or current direction - in effect one or two additional free parameters in the model-were necessary to obtain a close fit (typically 1 km rms error) of the modelled track to the observed drift.

The mean values of air and water drag coefficients for minimum error in modelled drift were 0.66 and 0.79 respectively. The drift due to wind was on average only slightly less than that due to currents in the tracks which we modelled.

In twelve cases in which icebergs were towed the effect of towing was investigated by modelling the free drift track with towing forces removed. The purpose of towing was presumed to be to prevent the iceberg from closely approaching a drillship, but in six cases we estimated that the effect of towing was to make the iceberg approach the drillship more closely and in two other cases the closest range was unaffected. In two of the four "successful" towing cases our model indicates that without towing it would have been necessary to move the drillship to avoid a collision.

By modelling the deceleration of iceberg K007 during a scouring event, we find that a bottom drag force of 100 tonnes is consistent with the 1 km length of the scour, as identified in a sidescan sonar record.

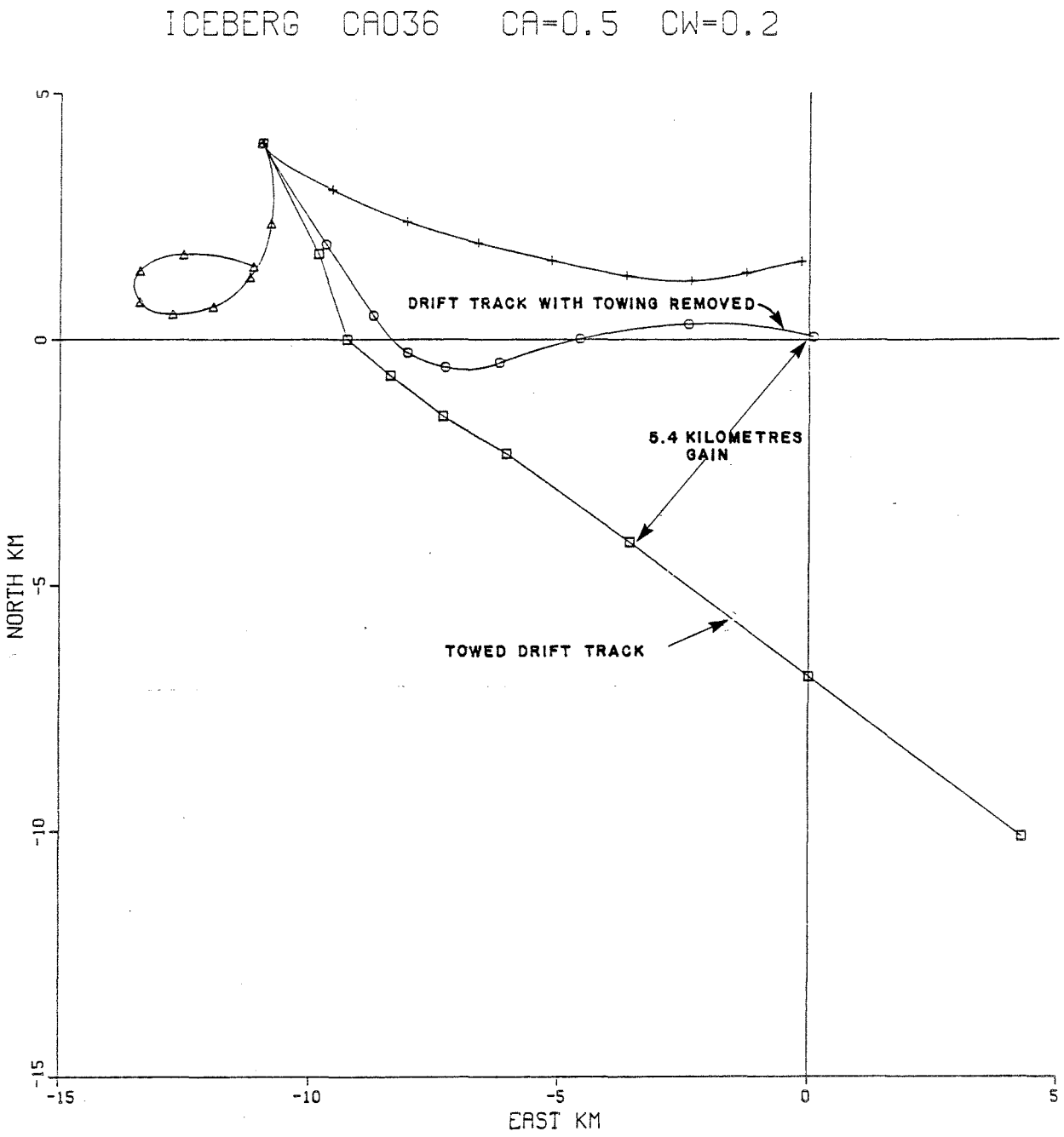


FIGURE 18

EXAMPLE OF 5.4 Km GAIN IN MINIMUM RANGE DUE TO TOWING WITH A TOW FORCE VARYING FROM 4 TO 15 TONNES. THE TOW DIRECTION WAS NOT SPECIFIED BUT IS PRESUMED TO BE TOWARD THE SOUTH SOUTHWEST.

While operational data have not been found adequate to model iceberg tracks in a majority of cases, the use of selected tracks has allowed us to test the model and to reach useful conclusions.

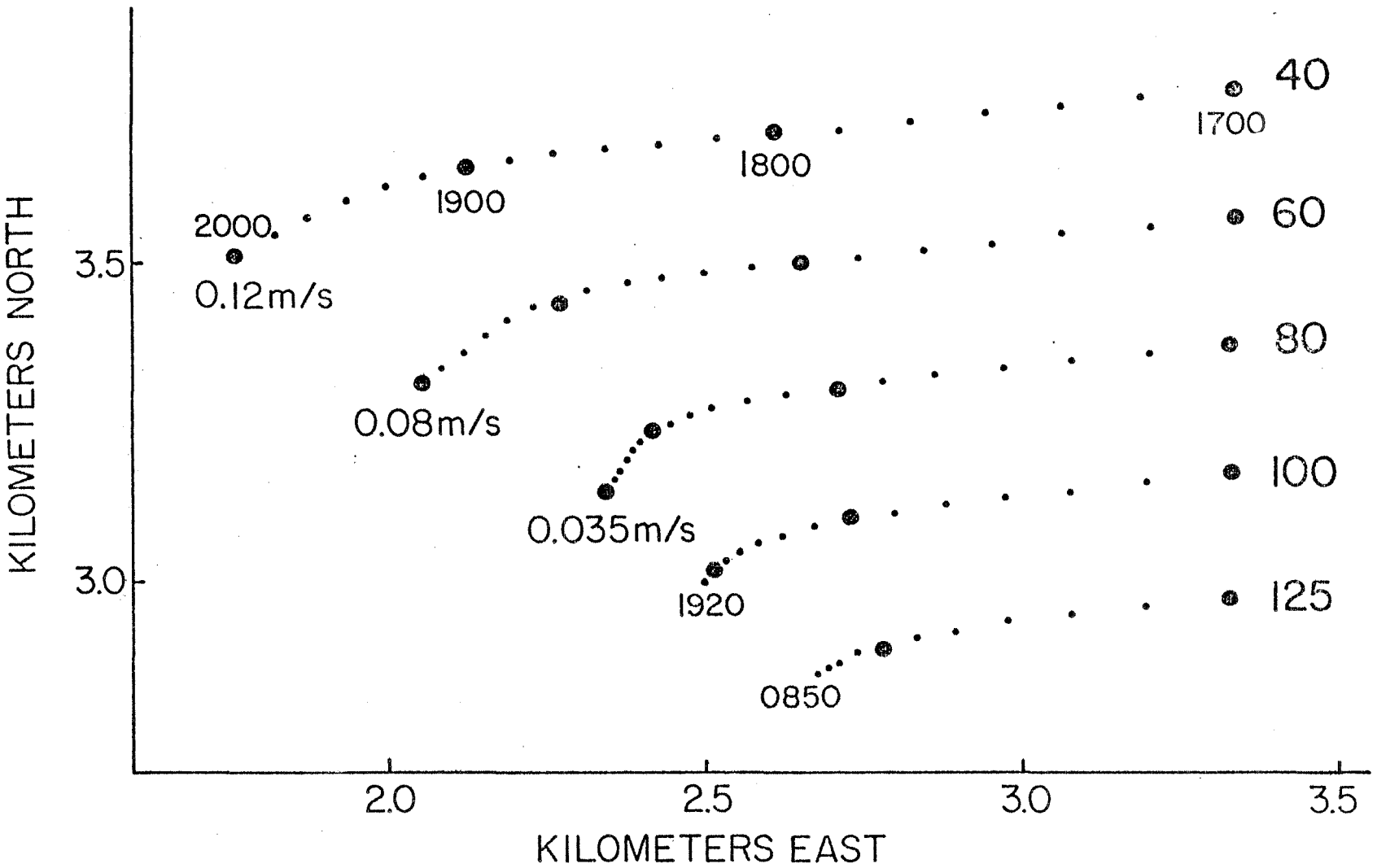


FIGURE 19

MODELLED TRACKS OF ICEBERG K007 AT 10 MINUTE INTERVALS STARTING AT 1700, OCTOBER 15, 1976. BOTTOM DRAG FORCE IS LABELLED AT BEGINNING OF EACH TRACK (AT RIGHT) AND EITHER THE STOP TIME OR THE VELOCITY AFTER 3 HOURS IS LABELLED AT THE END. COORDINATES ARE DISTANCE FROM THE DRILLSHIP, FOR THE TOP TRACK (40 TONNE DRAG) WITH EACH SUBSEQUENT TRACK DISPLACED 2 Km SOUTHWARD FOR CLARITY.

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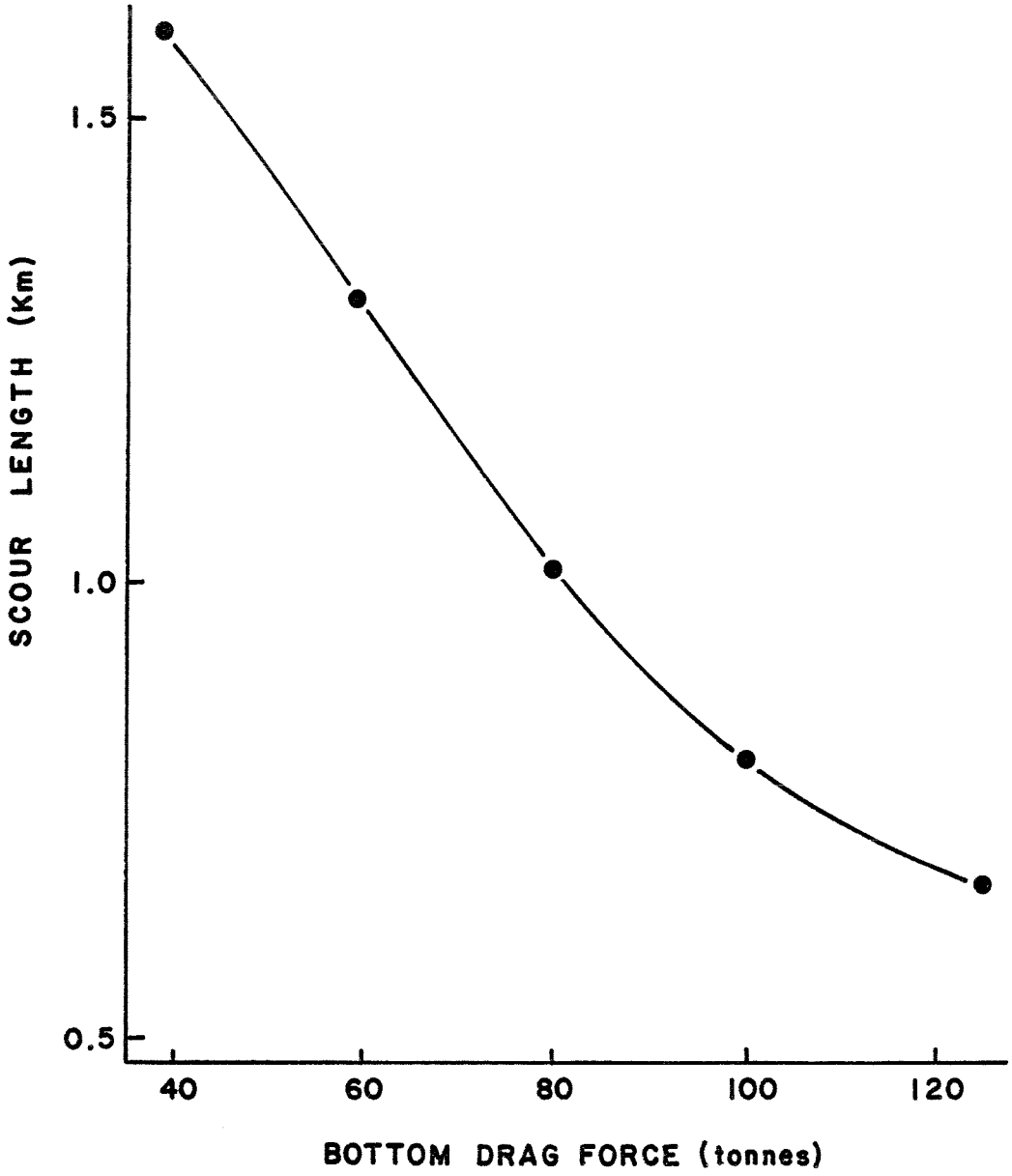


FIGURE 20

LENGTH OF SCOUR FROM FIGURE 19 AS A FUNCTION OF BOTTOM DRAG FORCE

APPENDIX 1.

List of 63 Iceberg Tracks having minimum range (last number on line) within 3 nautical miles (5 km) and with estimated mass greater than 10^5 tonnnes. Symbols at ends of lines: A - acceptable for modelling studies, M - missing wind or current data, R - rejected because model clearly will not be able to reproduce drift track, P - previously studied. A dash before the mass value indicates that it was estimated from reported dimensions.

At the end of this Appendix is a table of the number of icebergs grouped by closest distance of approach in various ranges.

Site, Site Code[1] # of tracks	Iceberg	FIRST POSITION hour	day	mo	yr	type[2]	H m	L m	W m	Mass[5] 10^3 tonne	Towed[3]	Closest n mi.	Data Availability
Bonavista C-99 BV (75)	018	0905	26	06	74	N	20	130	048	(265)	N	1.7	M
	034	1915	28	07	74	N	40	195	-	5000	N	2.8	A*
	047	0542	03	07	74	N	15	065	-	(135)	N	1.1	A
	050	2230	02	07	74	T	38	115	-	4000	Y	0.4	M
	086	2230	23	07	74	D	43	110	-	750	Y	2.7	M*
	087	2340	24	07	74	N	48	097	-	(958)	N	2.4	M
	135	0800	02	08	74	N	20	080	-	(271)	Y	2.2	M
	147	2100	03	08	74	N	32	071	-	(342)	Y	1.0	M
Bonavista C-99 re-entered RBV (18)	23	0600	16	07	75	N	25	100	-	800	Y	1.9	M
Gudrid H-55 G (46)	031	1700	16	06	74	N	45	238	-	(5405)	N	1.8	M
	015	1100	17	06	74	N	50	340	-	1500	N	0.2	M
	019	2400	17	06	74	N	31	160	-	2000	Y	0.6	M*
	040	1645	23	06	74	N	40	103	-	750	Y	0.7	M*
	041	0355	24	06	74	N	18	105	-	500	Y	1.1	M*
	043	0700	23	06	74	N	56	156	-	2500	Y	1.7	A
	069	2000	27	07	74	D	29	088	-	500	Y	2.2	M
	100	0200	03	08	74	N	55	450	-	1000	N	1.1	M
	101	0030	03	08	74	N	54	157	-	2000	N	1.7	M
	108	1500	03	08	74	N	29	086	-	500	Y	0.9	M
	111	0100	04	08	74	N	15	061	-	200	Y	3.0	M
	182	0145	04	09	74	N	36	101	-	400	Y	2.0	R*
	197	1700	02	09	74	N	35	200	-	3500	Y	1.0	R*
	201	1400	03	09	74	N	46	109	-	300	Y	1.8	R
	207	0400	06	09	74	N	24	083	-	500	Y	1.7	M

Site, Site Code[1] # of tracks	Iceberg	FIRST POSITION hour	day	mo	yr	type[2]	H m	L m	W m	Mass[5] 10^3 tonne	Towed[3]	Closest n mi.	Data Availability
Indn Harbour M-52RE RIH (8)	05	1600	23	08	76	N	22	093	-	900	Y	2.5	M
Bjarni H-81 BJ (18)	44	0330	06	09	73	N	65	150	-	2000	Y	1.3	R*
Bjarni H-18 - RE BH (1)	01	2000	05	10	74	D	20	080	050	500	N	2.4	M*
Skolp E-07 SK (31)	024	0800	07	08	78	D	17	084	-	500	Y	2.9	A
	042	0300	09	08	78	N	19	147	-	5500	N	0.4	A
	045	0100	13	08	78	N	14	067	-	150	Y	2.2	A
Freydis B-87 F (13)	002	1500	02	07	75	T	15	125	-	935	Y	2.4	M
	005	1500	02	07	75	T	20	120	-	900	Y	2.0	M
	022	0100	10	07	75	N	26	089	-	400	Y	2.9	A
Karlsefni A-13 RK (9)	013	0500	19	08	75	N	15	120	-	500	Y	1.2	A

NOTES

1. See Table 1 and Fig. 1 for site locations.
2. D- Domed T- Tabular
3. Y- Towed N- Not towed
4. A- Data available M- Wind or current data missing R- Rejected because winds and currents do not match drift
   *- Anomalies in position or timing in computer tape data, log sheets to be used instead
5. Mass values in brackets are estimated from dimensions.

Site, Site Code[1] # of tracks	Iceberg	FIRST POSITION hour	day	mo	yr	type[2]	H m	L m	W m	Mass[5] 10^3 tonne	Towed[3]	Closest n mi.	Data Availability
Snorri J-90 SN (24)	06	1800	29	07	75	N	21	063	-	170	Y	0.9	M
	08	1200	30	07	75	N	23	066	-	300	Y	2.5	M
	09	1200	30	07	75	N	33	080	-	300	Y	1.3	A
Snorri J-90RE S (7)	001	0545	28	08	76	N	18	050	-	150	Y	0.2	M
Roberval K-92RE RB (85)	022	1100	10	07	79	D	32	320	-	3000	Y	2.5	A
	030	0100	12	07	79	N	30	090	-	370	N	2.2	A
	093	0600	05	08	79	N	52	220	-	3500	Y	2.7	M
	094	0600	05	08	79	N	49	312	-	6500	Y	2.6	R*
	120	1400	16	08	79	N	63	130	-	3000	N	2.5	R
	126	1600	17	08	79	T	10	100	-	(212)	Y	2.2	A
	139	0400	03	09	79	N	45	090	-	1000	Y	2.2	M
Karlsefni A-13RE RK (21)	007	2000	12	10	79	N	85	230	180	25000	Y	1.0	A
	018	1545	24	09	79	N	55	241	173	12000	Y	1.4	A*
Bjarni 0-82 NB (55)	012	0730	30	07	79	T	42	190	-	6250	Y	2.3	A
	019	1330	31	07	79	N	42	133	-	2200	Y	1.0	A
	038	1930	15	08	79	T	51	218	-	10000	Y	2.3	A
	068	1445	23	08	79	N	35	067	-	500	Y	1.6	A
	078	1930	31	08	79	T	24	169	-	2500	Y	2.8	M
Leif E-38RE LR (5)	1	1532	25	07	73	T	30	126	-	2000	Y	1.6	A

Site, Site Code[2] # of tracks	Iceberg	FIRST POSITION hour	day	mo	yr	type[2]	H m	L m	W m	Mass[5] 10^3 tonne	Towed[3]	Closest n mi.	Data Availability
Leif M-48 L (6)	6X	0005	01	08	73	N	65	143	132	1814	N	2.7	A*
Tyrk P-100 TY (37)	011	0600	18	07	79	D	42	148	-	1400	Y	1.0	R*
	015	2000	18	07	79	D	53	126	-	1100	Y	2.3	R
	016	2000	19	07	79	D	25	075	-	240	Y	2.6	R
	019	0800	18	07	79	D	38	210	-	5000	N	2.2	R
	076	0630	04	08	79	D	20	077	-	170	Y	2.8	R
	142	0630	16	08	79	N	14	053	-	100	Y	2.1	R
Gilbert F-53 GI (10)	007	2100	27	08	79	N	70	224	181	5000	Y	2.7	A
	011	1100	29	08	79	N	24	068	057	300	Y	2.0	R
Hopedale E-33 HO (35)	052	0100	28	08	78	T	24	077	-	1400	T	2.8	N

Tracks for all Well Sites: 544 (with at least 8 positions and with mass or size information)

Tracks for all Well Sites: 63 (with at least 8 positions and with mass or size information and within 3 n. mi. minimum range)

Tracks Available for Model Development: 20

Minimum Range (Nautical Miles)	No. of Icebergs
0 - 1	13
1 - 2	16
2 - 3	33
3 - 5	106
5 - 7	80
7 - 10	69
10 - 15	50
>15	21

APPENDIX 2.

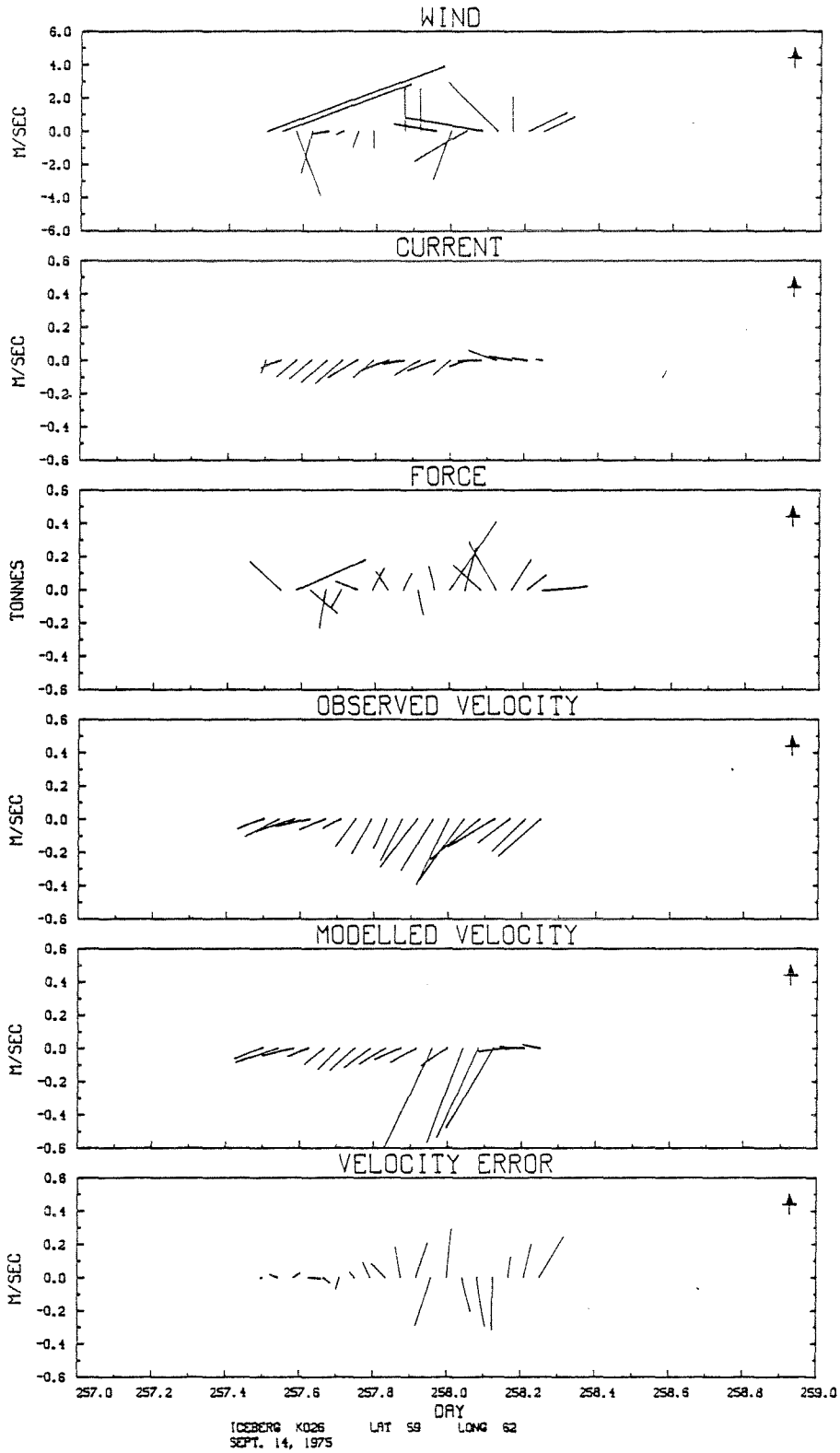
Stick Plots of Wind, Current, Force and Velocity for Icebergs

K026
N039
CA009
CA036
CA062
B55
BV47
HE04 and
RB126

Similar Plots are Shown by Smith and Banke (1983) for Group I Icebergs

K007
F018
F025
K016
K024
S012

For RB22 see Fig. 8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-4.0
-6.0
CURRENT
M/SEC
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0.4
0.2
0.0
-0.2
-0.4
-0.6
FORCE
TONNES
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
OBSERVED VELOCITY
M/SEC
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
MODELLED VELOCITY
M/SEC
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
VELOCITY ERROR
M/SEC
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
257.0
257.2
257.4
257.6
257.8
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258.2
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258.6
258.8
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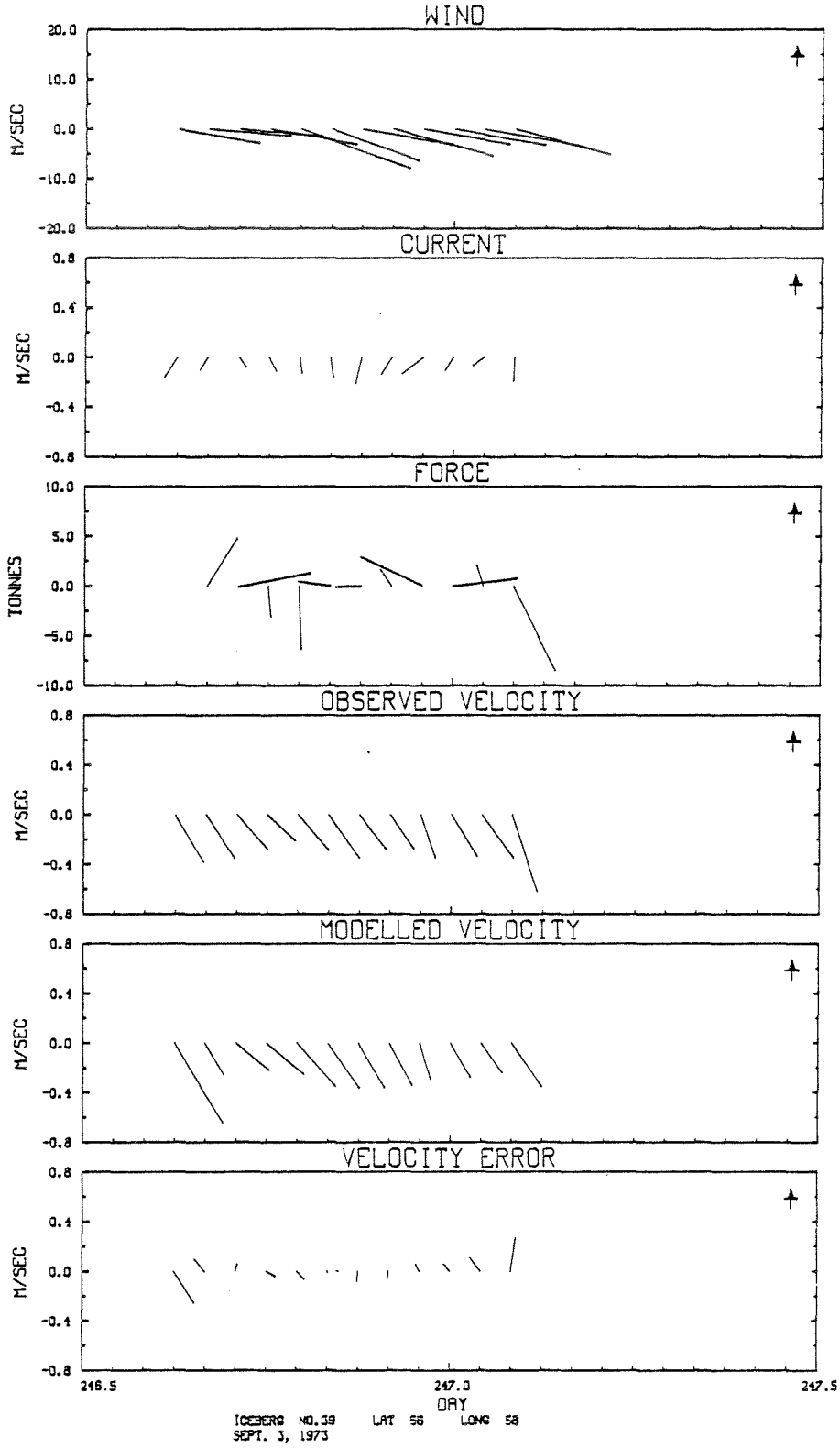
ICEBERG K026 LAT 59 LONG 62
SEPT. 14, 1975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0.0
-0.4
-0.8
FORCE
TONNES
10.0
5.0
0.0
-5.0
-10.0
OBSERVED VELOCITY
M/SEC
0.8
0.4
0.0
-0.4
-0.8
MODELLED VELOCITY
M/SEC
0.8
0.4
0.0
-0.4
-0.8
VELOCITY ERROR
M/SEC
0.8
0.4
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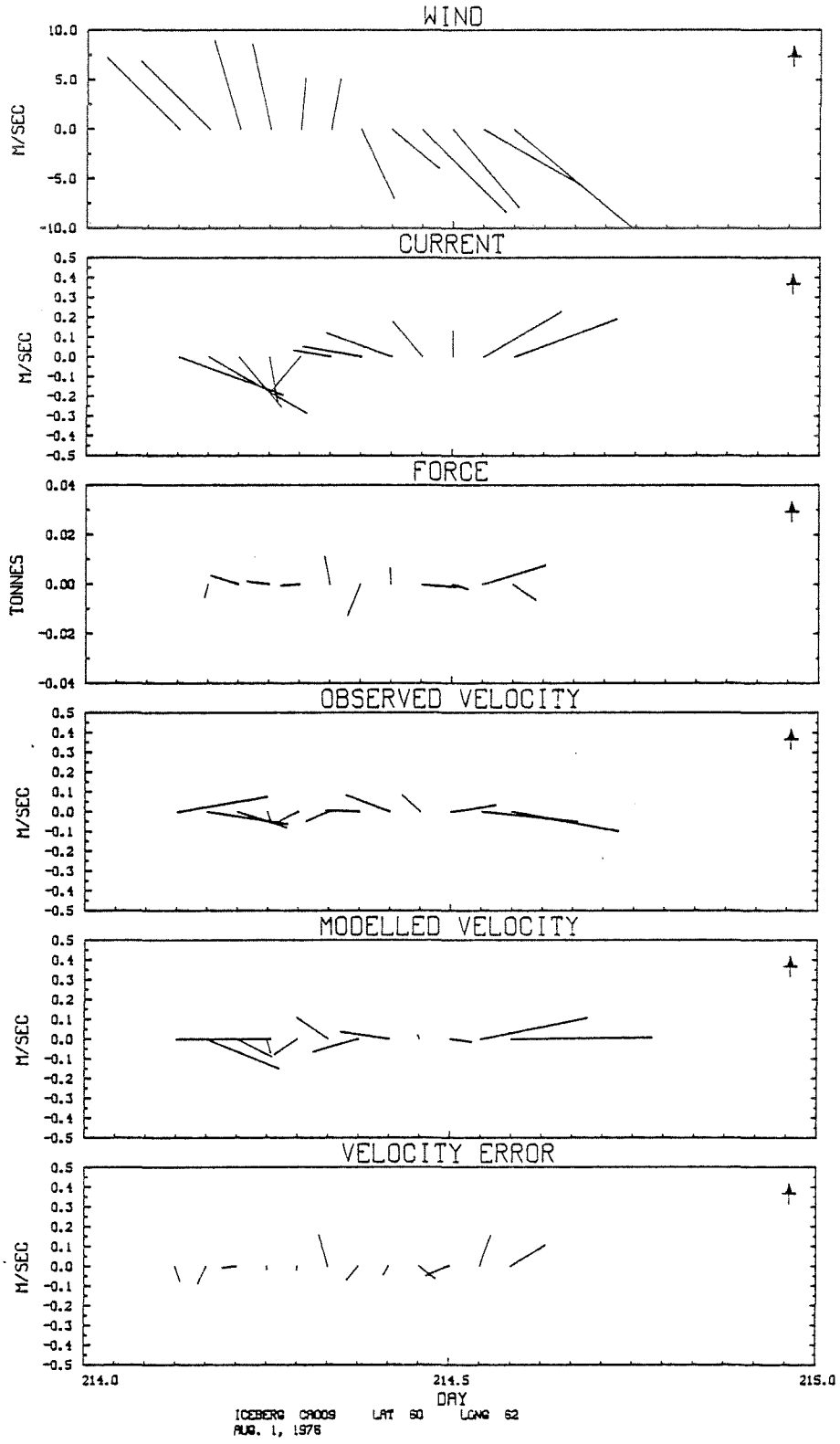
-0.8
246.5
247.0
247.5
DAY
ICEBERG NO.39 LAT 56 LONG 58
SEPT. 3, 1973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CURRENT
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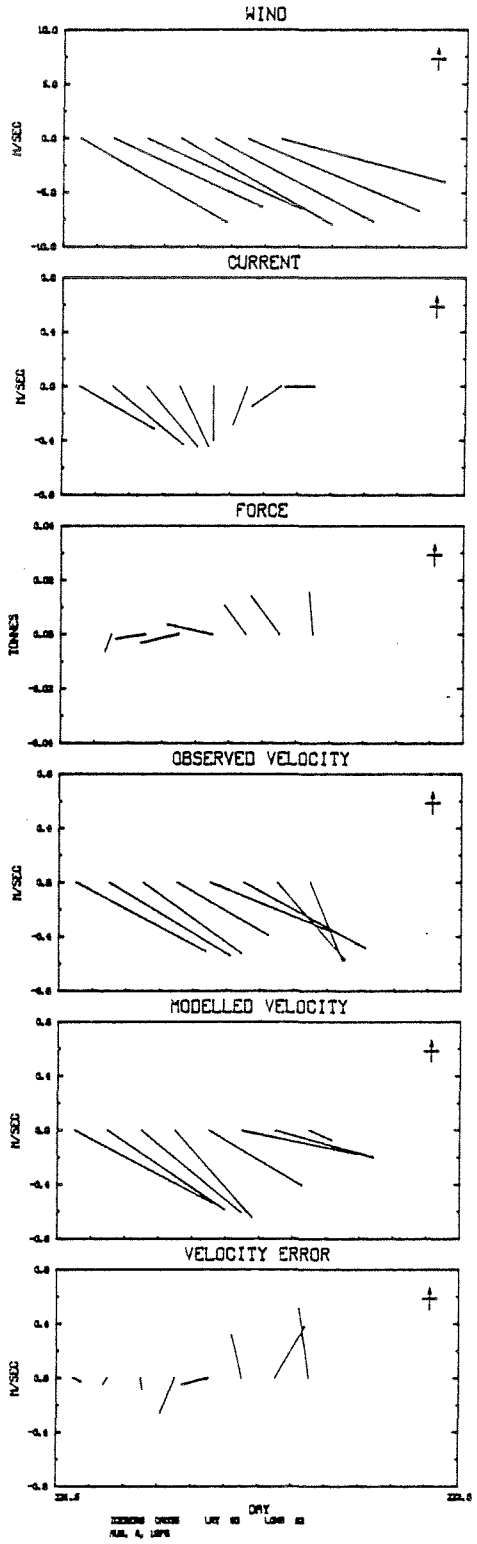
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
FORCE
TONNES
0.04
0.02
0.00
-0.02
-0.04
OBSERVED VELOCITY
M/SEC
MODELLED VELOCITY
M/SEC
VELOCITY ERROR
M/SEC
214.0
214.5
215.0
DAY
ICEBERG CROSS LAT 60 LONG 62
AUG. 1, 1976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CURRENT
M/SEC
FORCE
TONNES
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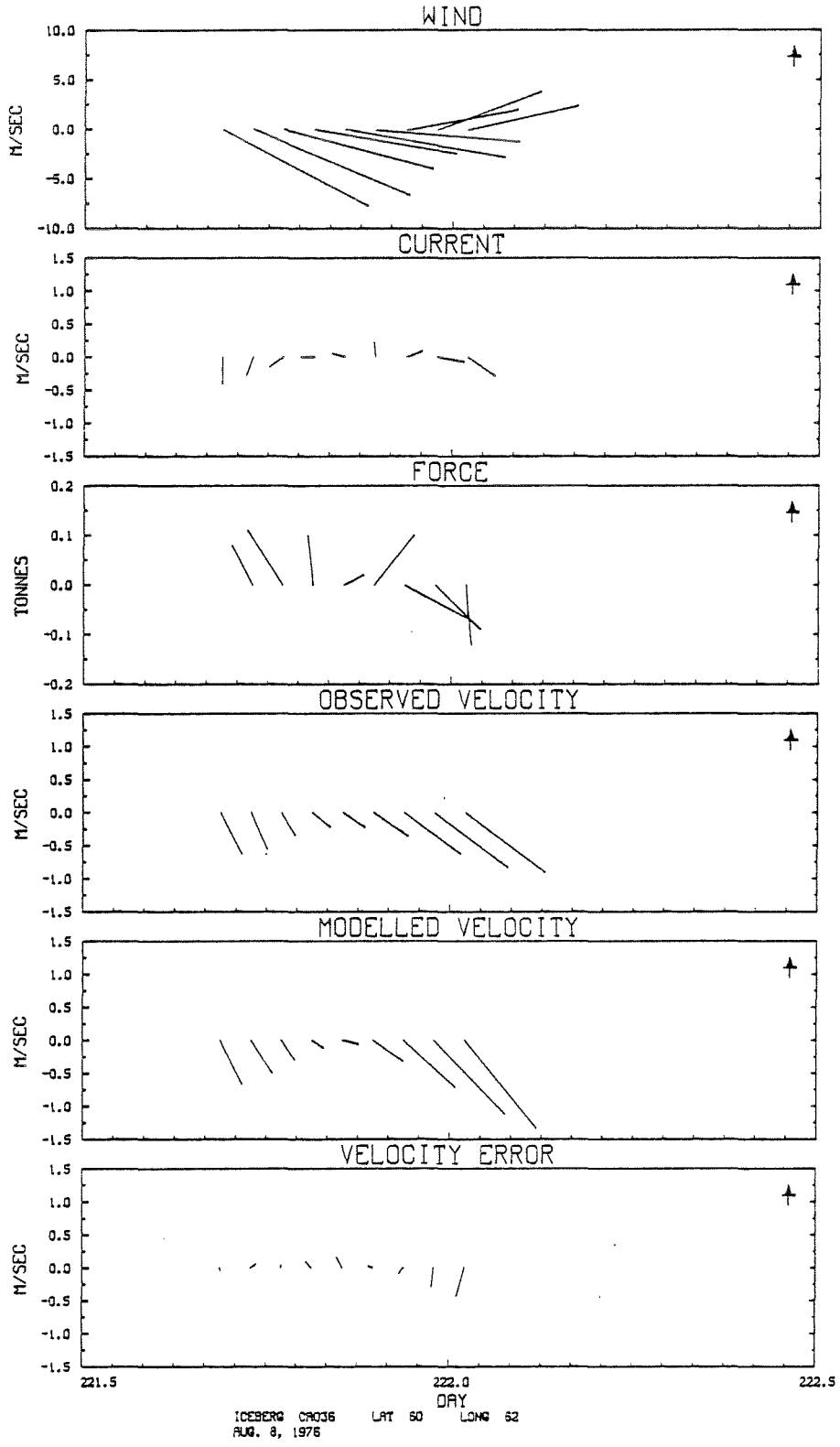
M/SEC
VELOCITY ERROR
M/SEC
DAY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-1.5
FORCE
TONNES
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0.0
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OBSERVED VELOCITY
M/SEC
MODELLED VELOCITY
M/SEC
VELOCITY ERROR
M/SEC
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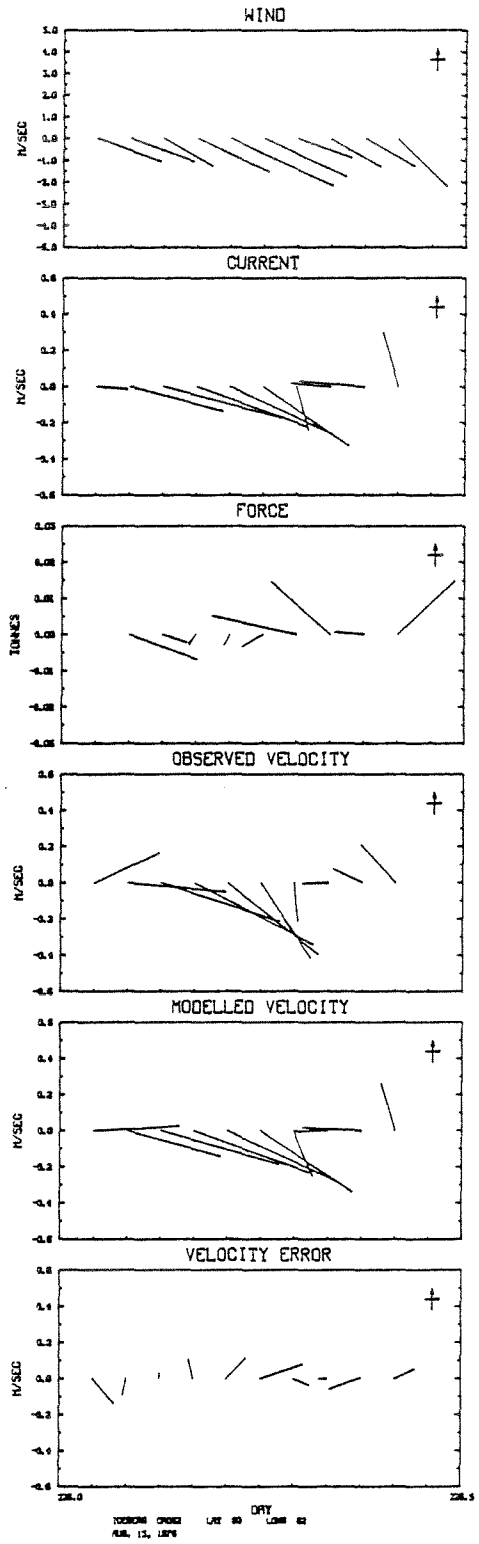
222.0
222.5
DAY
ICEBERG CA036 LAT 60 LONG 62
AUG. 8, 1976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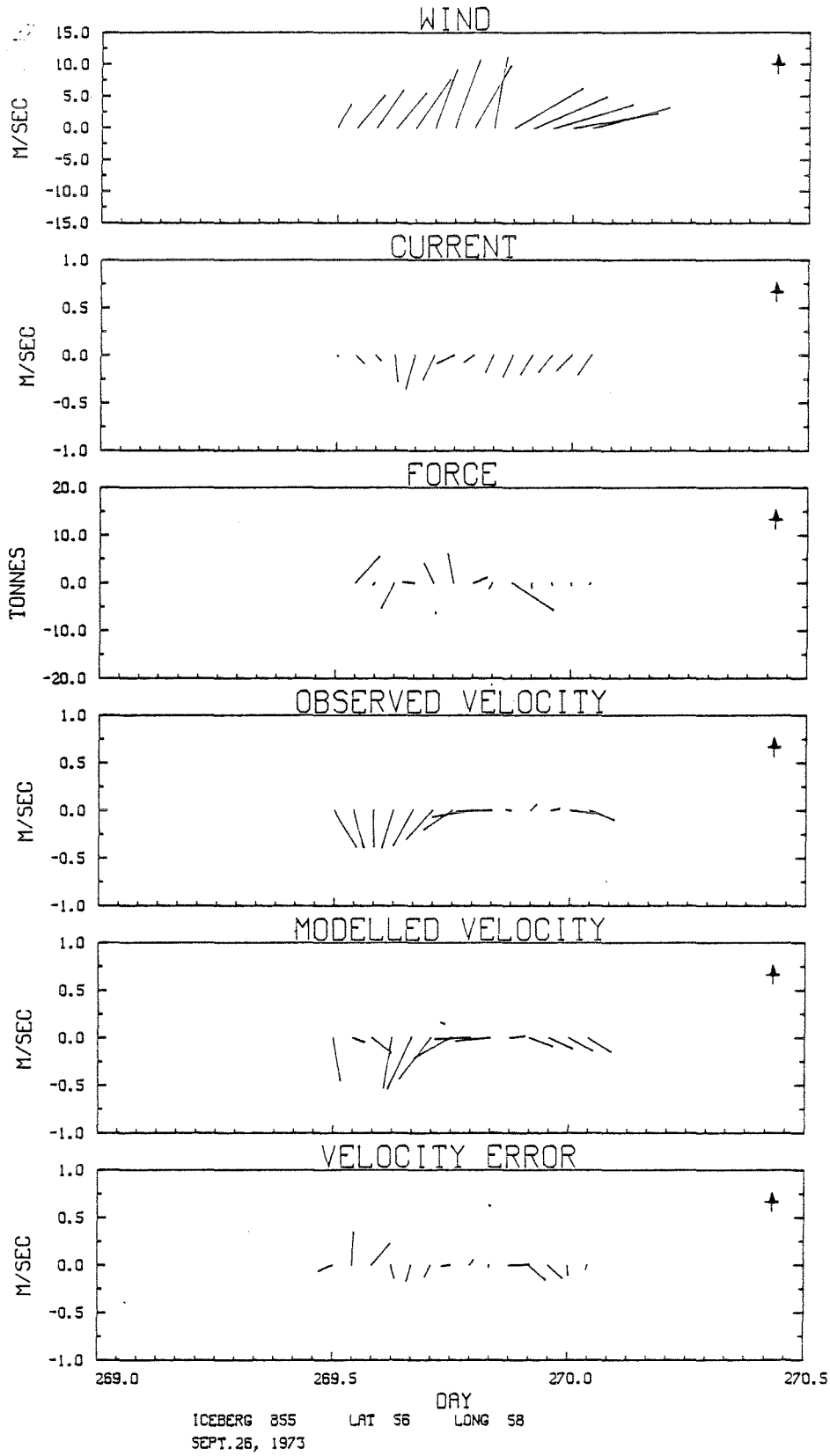
M/SEC
CURRENT
M/SEC
FORCE
TONNES
OBSERVED VELOCITY
M/SEC
MODELLED VELOCITY
M/SEC
VELOCITY ERROR
M/SEC
DAY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0.0
-0.5
-1.0
FORCE
TONNES
20.0
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-20.0
OBSERVED VELOCITY
M/SEC
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0.0
-0.5
-1.0
MODELLED VELOCITY
M/SEC
1.0
0.5
0.0
-0.5
-1.0
VELOCITY ERROR
M/SEC
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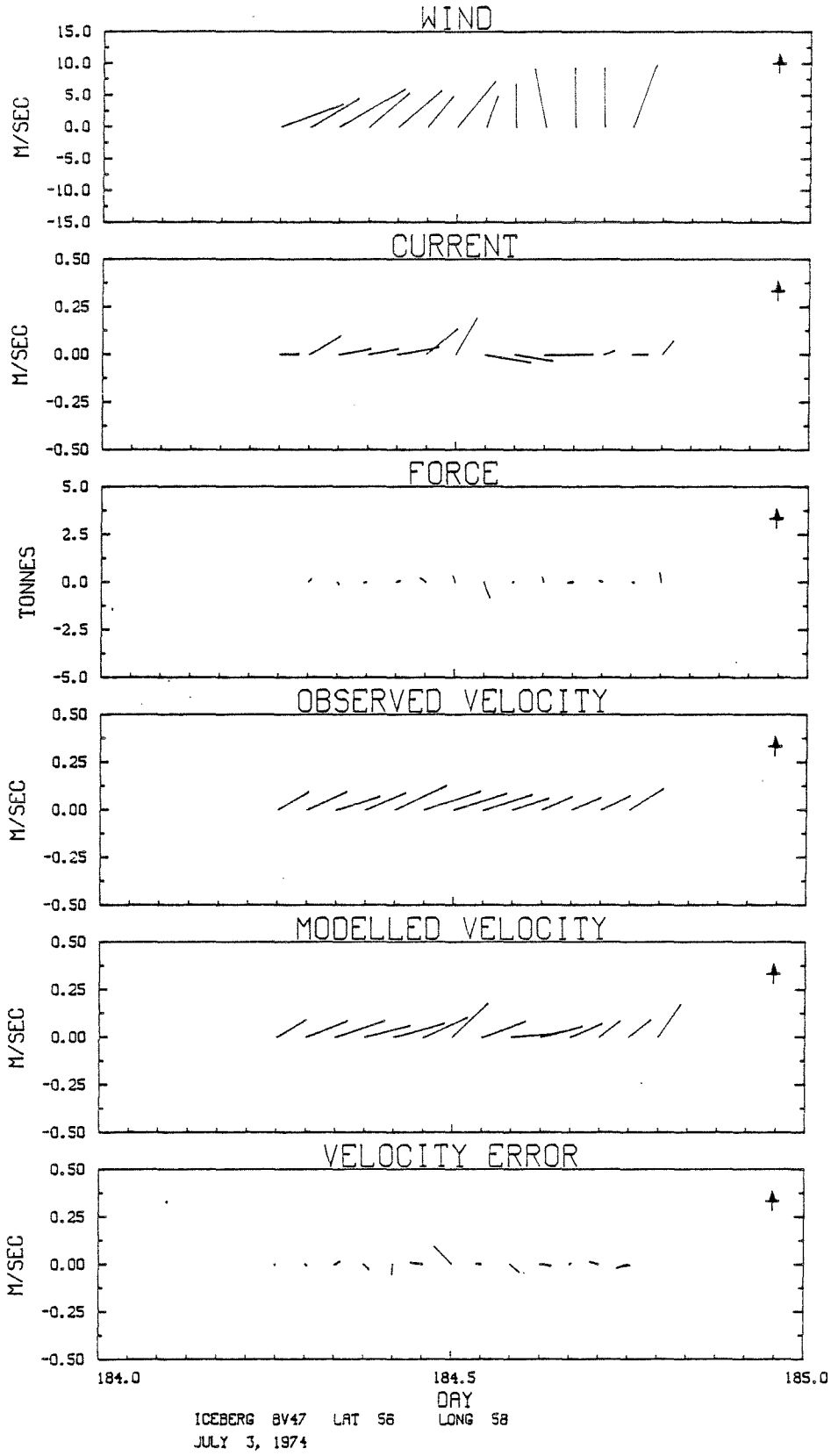
SEPT.26, 1973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CURRENT
M/SEC
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0.00
-0.25
-0.50
FORCE
TONNES
5.0
2.5
0.0
-2.5
-5.0
OBSERVED VELOCITY
M/SEC
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0.25
0.00
-0.25
-0.50
MODELLED VELOCITY
M/SEC
0.50
0.25
0.00
-0.25
-0.50
VELOCITY ERROR
M/SEC
0.50
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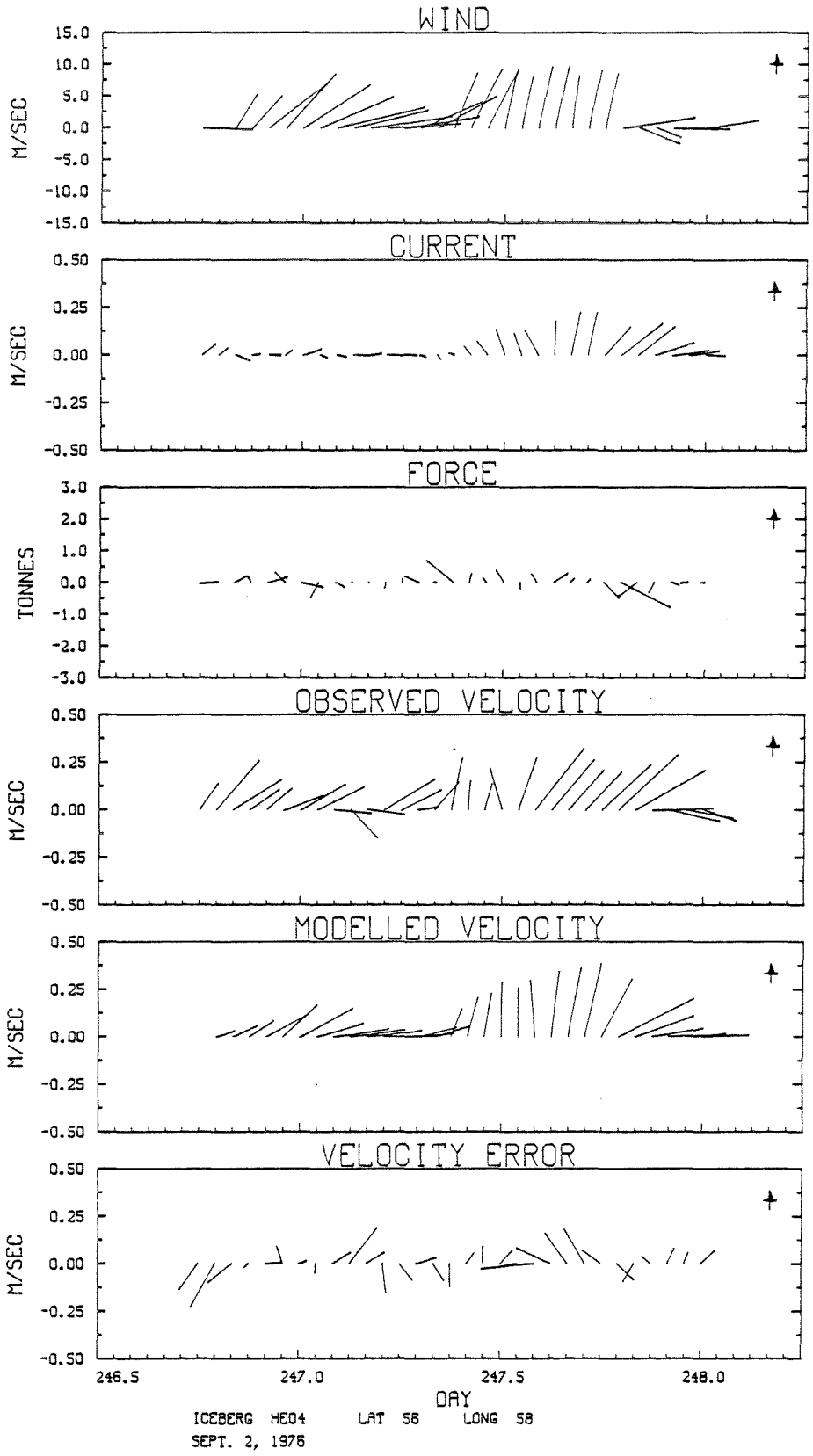
185.0
DAY
ICEBERG BV47 LAT 58 LONG 58
JULY 3, 1974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5.0
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CURRENT
M/SEC
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0.00
-0.25
-0.50
FORCE
TONNES
3.0
2.0
1.0
0.0
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OBSERVED VELOCITY
M/SEC
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MODELLED VELOCITY
M/SEC
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0.00
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VELOCITY ERROR
M/SEC
0.50
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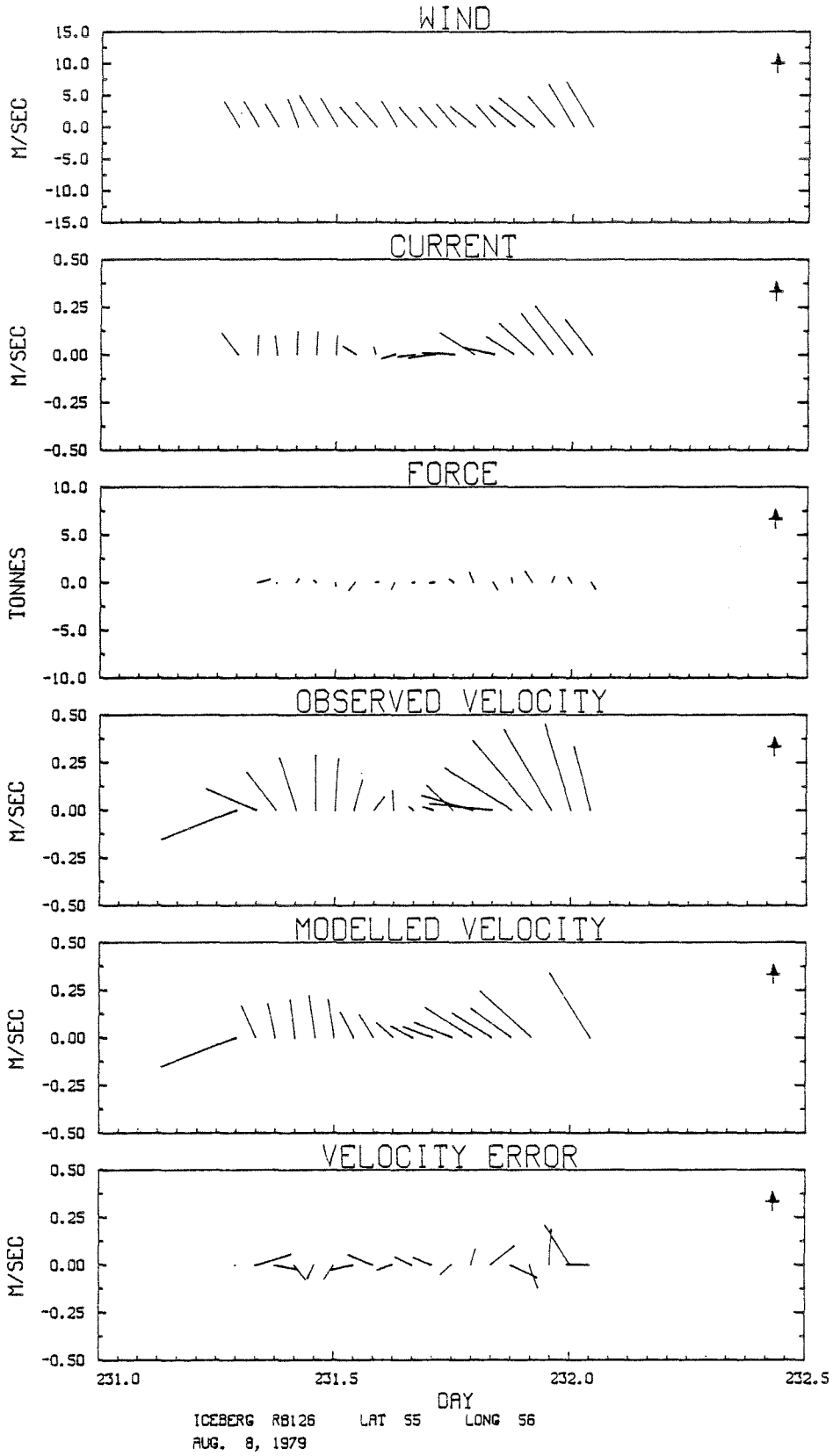
DAY
ICEBERG HE04 LAT 56 LONG 58
SEPT. 2, 1976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CURRENT
M/SEC
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0.00
-0.25
-0.50
FORCE
TONNES
10.0
5.0
0.0
-5.0
-10.0
OBSERVED VELOCITY
M/SEC
0.50
0.25
0.00
-0.25
-0.50
MODELLED VELOCITY
M/SEC
0.50
0.25
0.00
-0.25
-0.50
VELOCITY ERROR
M/SEC
0.50
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0.00
-0.25
-0.50
231.0
231.5
232.0
232.5
DAY
ICEBERG RB126 LAT 55 LONG 56
AUG. 8, 1979

APPENDIX 3.

Plots of Iceberg Drift Tracks for 38 Drift Track Segments Listed In Table 4

Legend:

Actual Drift Track

Modelled Drift Track Due to Winds and Currents

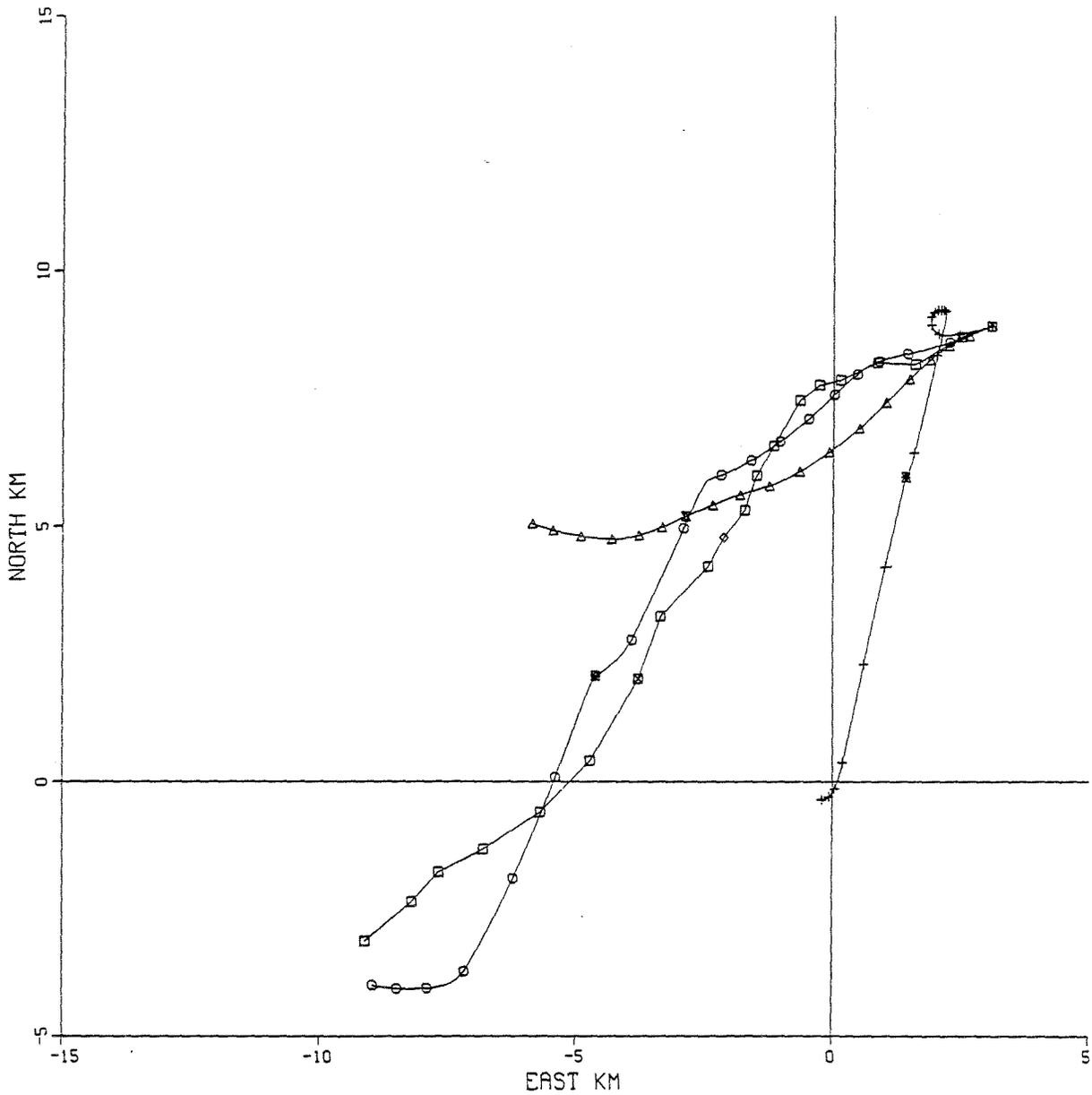
Modelled Drift Track Due to Currents Only; Eliminating Wind Influence

Modelled Drift Track Due to Winds and Towing if Towing Occurred, Setting Currents Equal to Zero

Similar plots of Group 1 Icebergs K007, F018, K016, K024 and S012 were published by Smith and Banke (1983)

For icebergs G17 and RB 22 see figures 12 and 7, respectively.

ICEBERG K026 CA=0.6 CW=0.6



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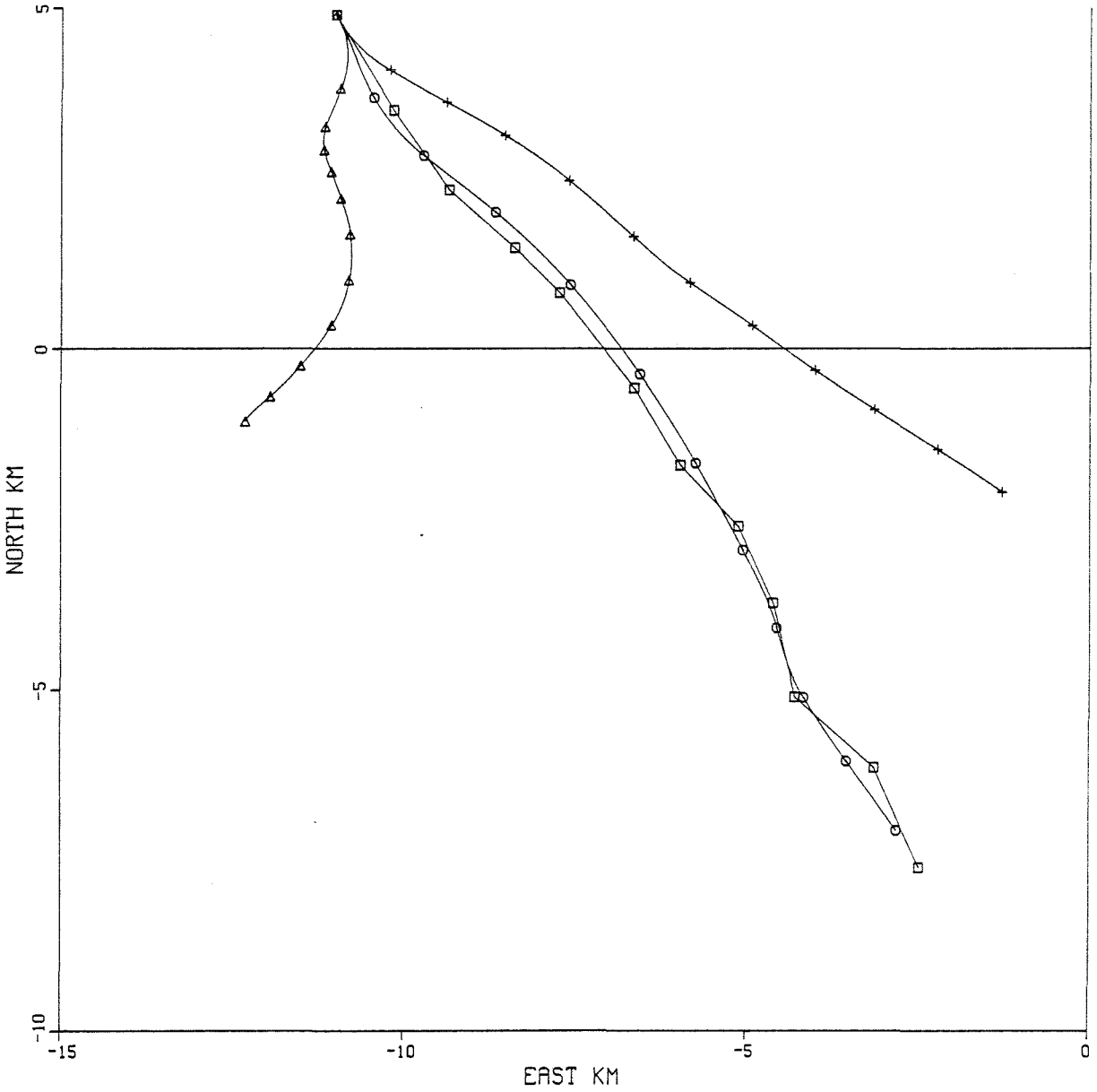

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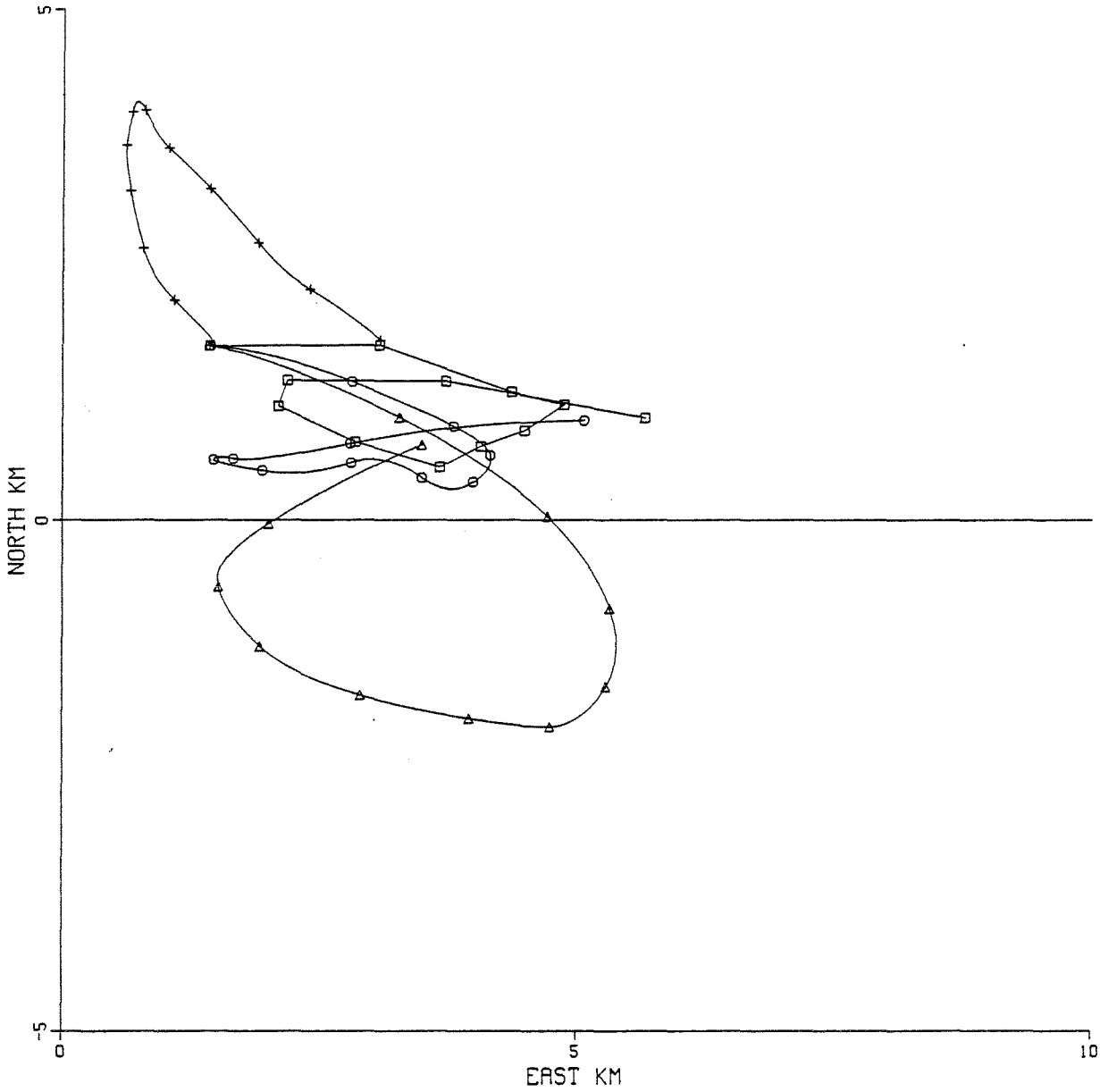
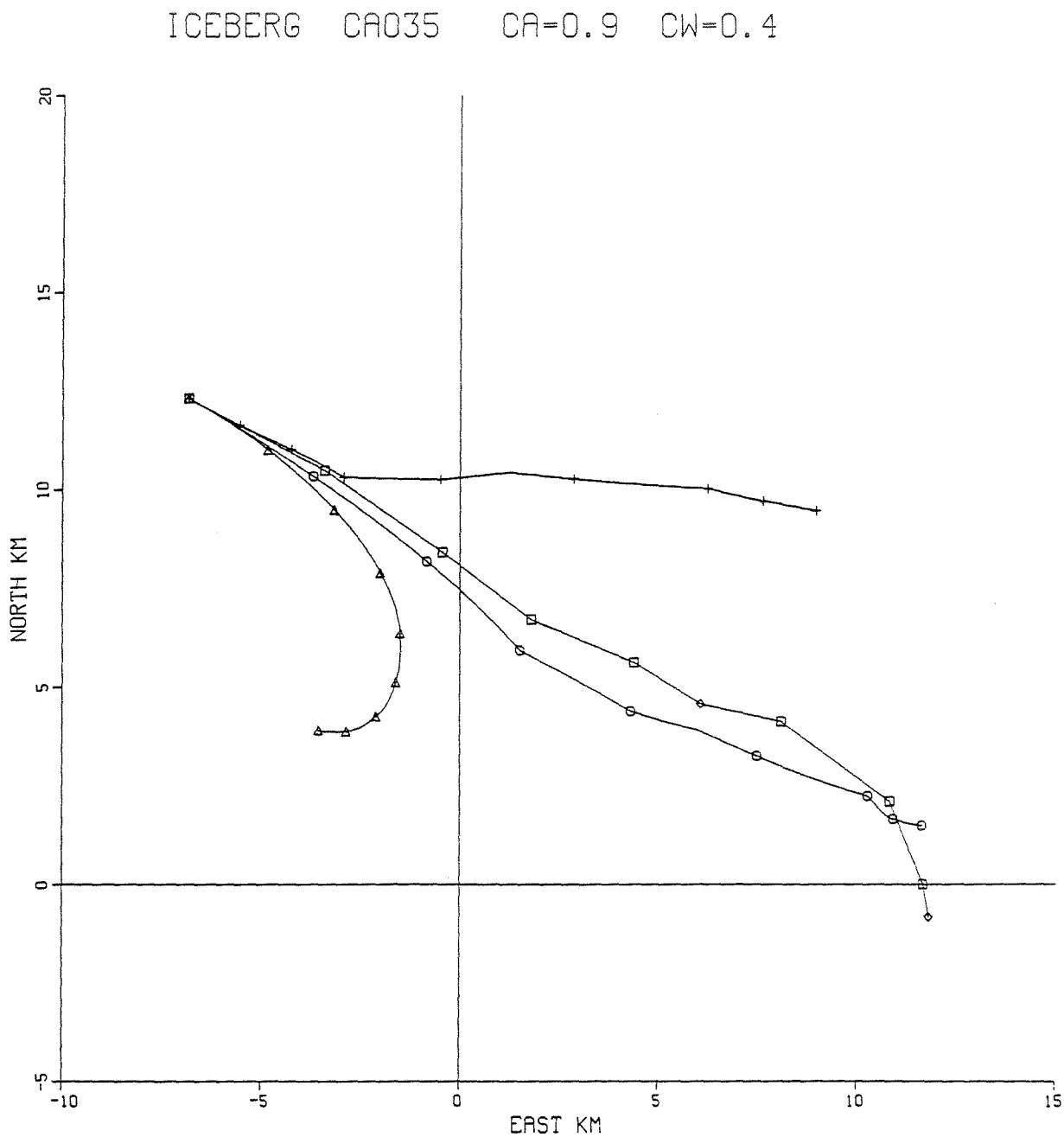
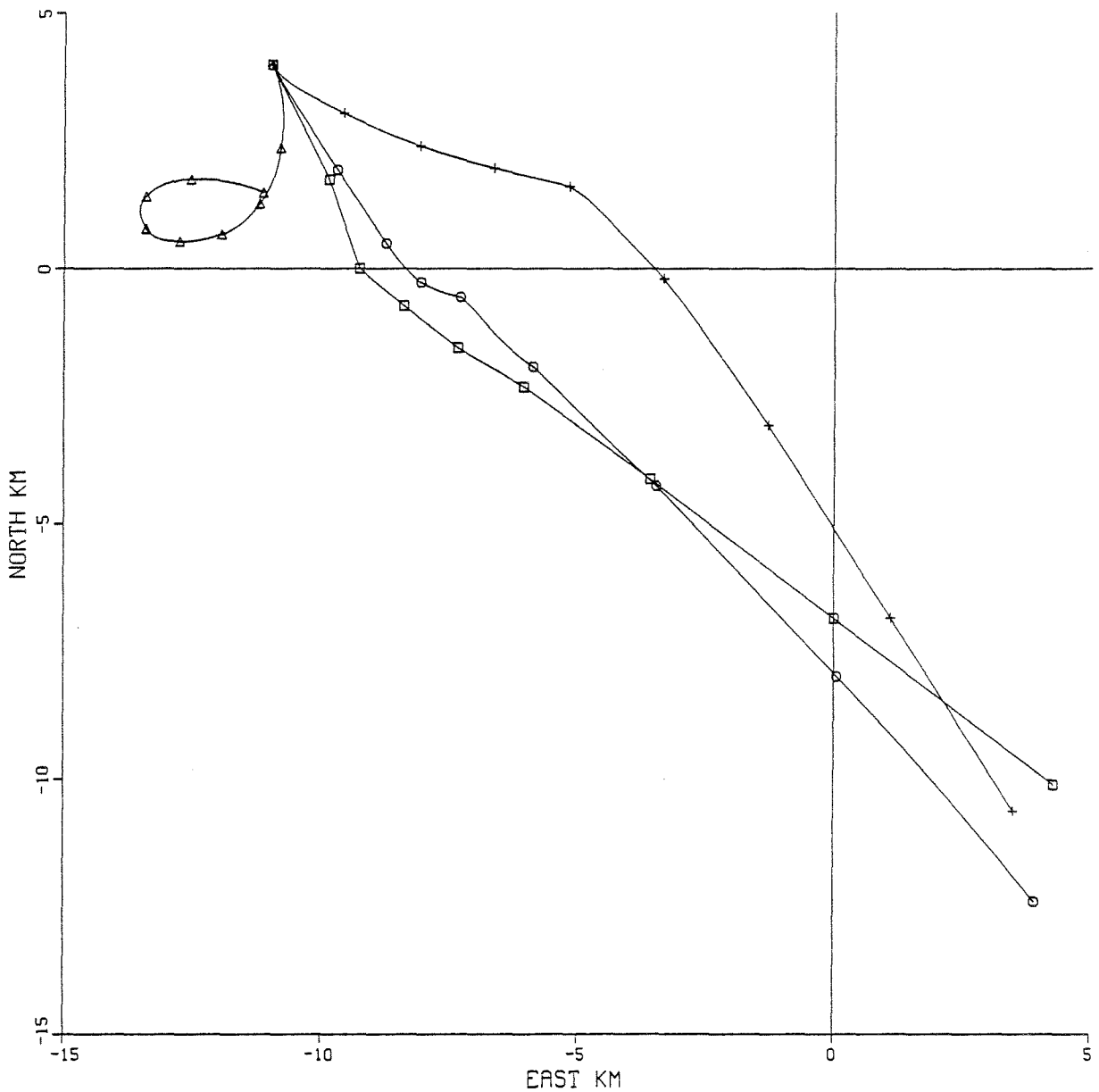
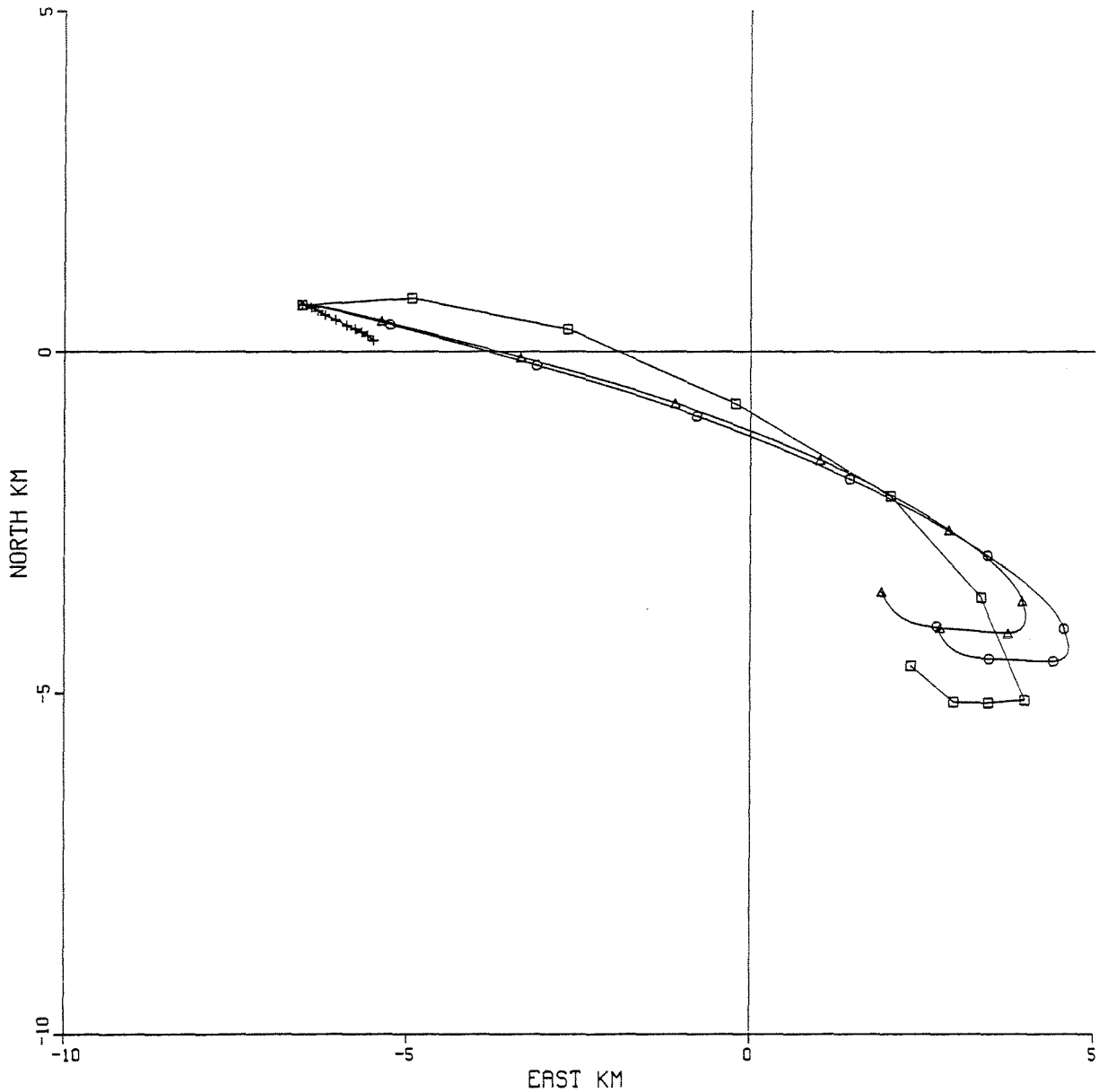



ICEBERG CA035 CA=0.9 CW=0.4
NORTH KM
EAST KM
20
15
10
5
0
-5
-10
-5
0
5
10
15

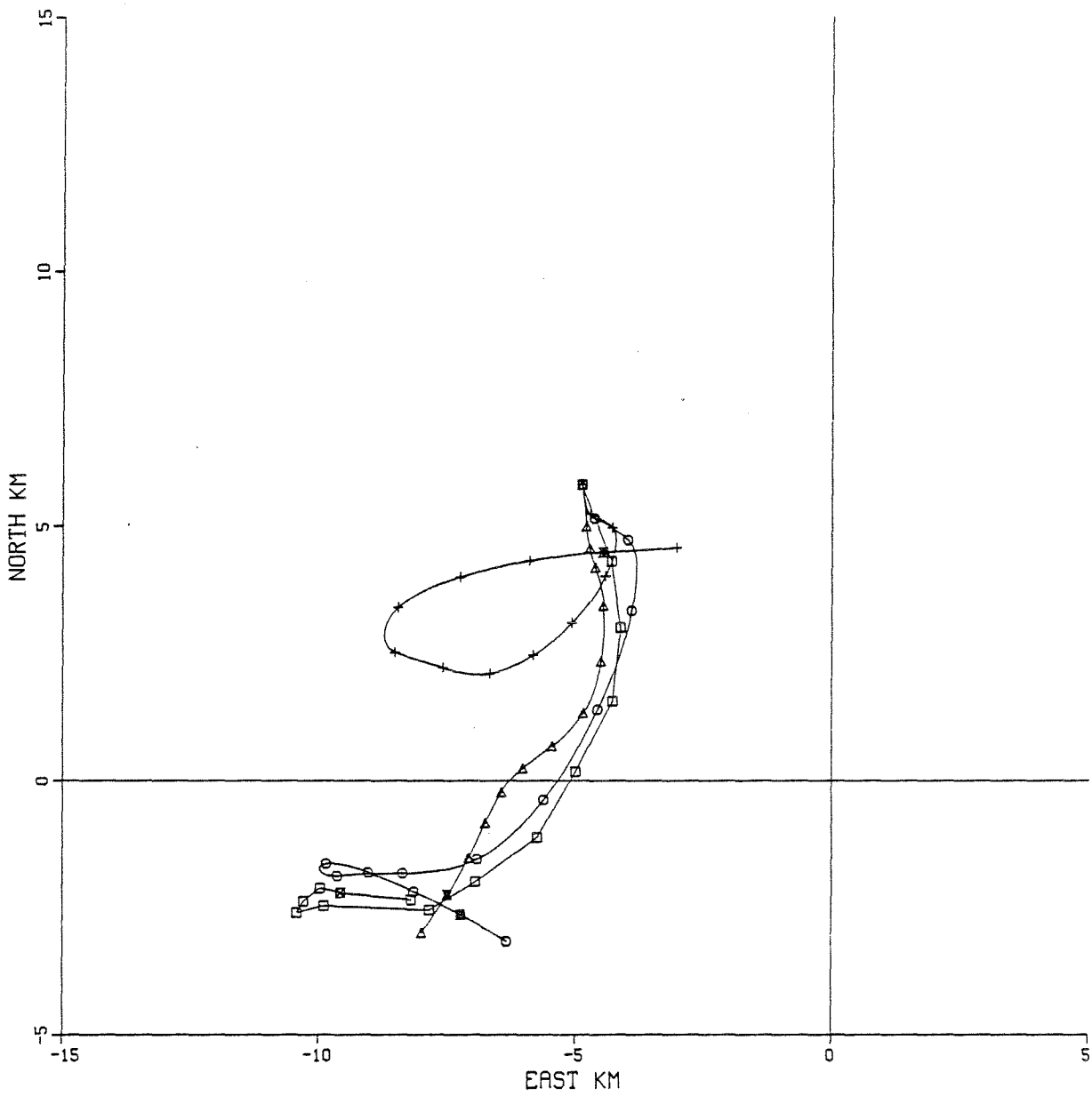
ICEBERG CA036 CA=0.5 CW=0.2

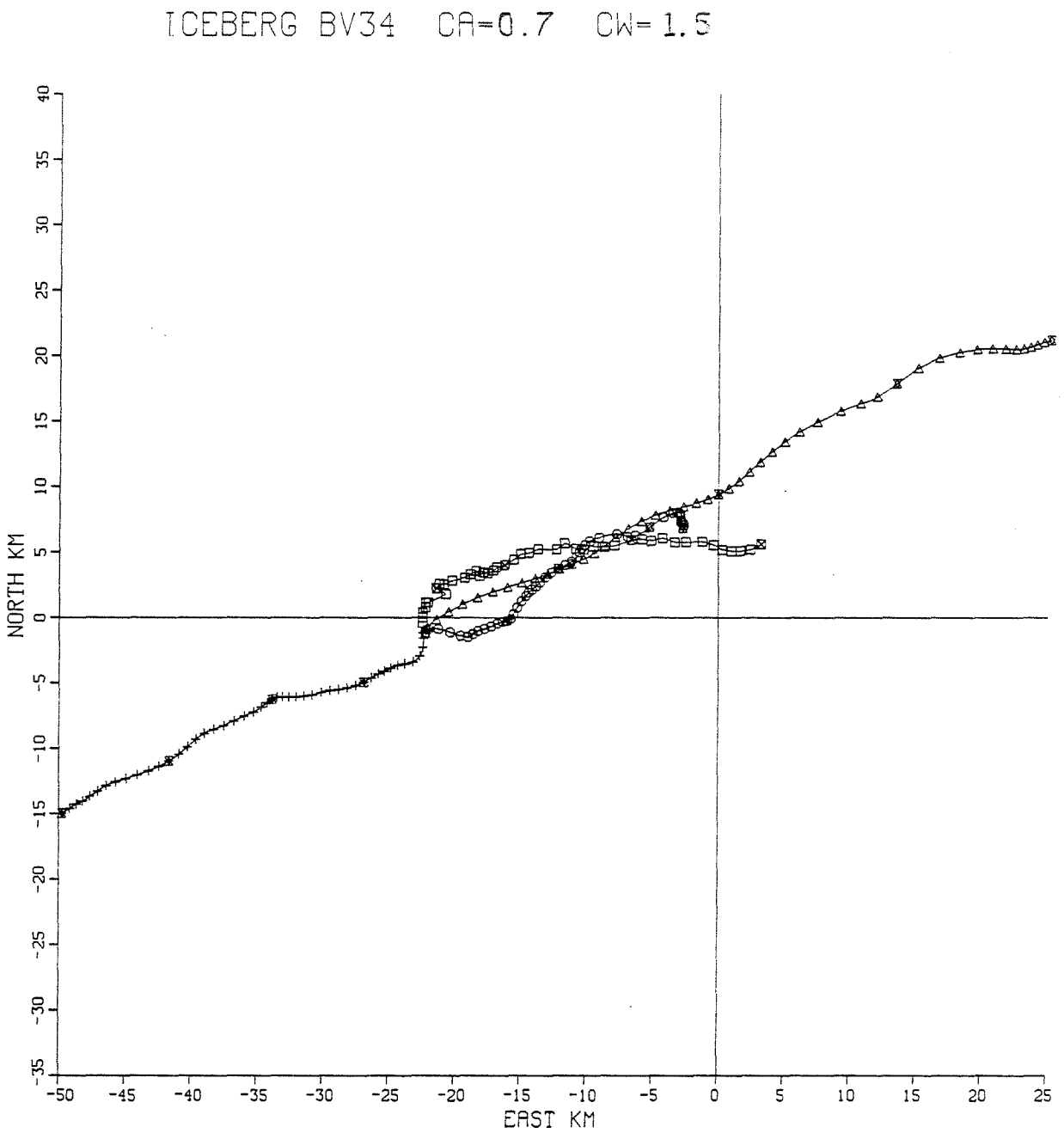


CA062 CURRENTS ROTATED CA=.9 CW=2.4

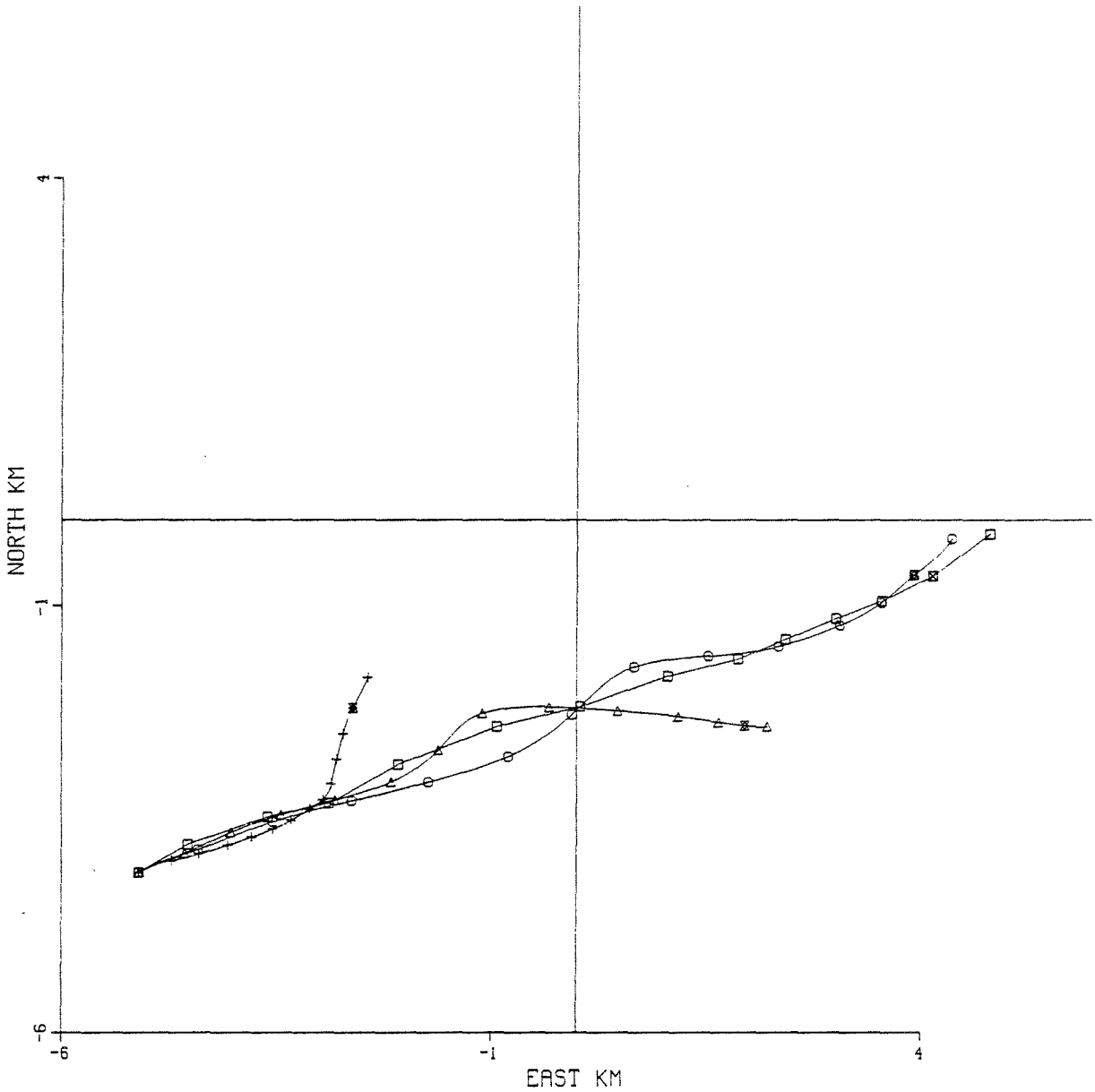


ICEBERG BJARNI B55 CA=1.0 CW=0.2

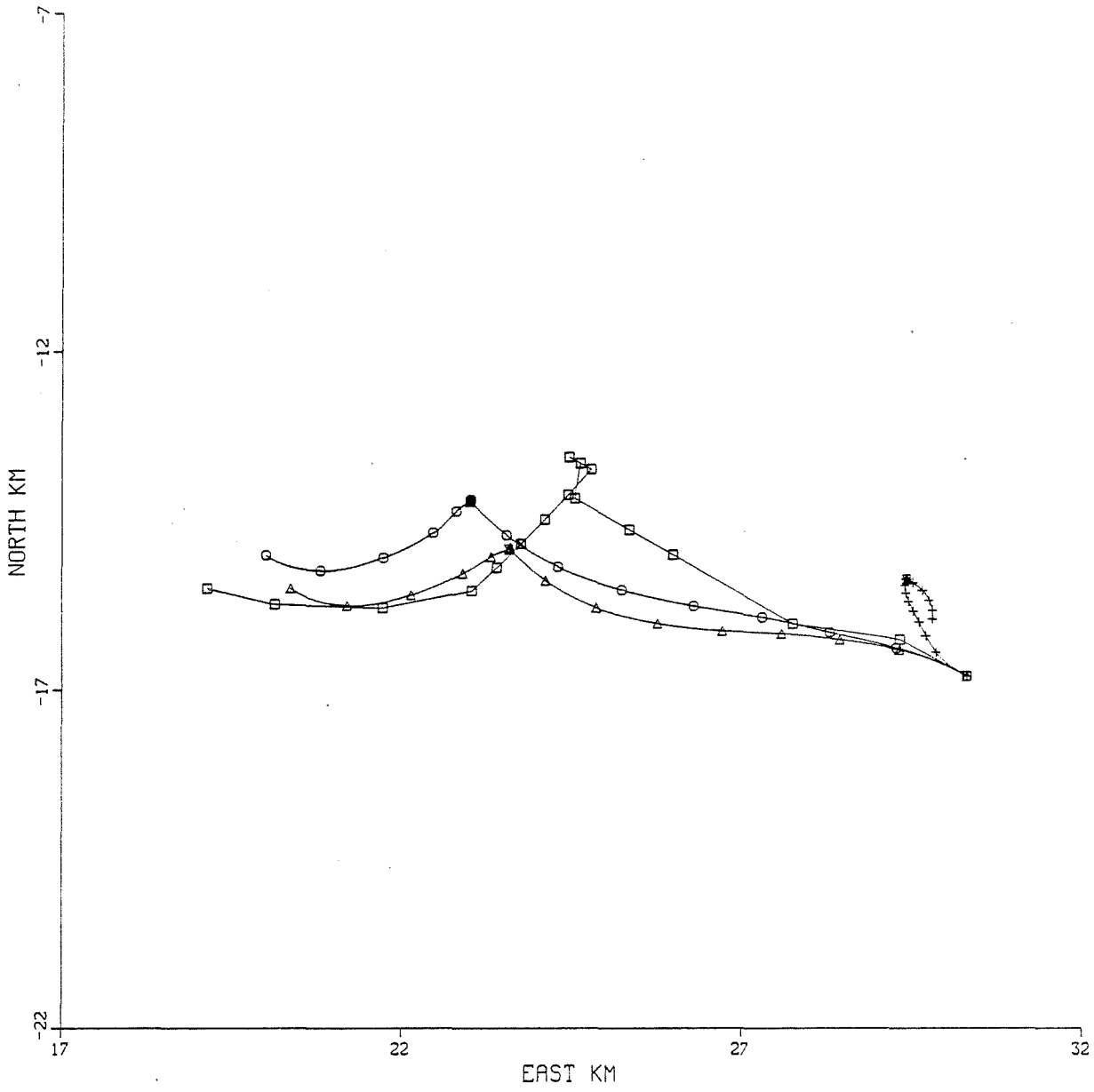


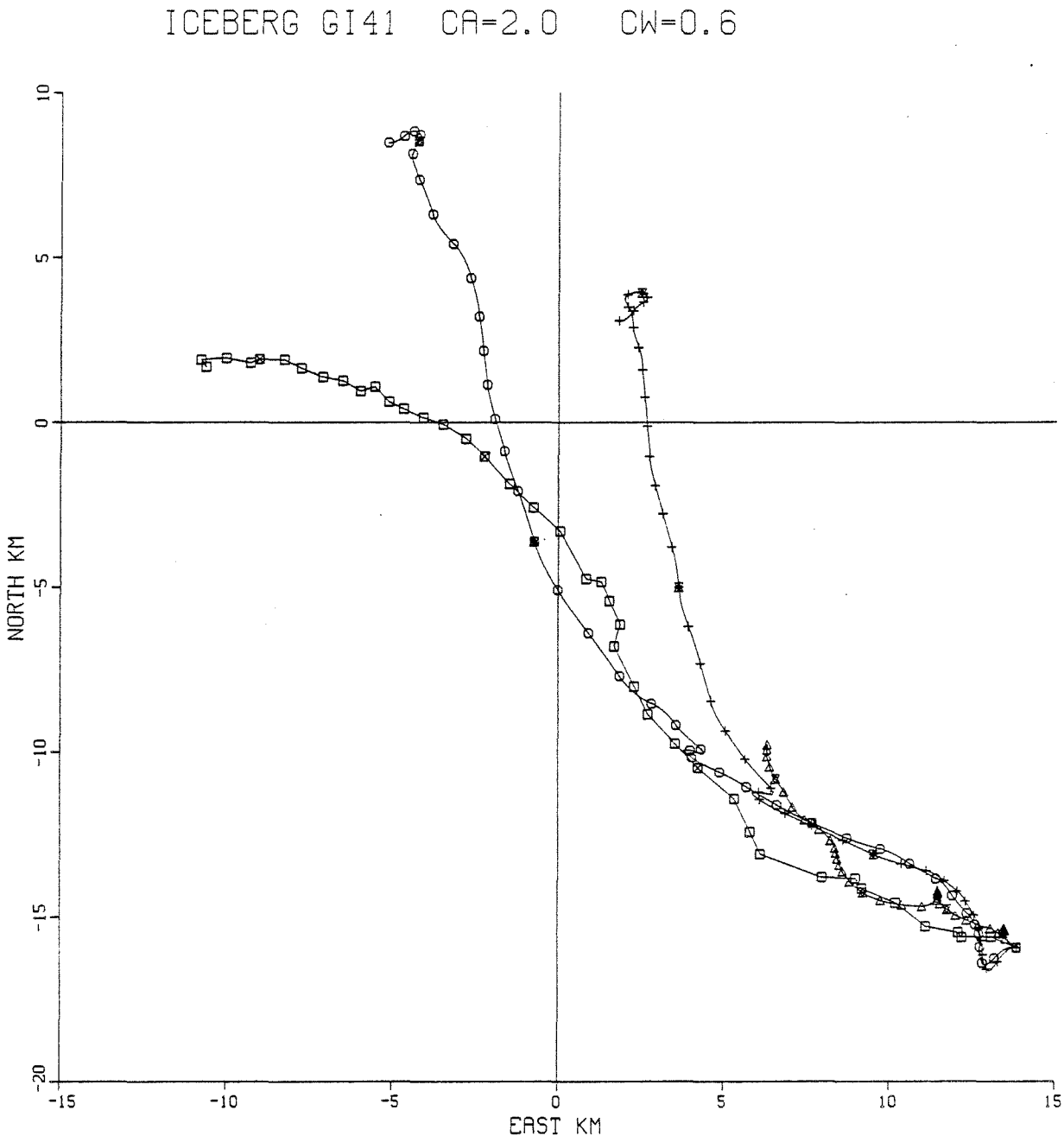

ICEBERG BV34 CA=0.7 CW=1.5
NORTH KM
EAST KM
40
35
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-50
-45
-40
-35
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25

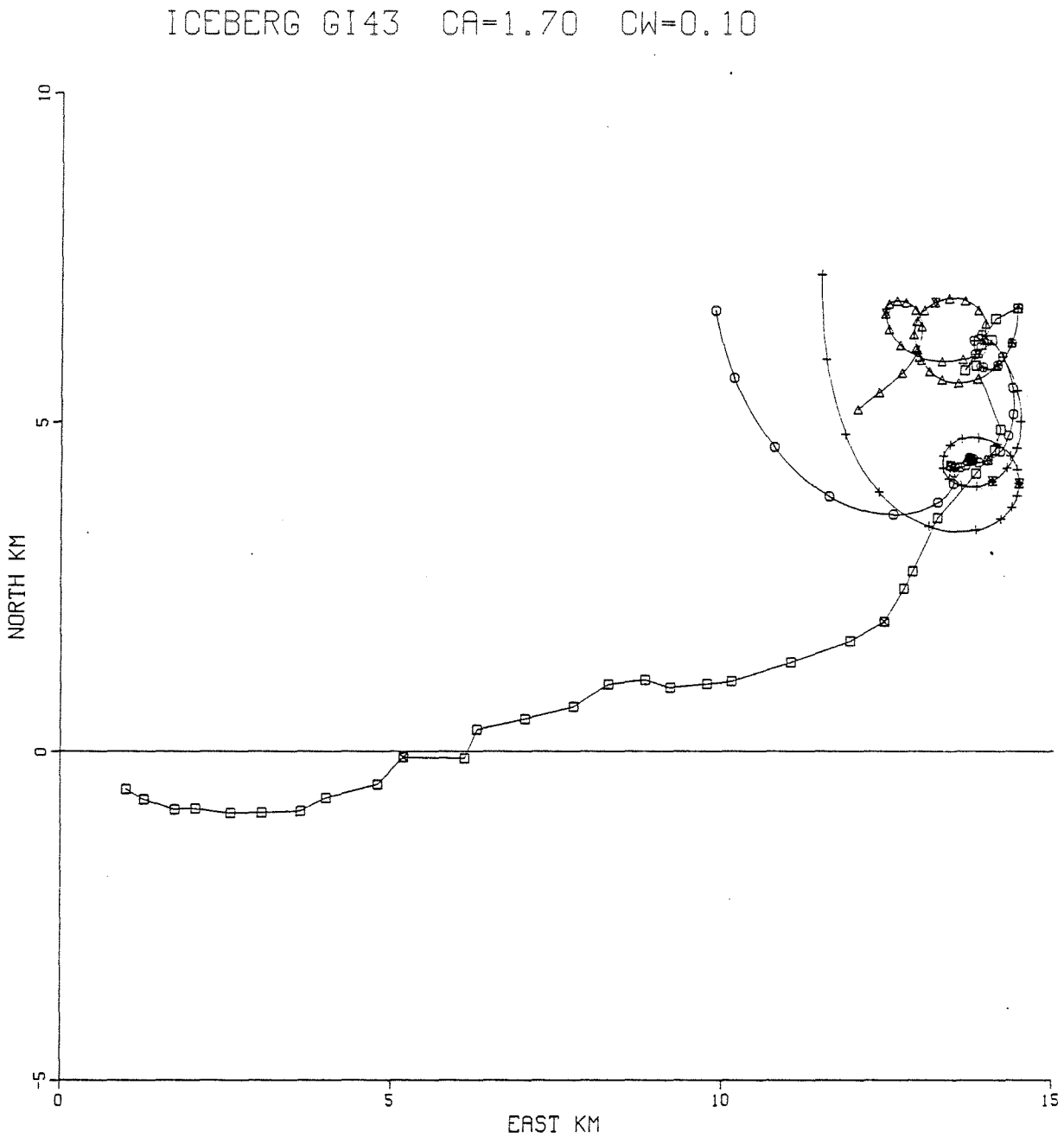
ICEBERG BV47 CA=0.1 CW=0.4



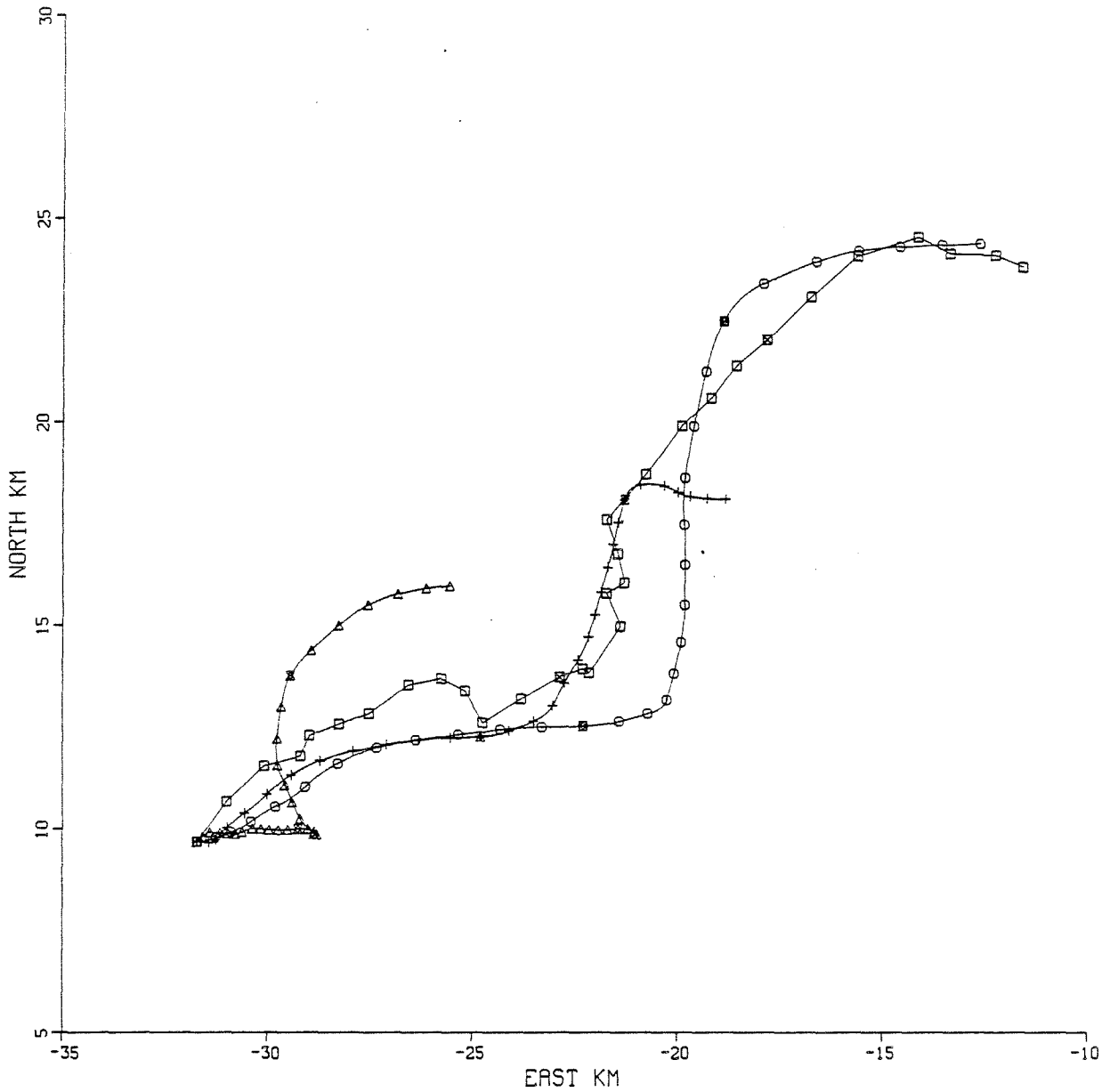
ICEBERG C104 CA=0.1 CW=1.3 GROUNDED

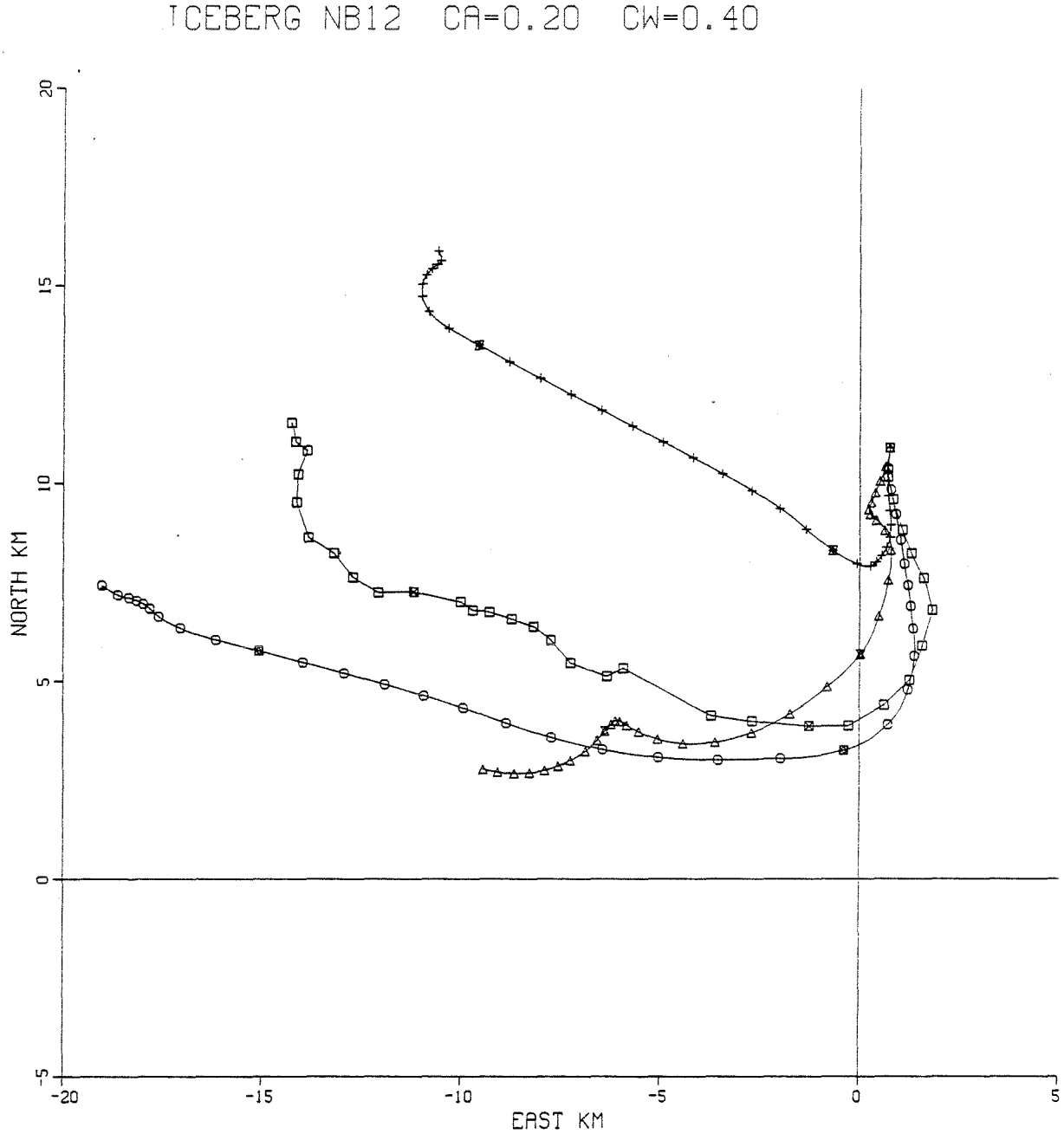



ICEBERG GI41 CA=2.0 CW=0.6
NORTH KM
EAST KM
10
5
0
-5
-10
-15
-20
-15
-10
-5
0
5
10
15

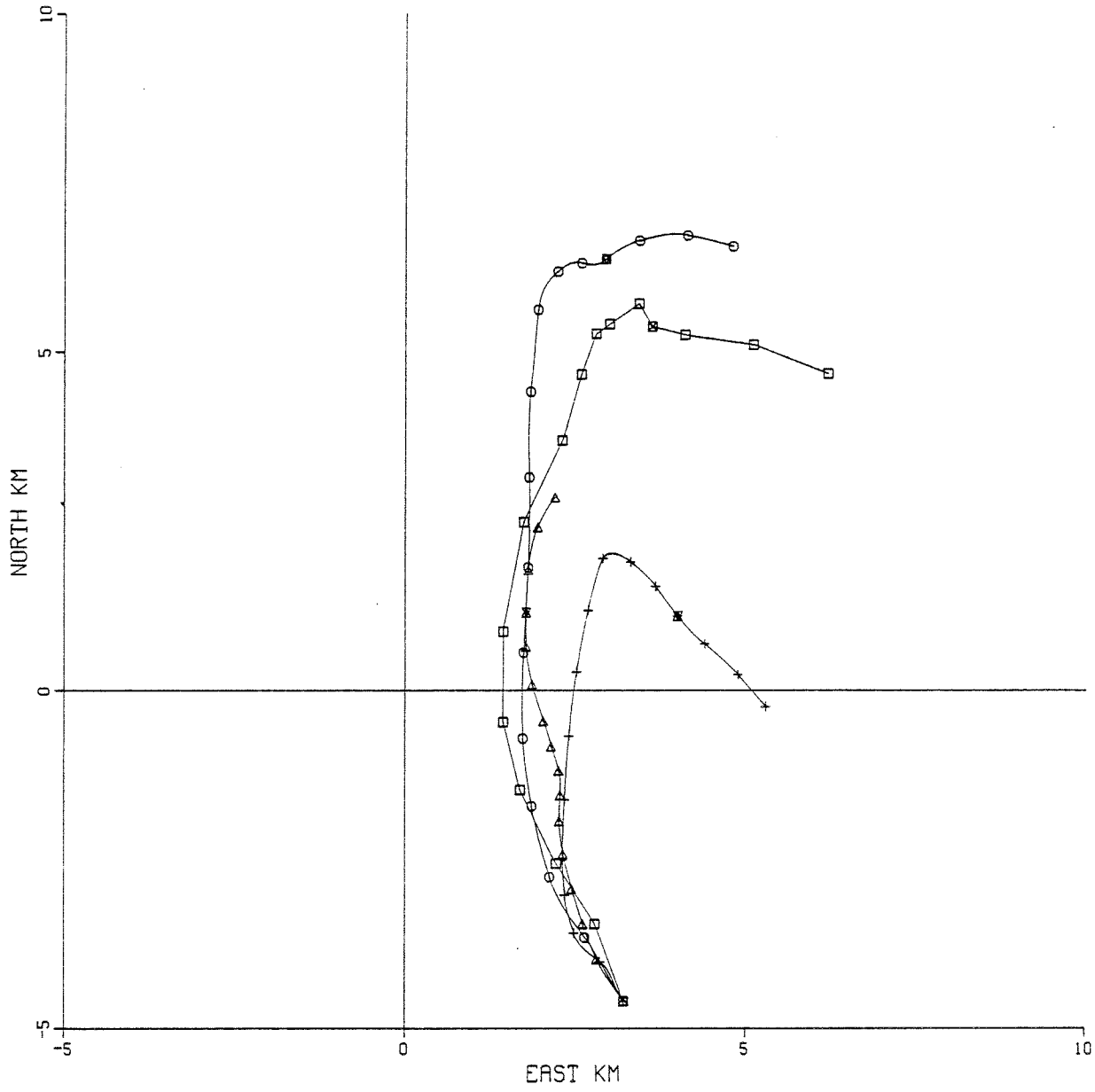

ICEBERG GI43 CA=1.70 CW=0.10
NORTH KM
EAST KM
10
5
0
-5
0
5
10
15

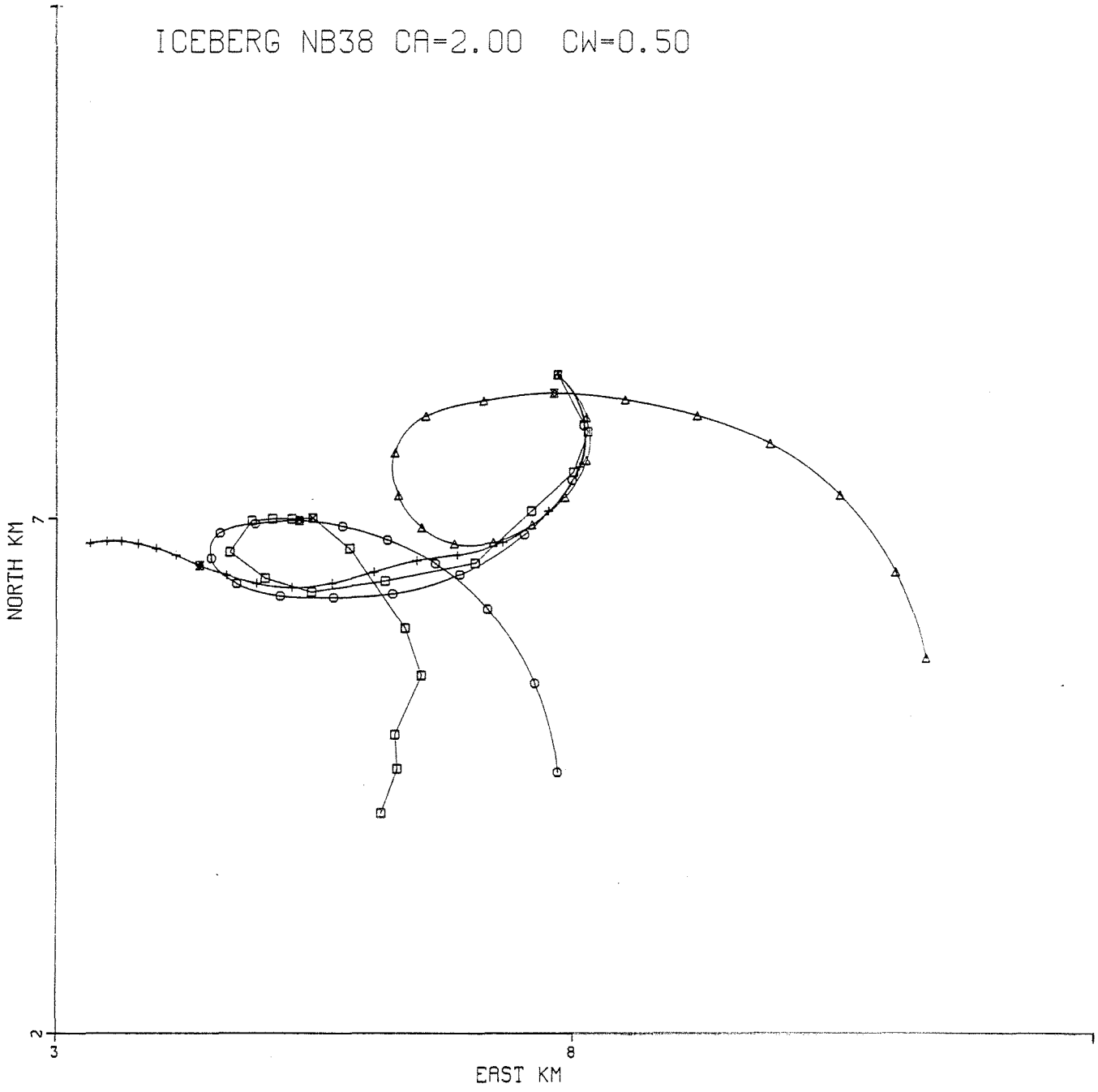
ICEBERG HE04 CA=.0.7 CW=0.5

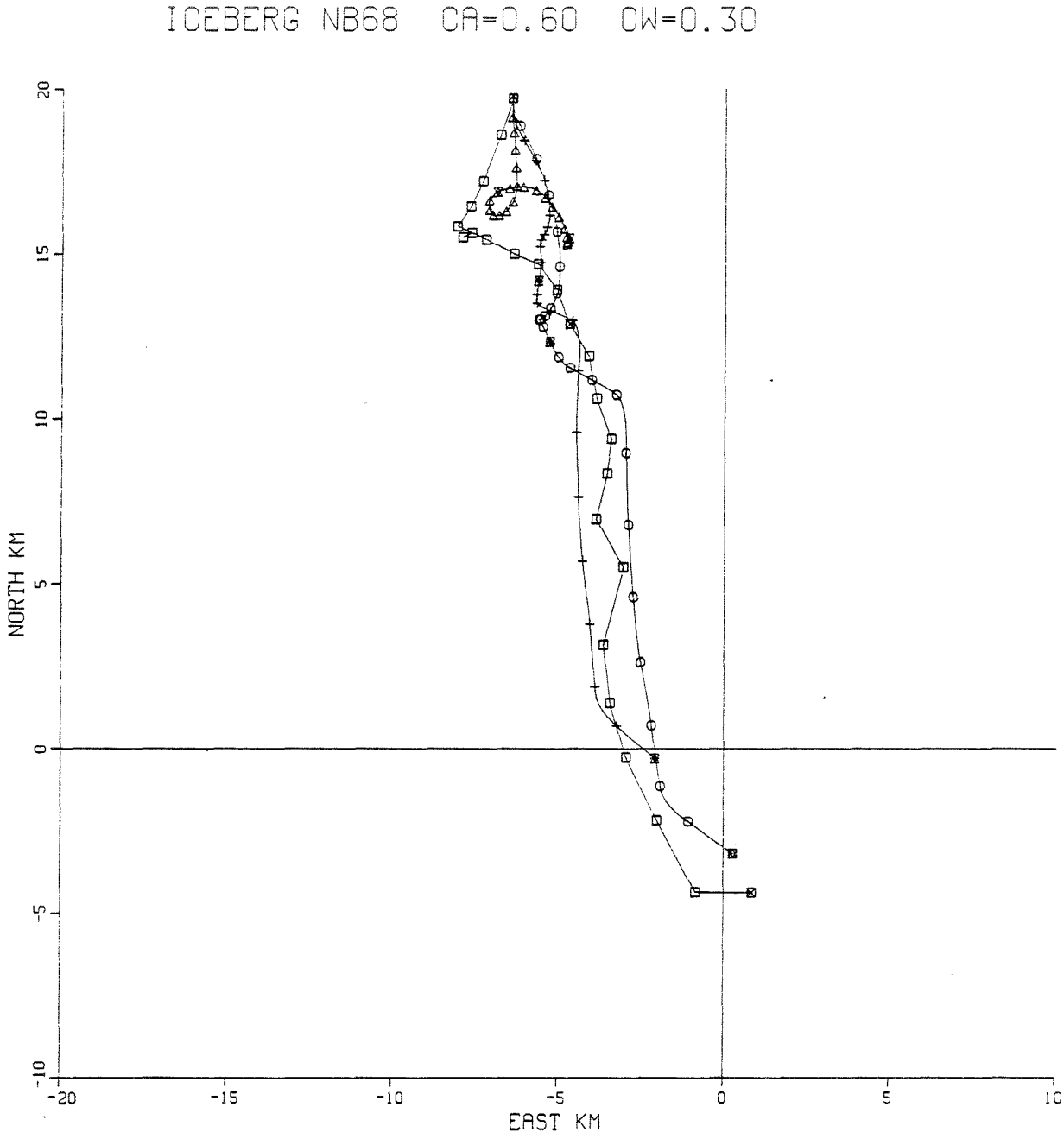



ICEBERG NB12 CA=0.20 CW=0.40
NORTH KM
EAST KM
20
15
10
5
0
-5
-20
-15
-10
-5
0
5

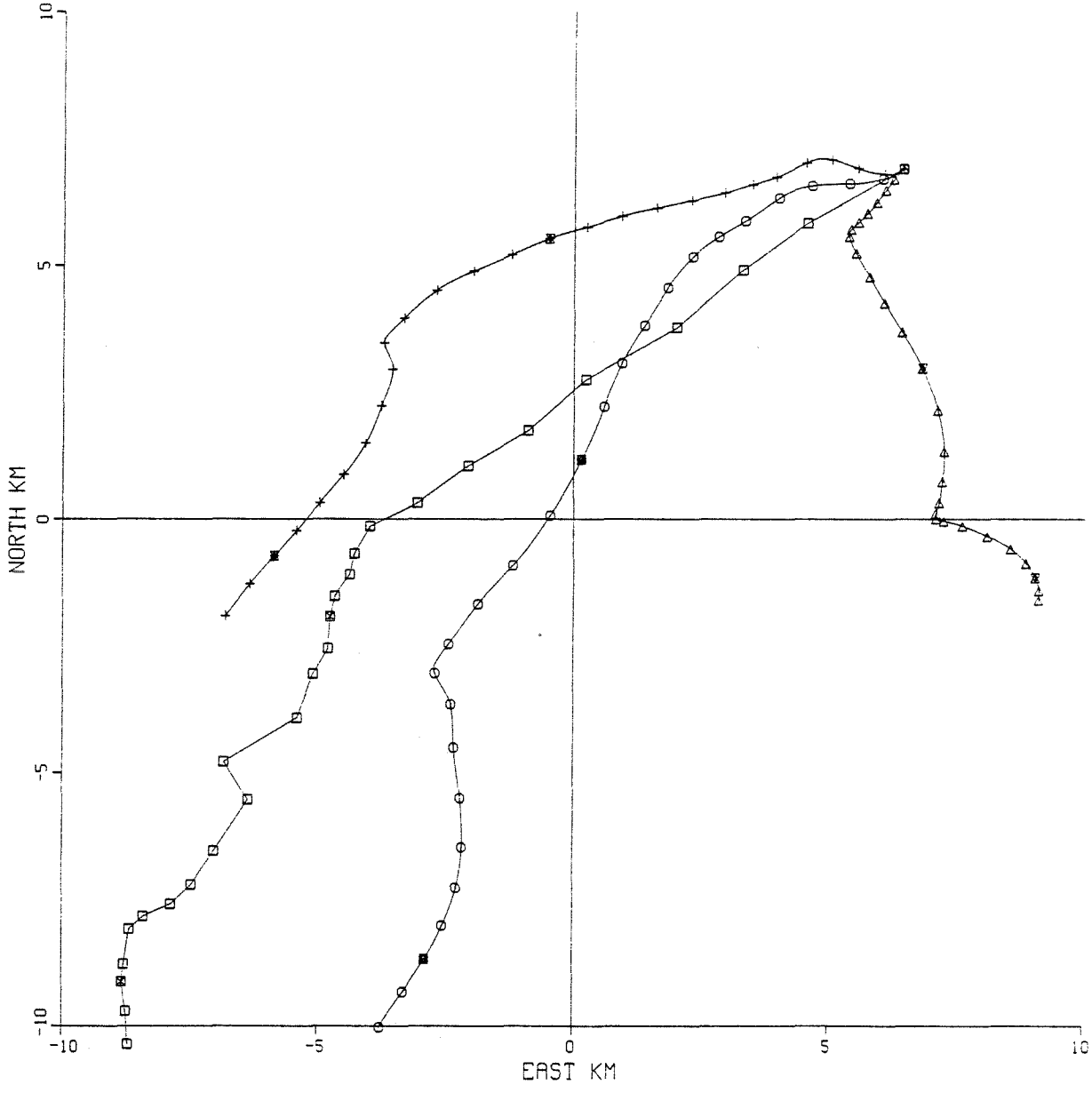
ICEBERG NB19 CA=0.8 CW=2.4



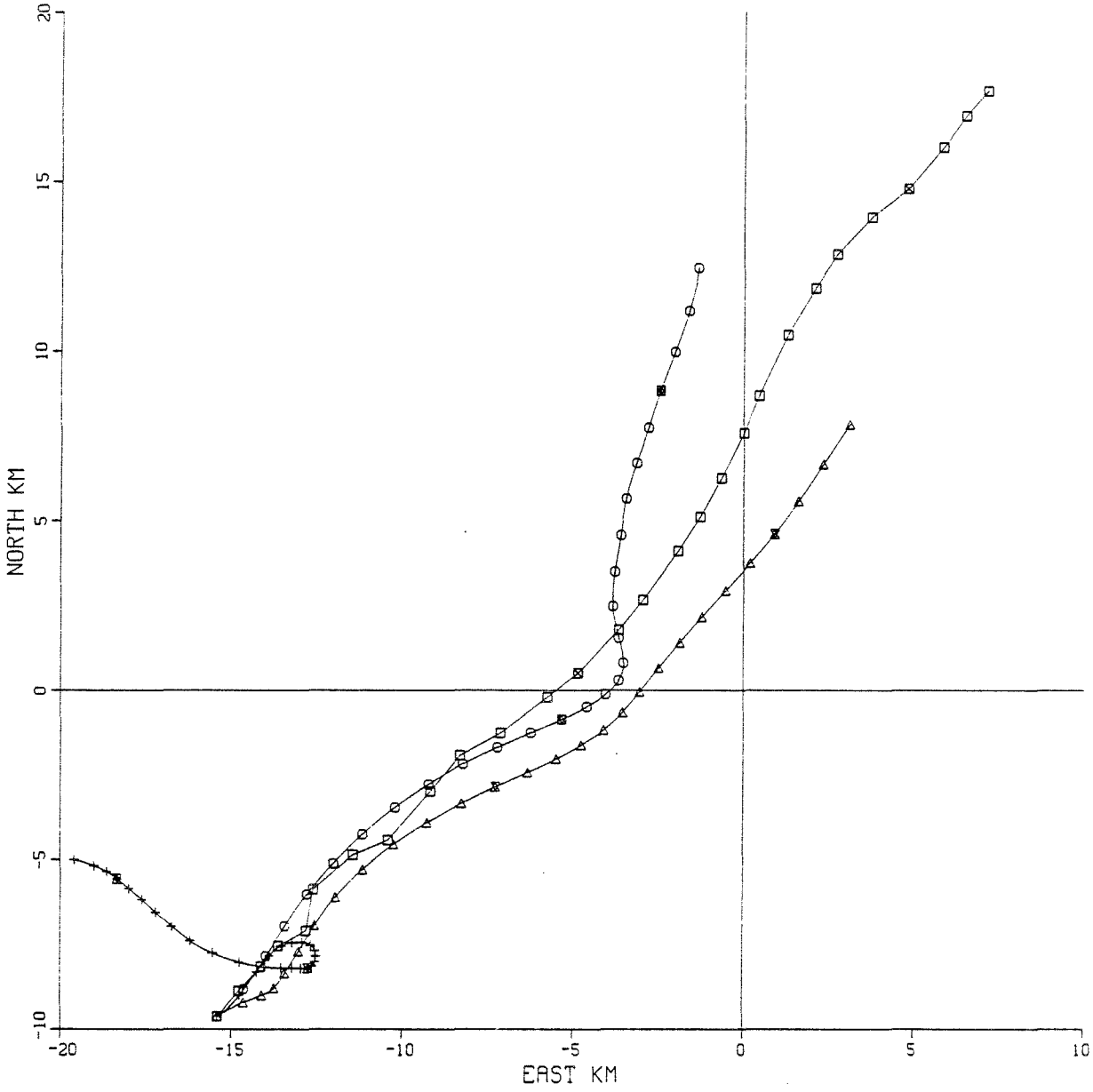

ICEBERG NB38 CA=2.00 CW=0.50
NORTH KM
7
2
3
8
EAST KM

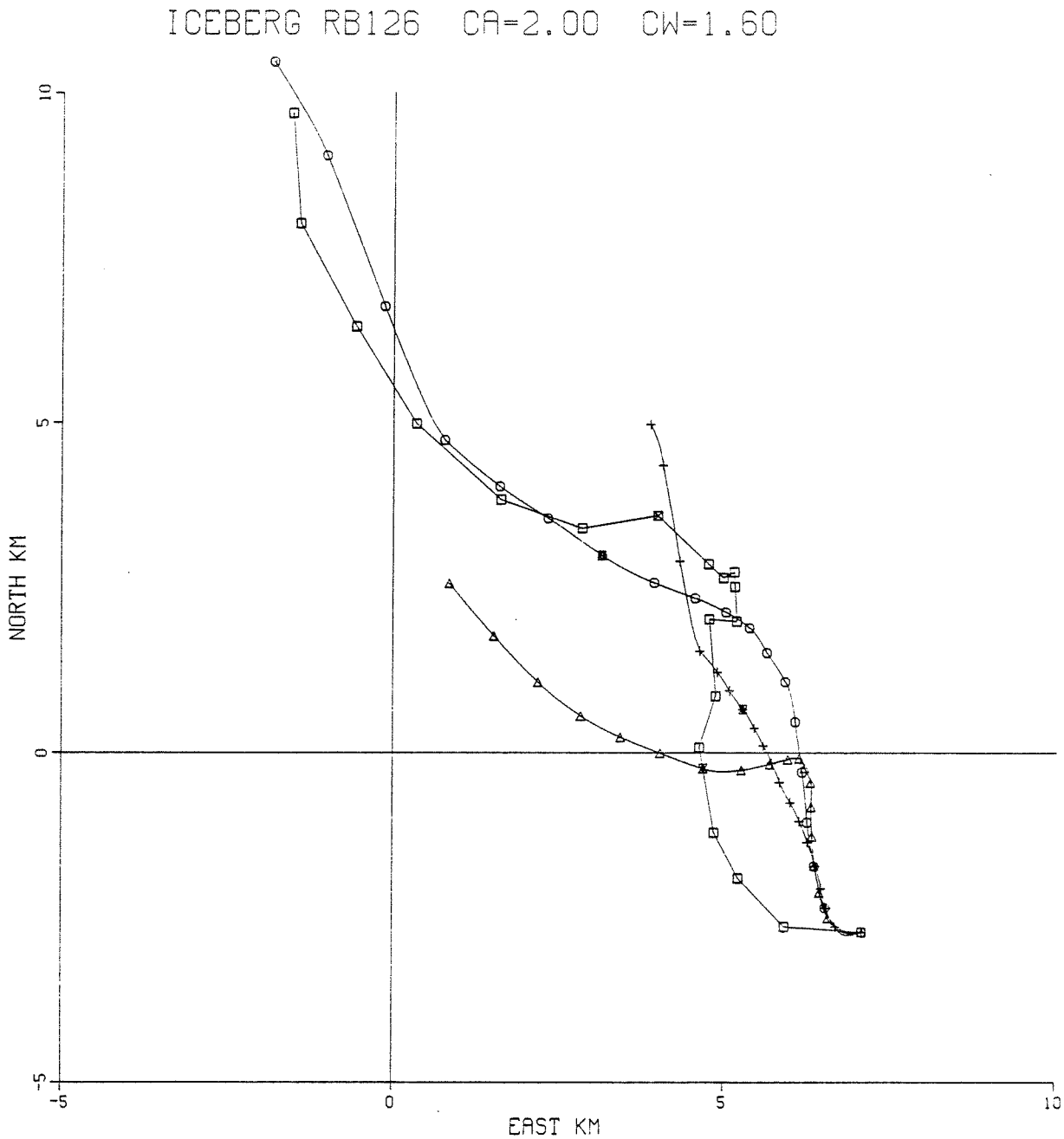

ICEBERG NB68 CA=0.60 CW=0.30
NORTH KM
EAST KM
20
15
10
5
0
-5
-10
-20
-15
-10
-5
0
5
10

ICEBERG RB04 CA=0.20 CW=0.10

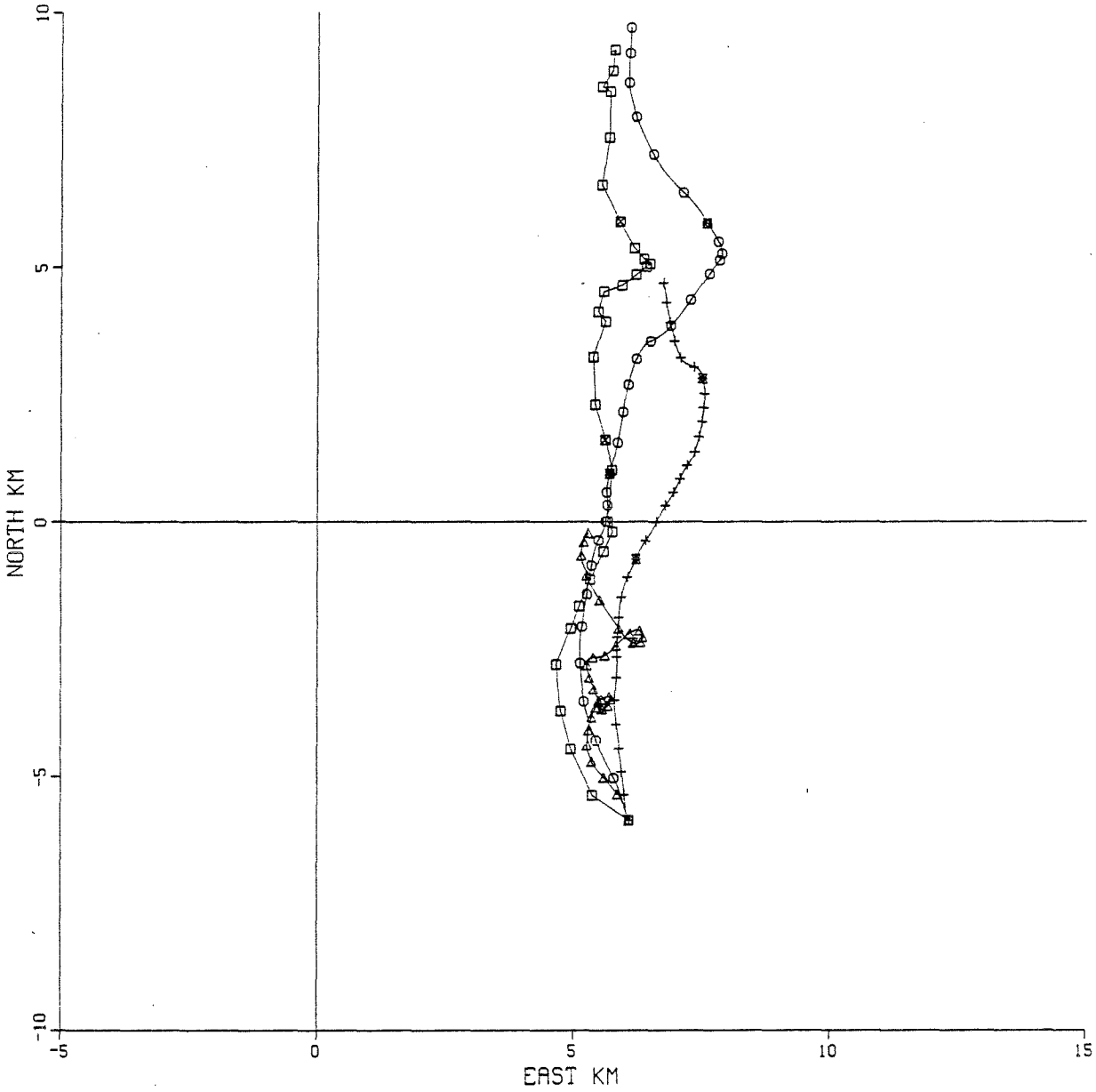


ICEBERG RB30 CA= .2 CW= .1

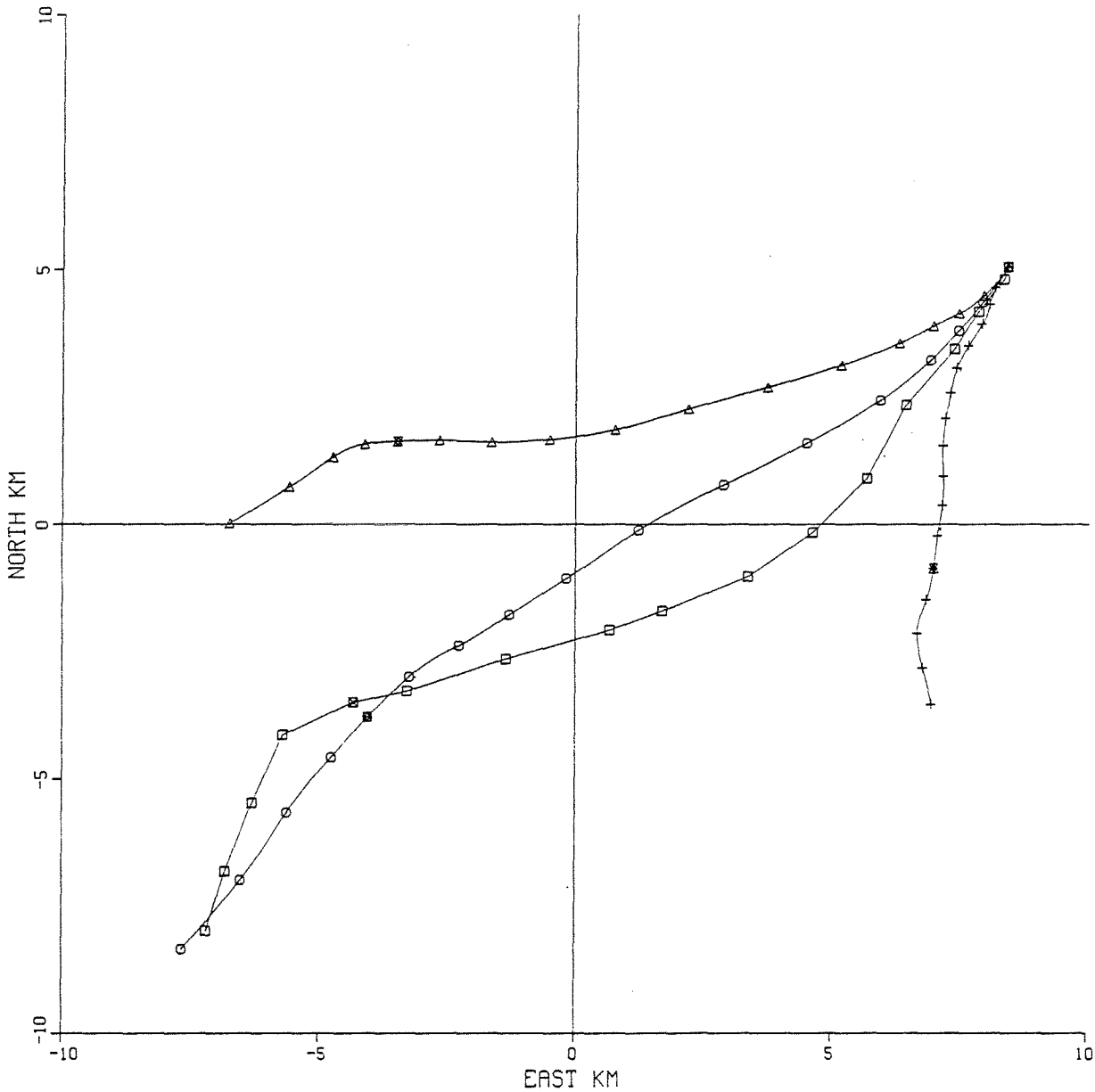



ICEBERG RB126 CA=2.00 CW=1.60
NORTH KM
EAST KM
10
5
0
-5
-5
0
5
10

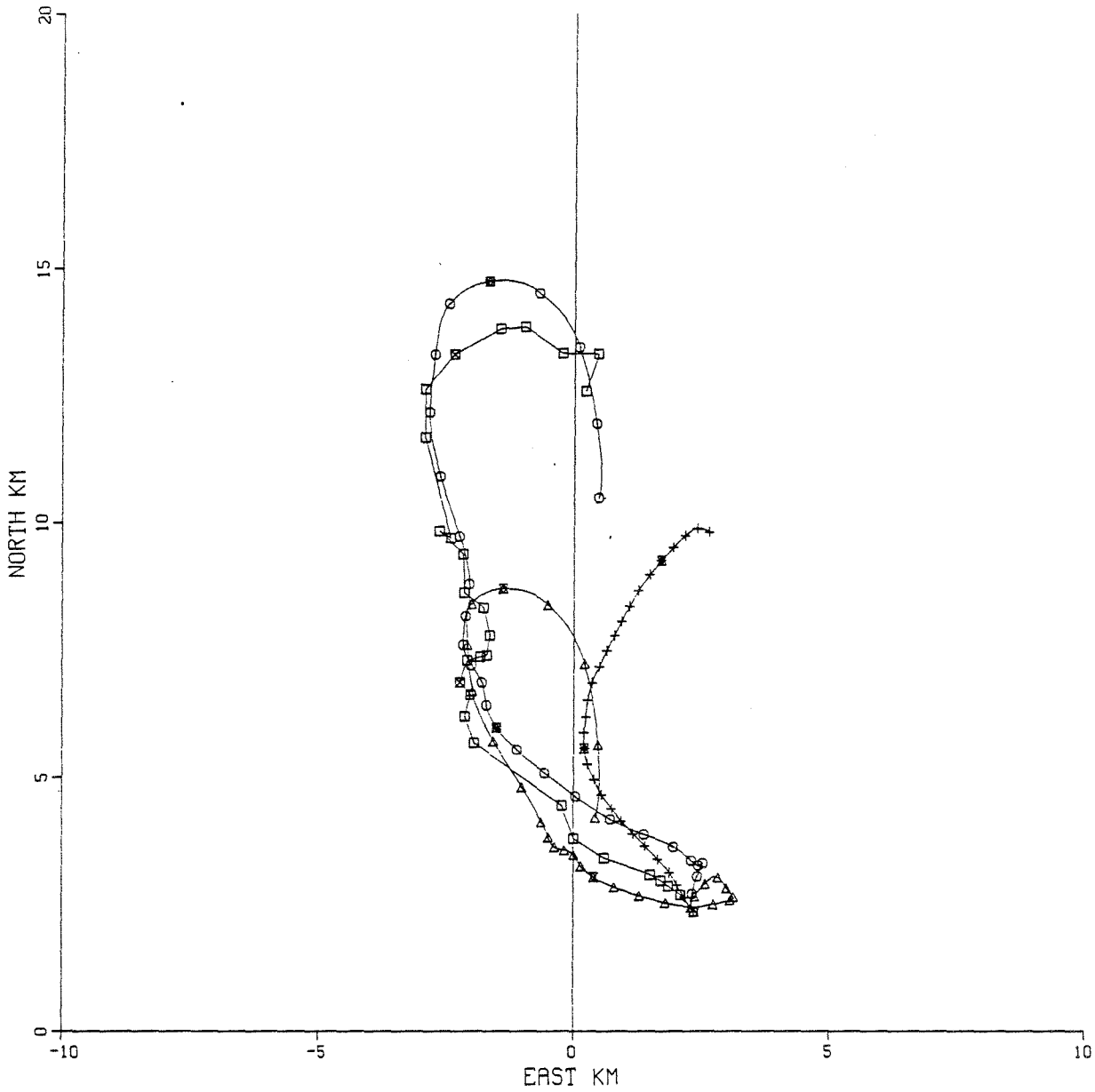
ICEBERG F022 CA=0.5 CW=1.7

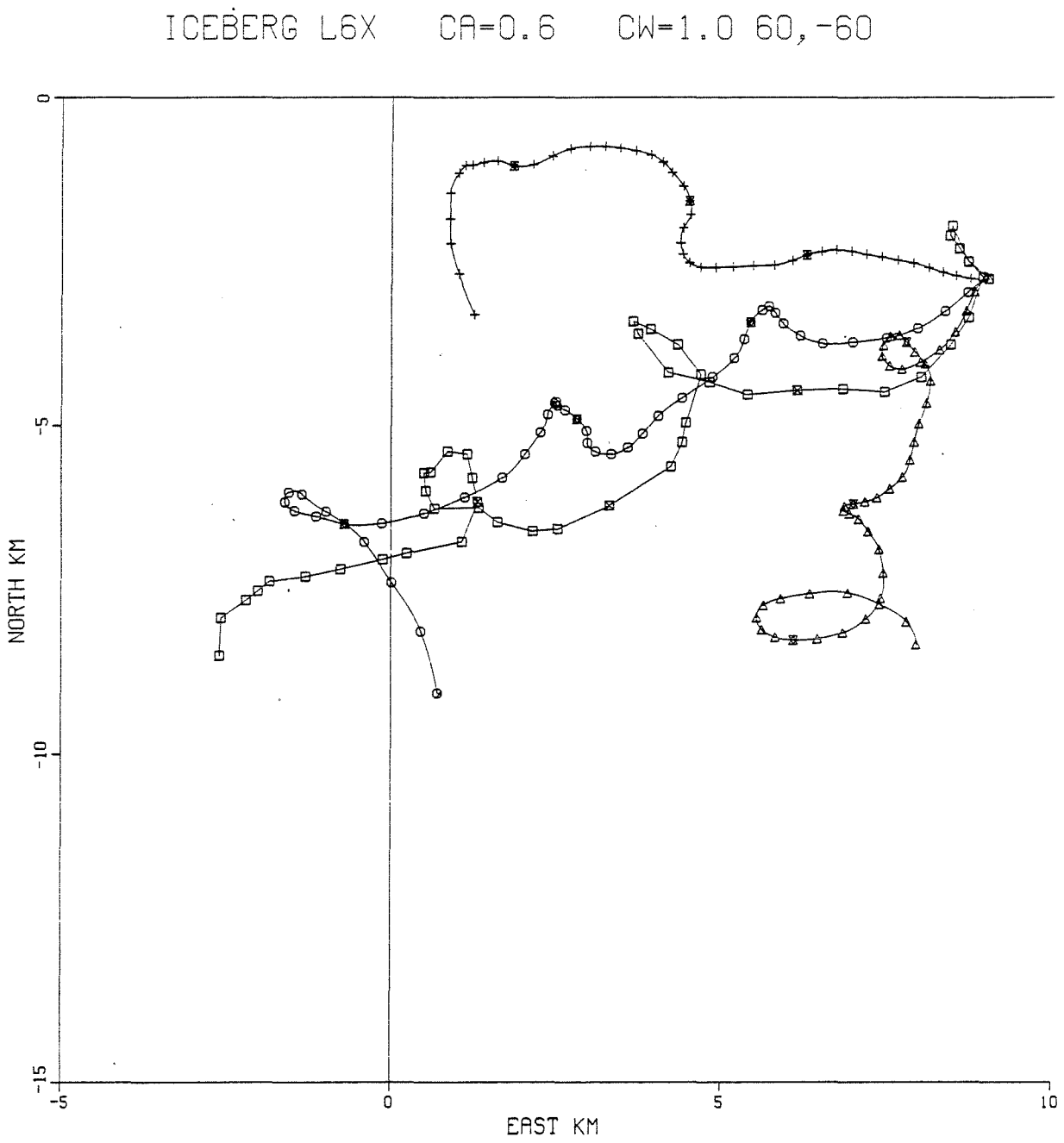


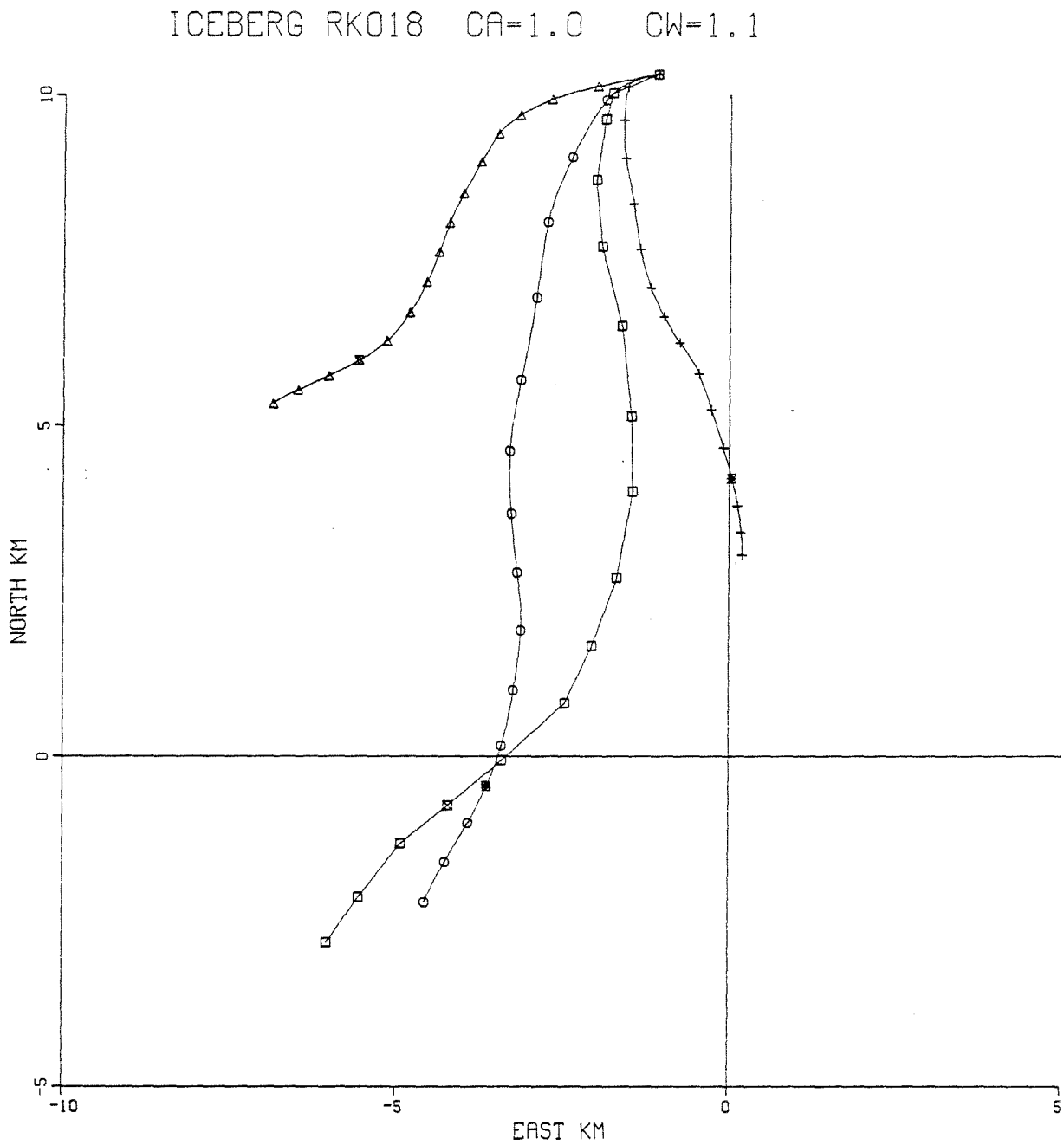
ICEBERG K013 CA=0.6 CW=0.7



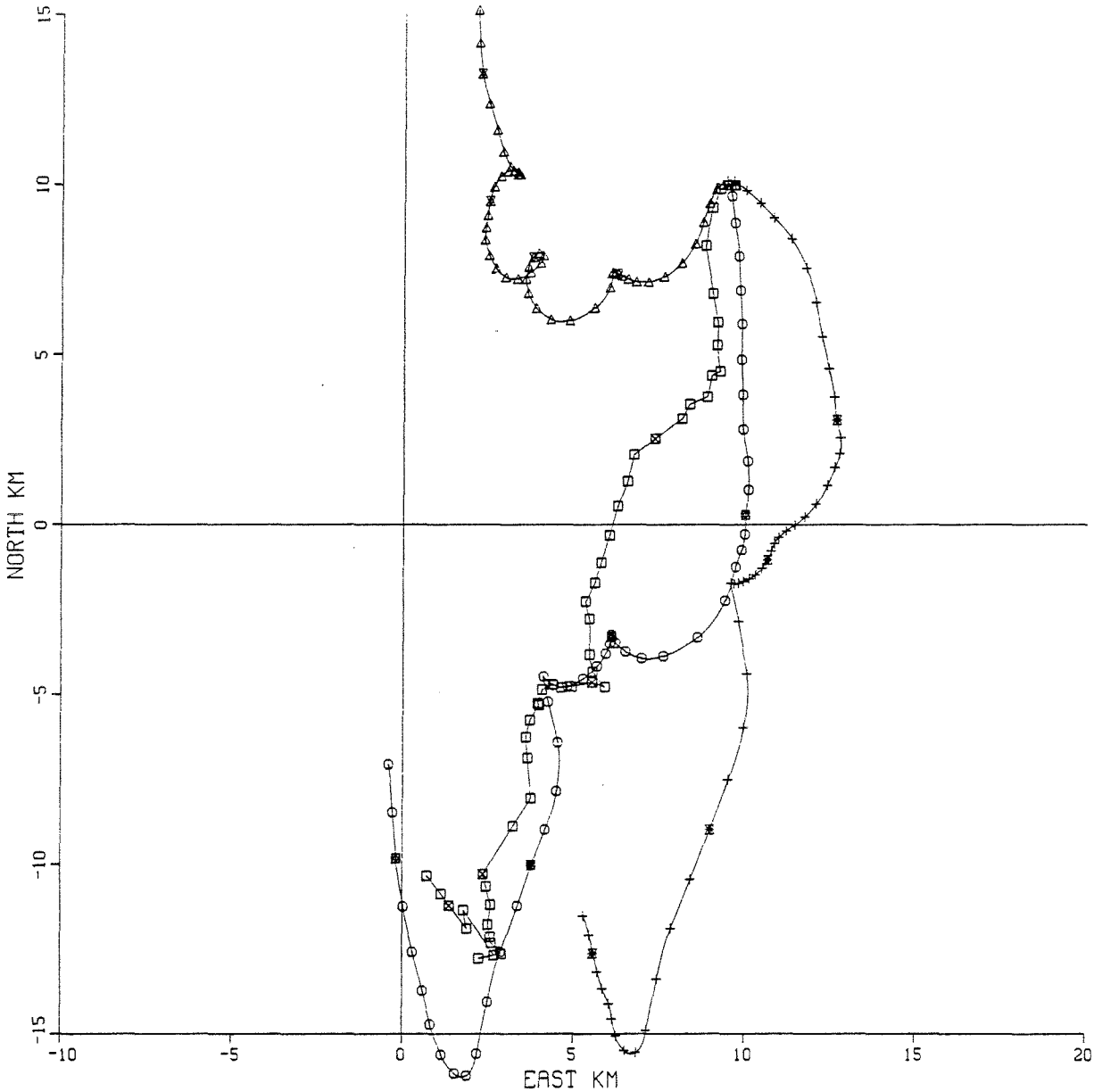
ICEBERG LR1 CA=0.2 CW=1.3



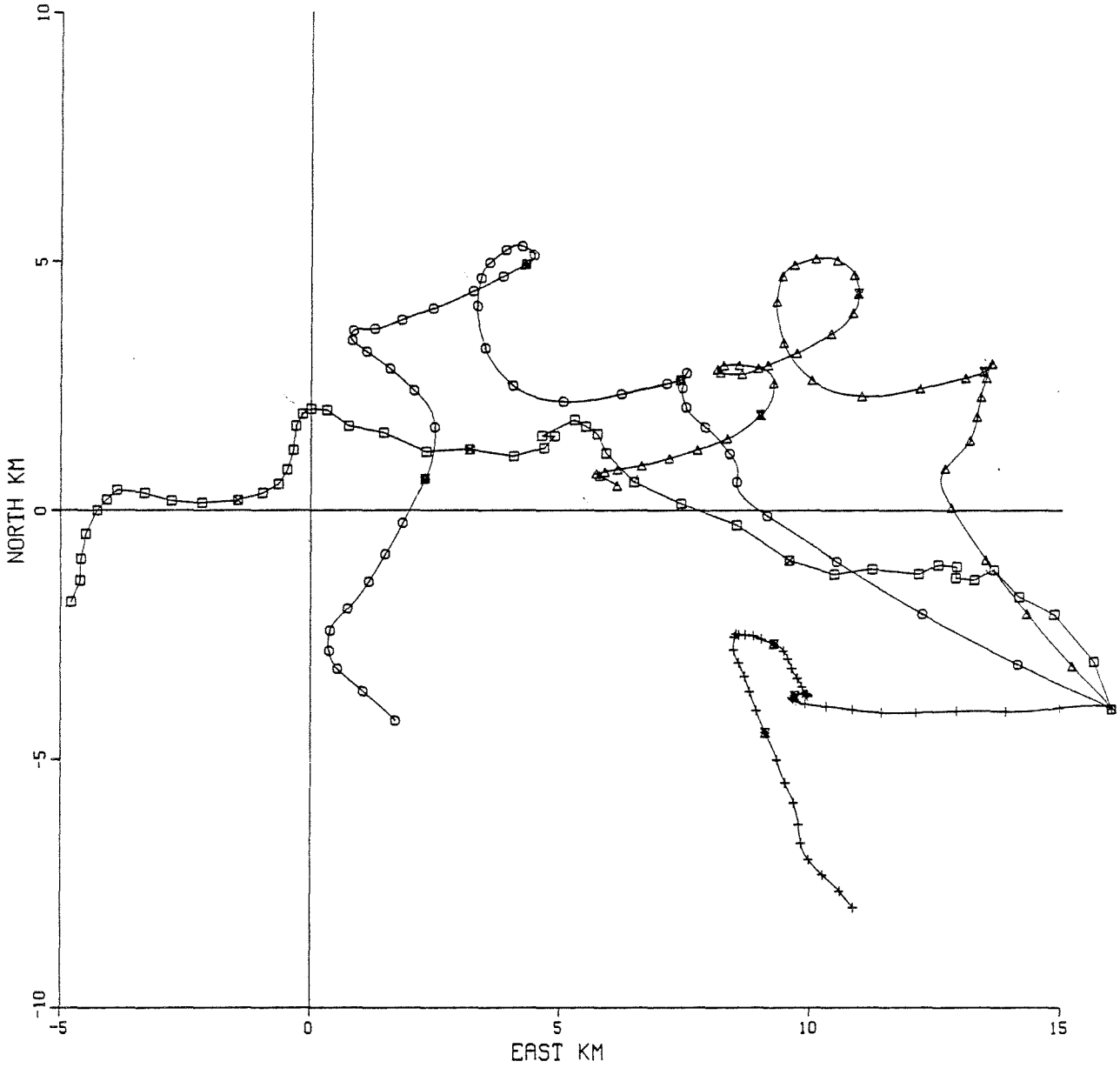

ICEBERG L6X CA=0.6 CW=1.0 60,-60
NORTH KM
EAST KM
0
-5
-10
-15
-5
0
5
10


ICEBERG RK018 CA=1.0 CW=1.1
NORTH KM
EAST KM
10
5
0
-5
-10
-5
0
5

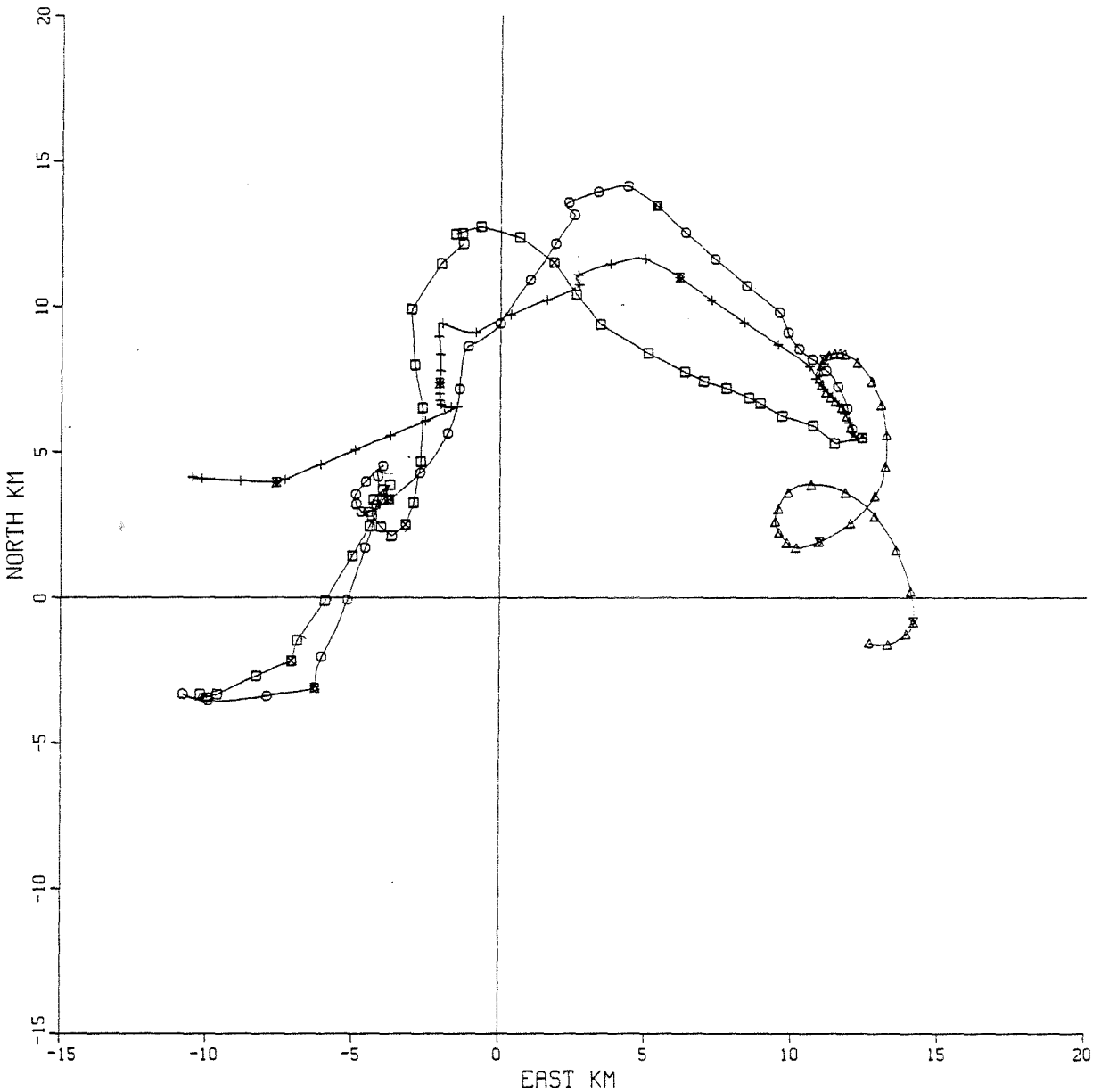
ICEBERG SK024 CA=0.3 CW=0.2



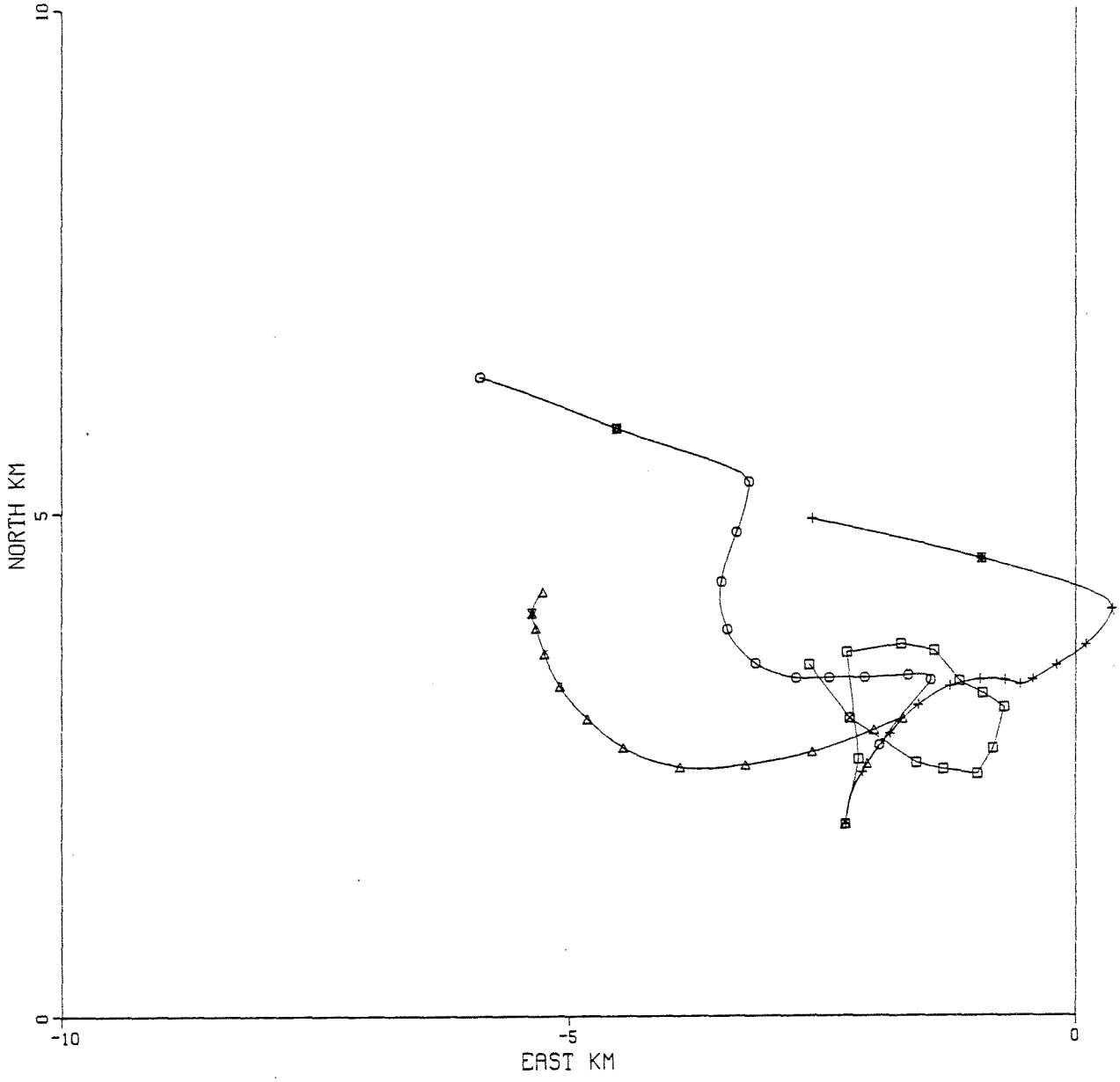
ICEBERG SK042 CA=2.0 CW=1.2



ICEBERG SK045.CA=0.20 CW=0.60



ICEBERG SN09 CA=0.3 CW=0.2

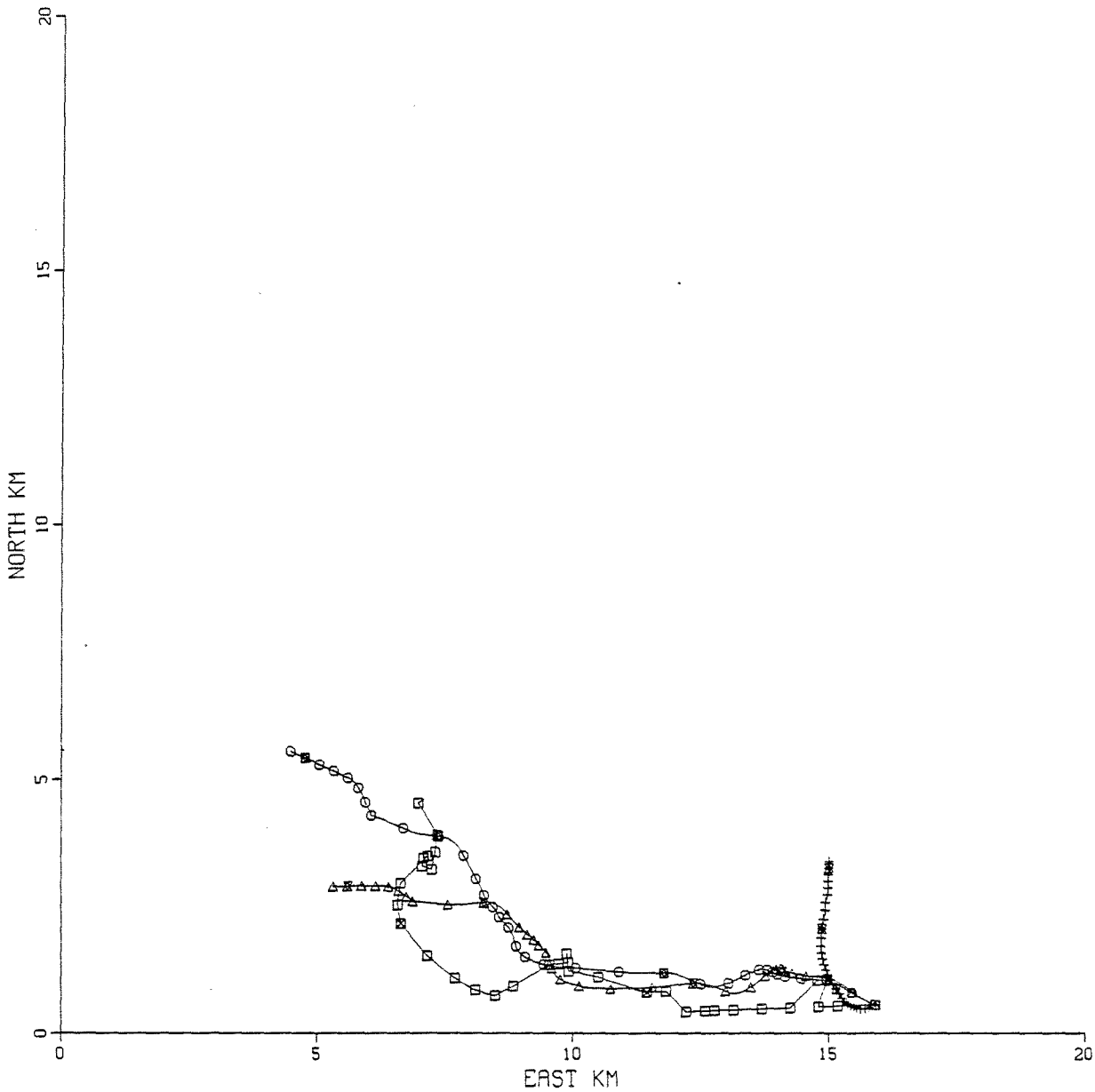


APPENDIX 4.

Plots of Drift Tracks with Towing Force Removed

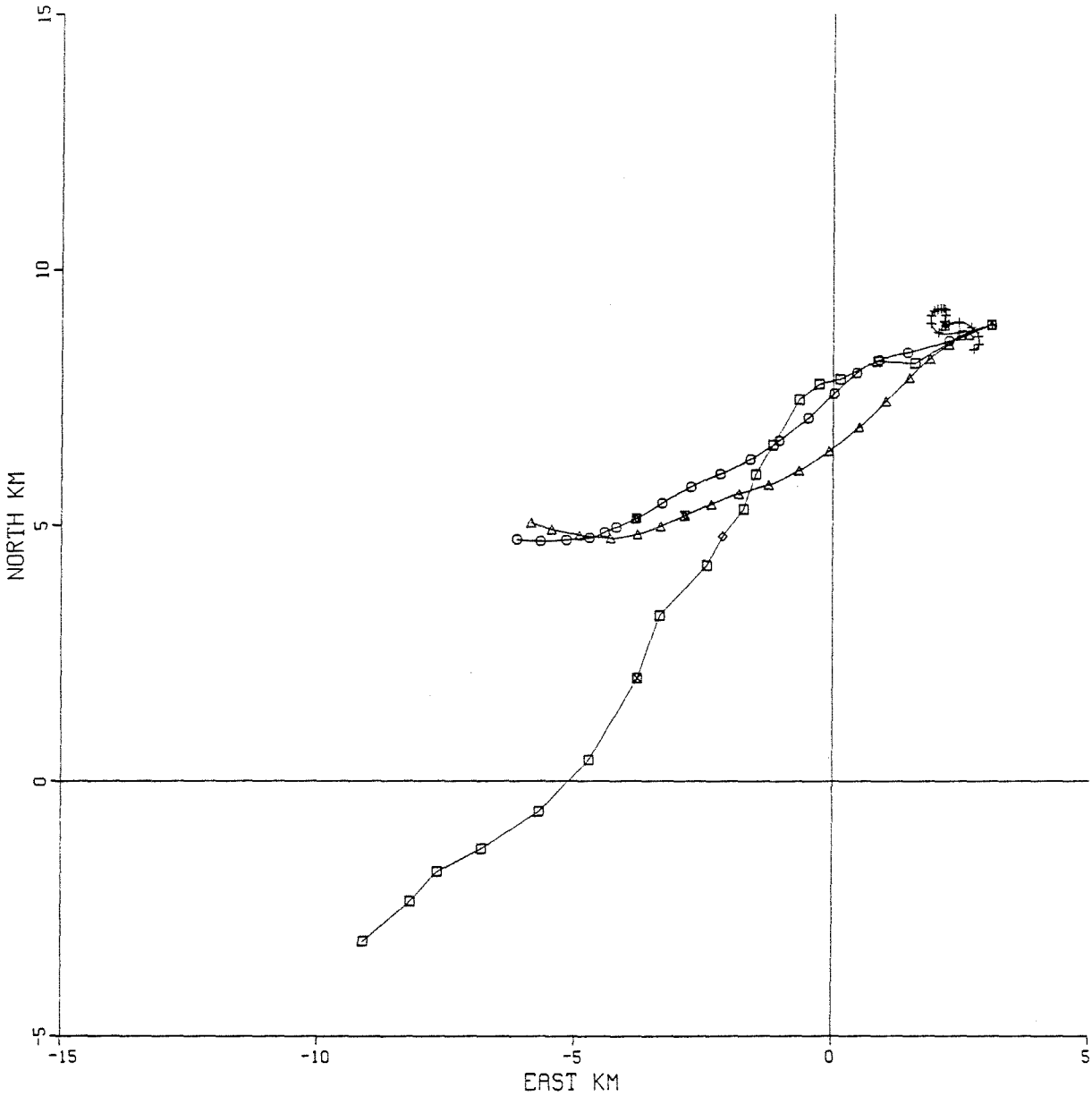
For Iceberg	RB22	see	Fig.	9
	NB68	"	"	16
	CA35	"	"	17
	CA36	"	"	18

ICEBERG F018 CA=0.1 CW=2.4

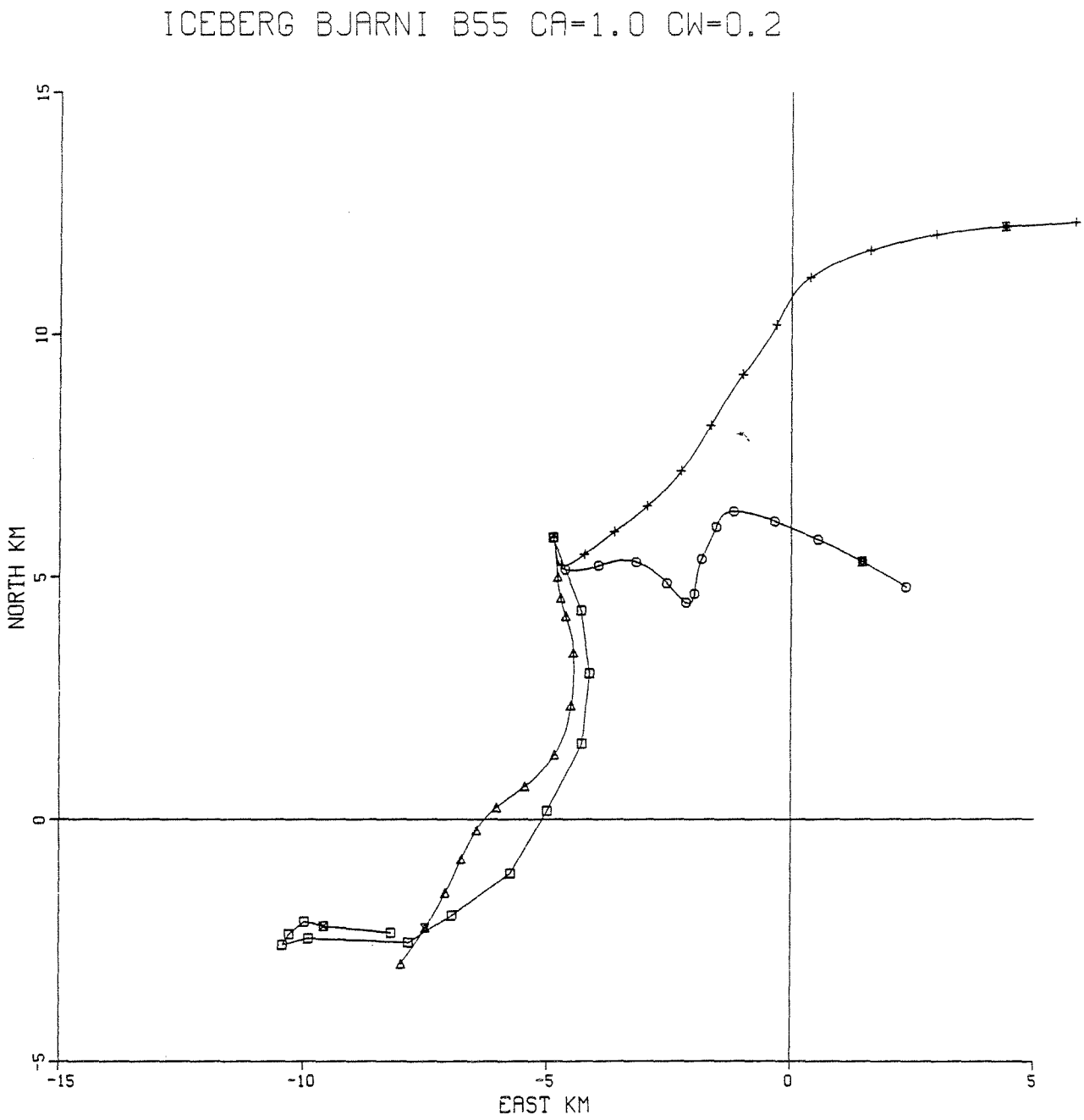


(TOWING LEADER)

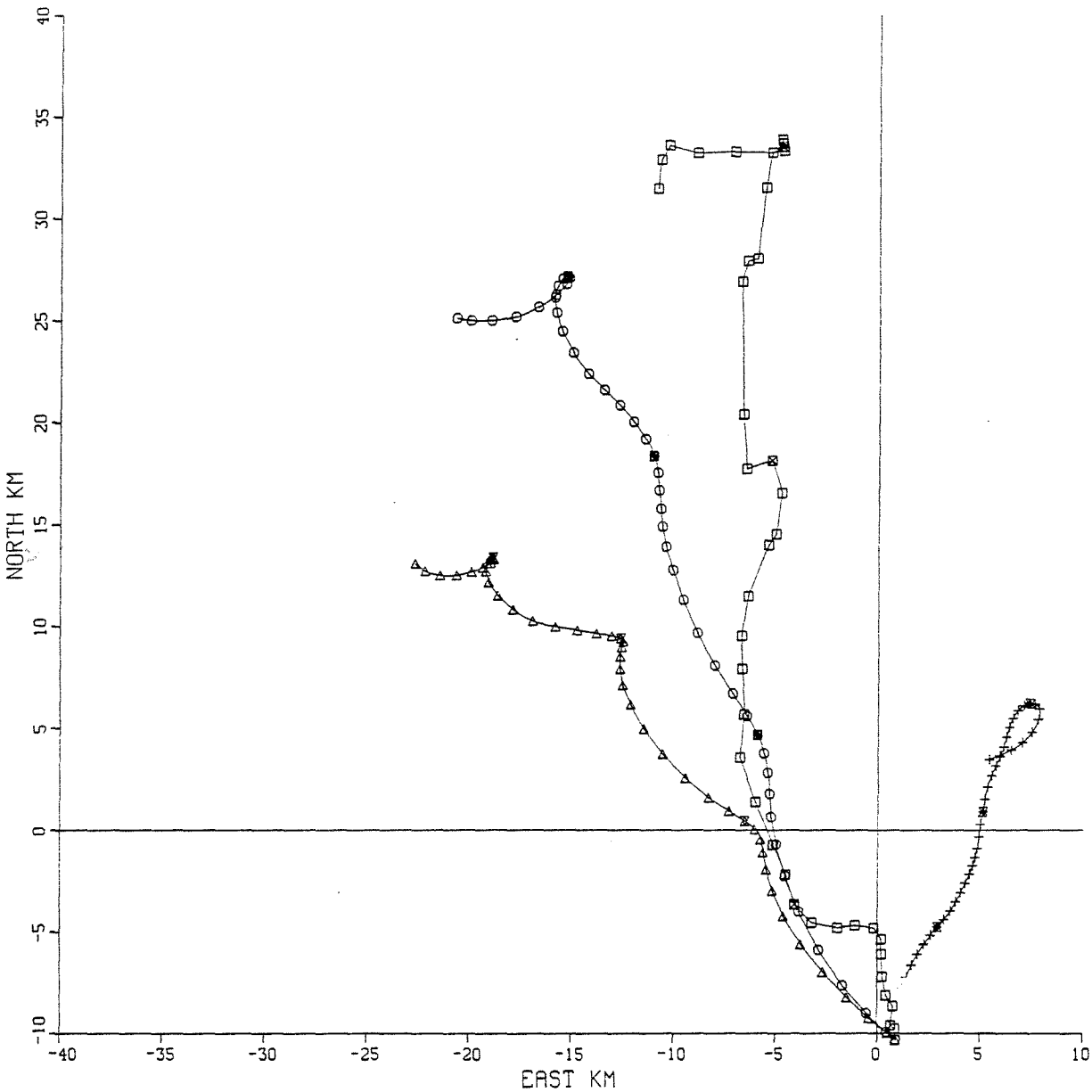
ICEBERG K026 CA=0.6 CW=0.6



Howard Reitsch

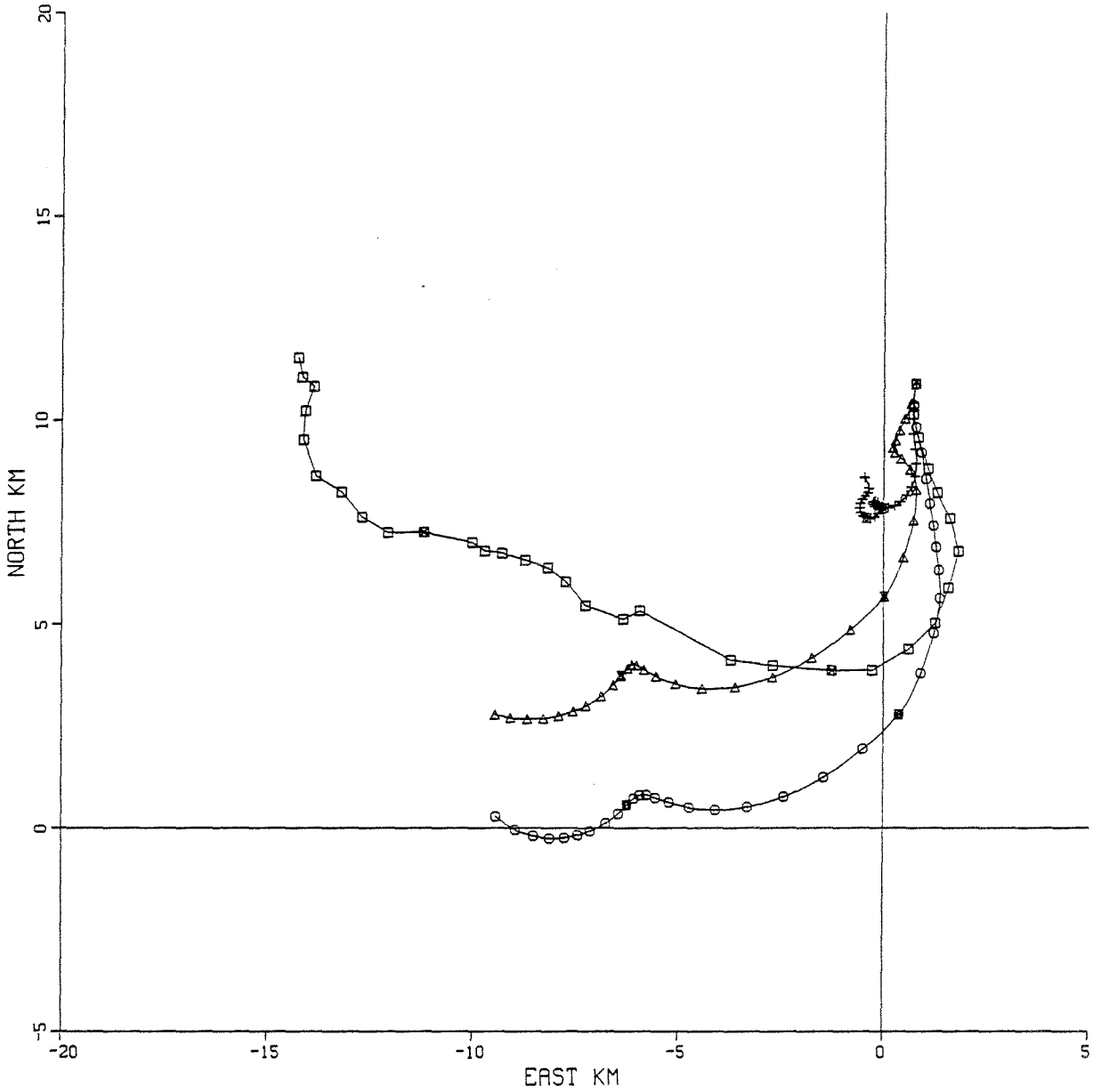

ICEBERG BJARNI B55 CA=1.0 CW=0.2
NORTH KM
EAST KM
15
10
5
0
-5
-15
-10
-5
0
5

ICEBERG GI7 CA=0.10 CW=0.10

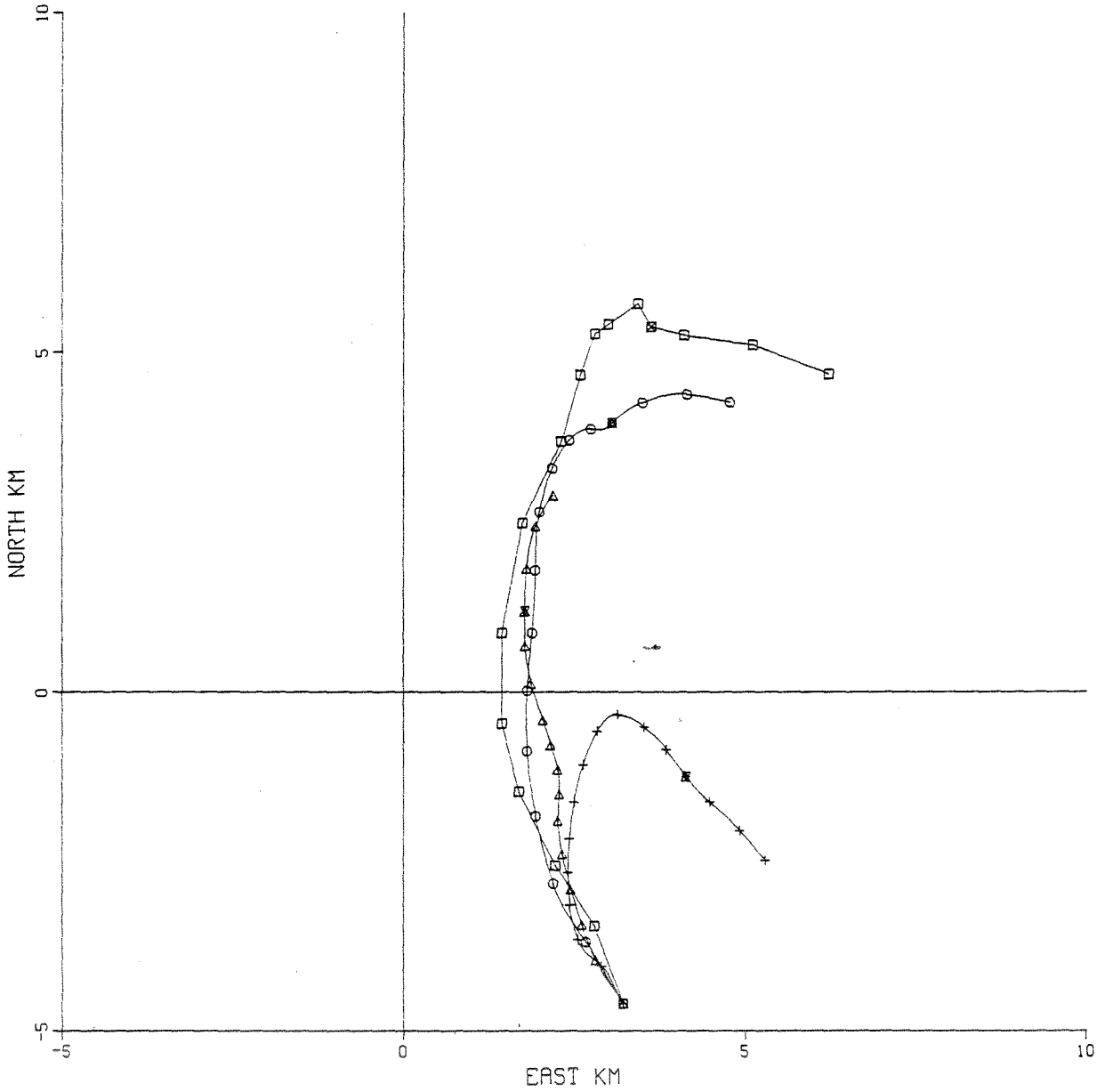


(Towing Received)

ICEBERG NB12 CA=0.20 CW=0.40

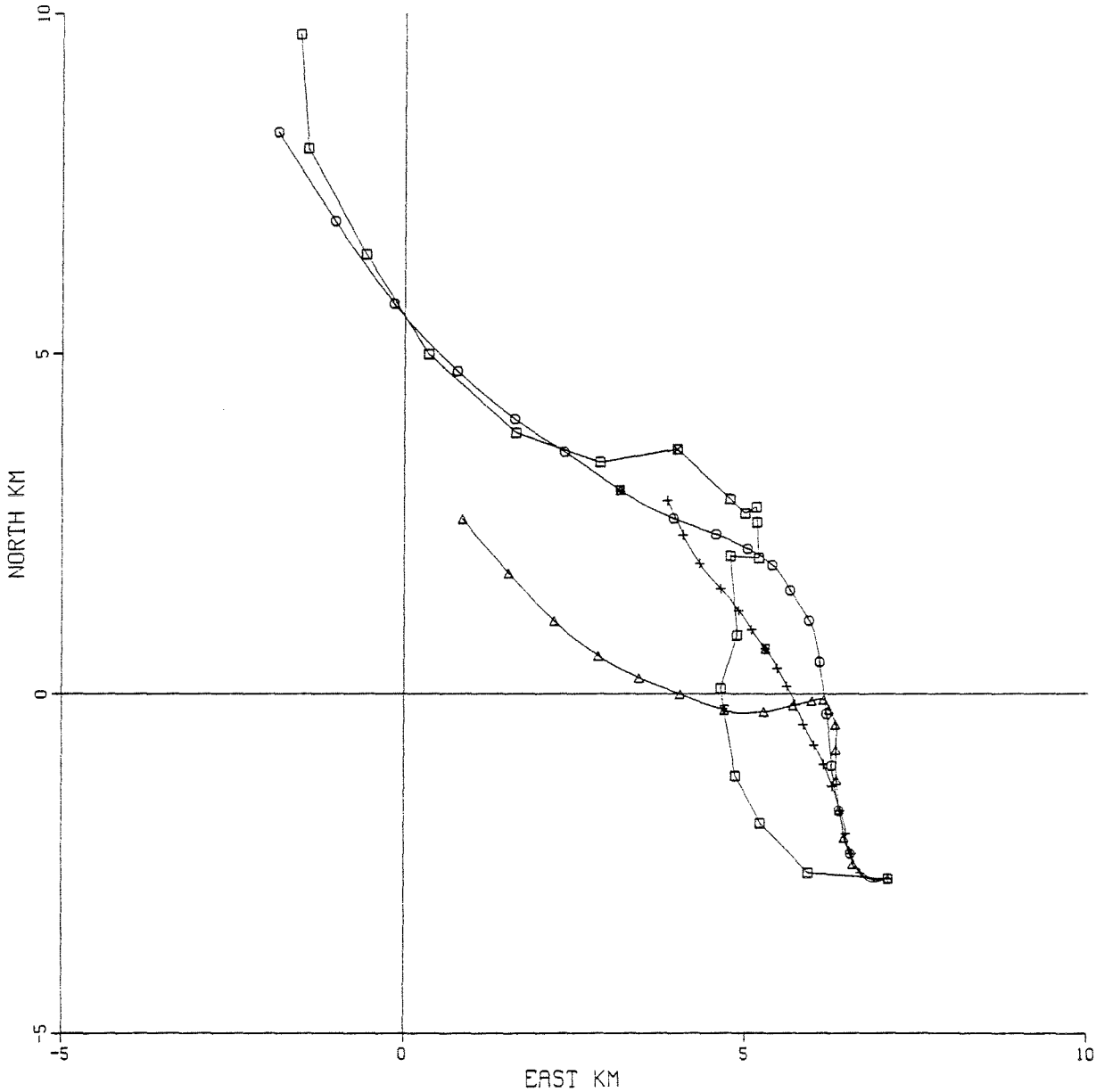


ICEBERG NB19 CA=0.60 CW=2.20



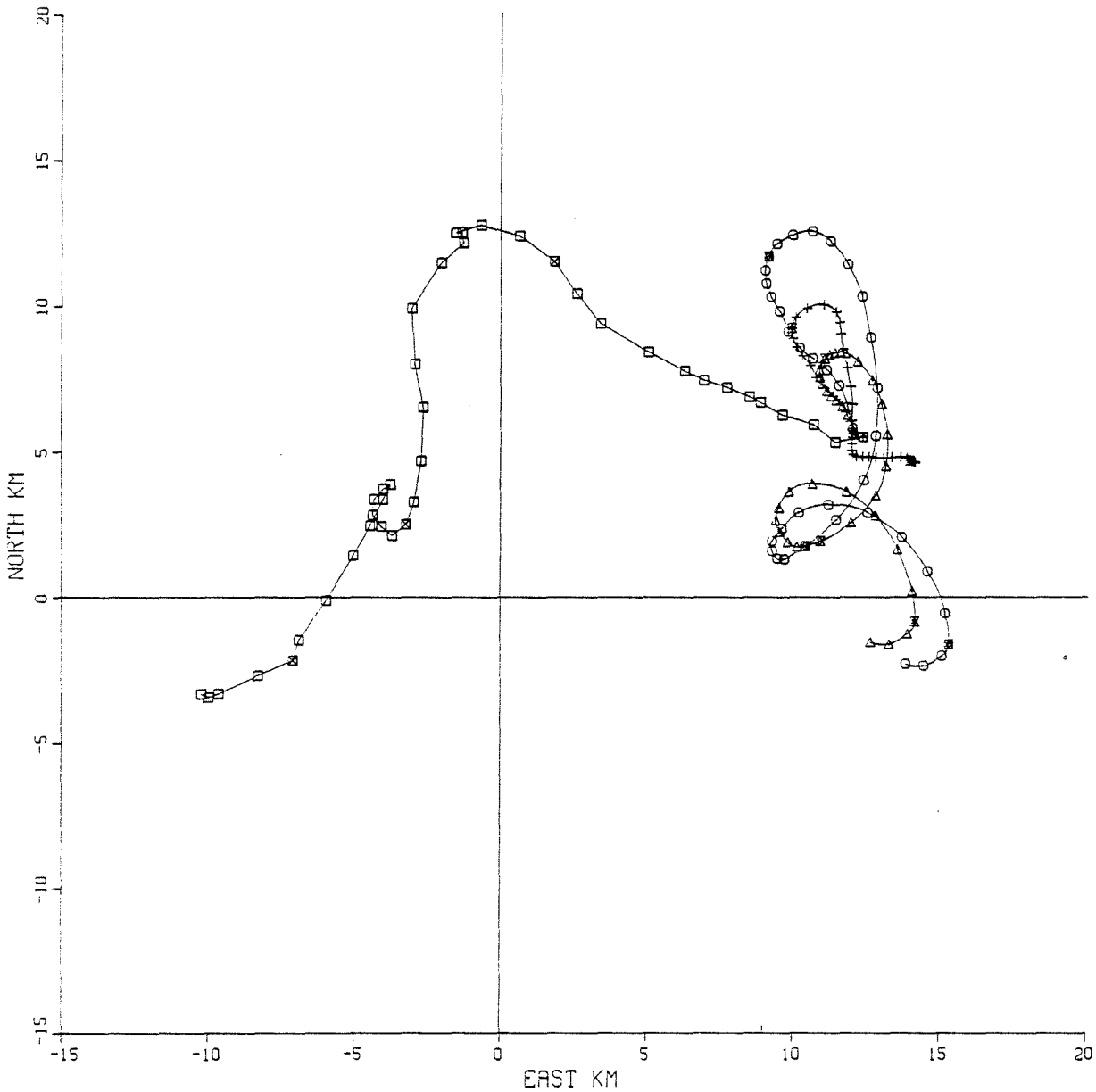
(Towing removed.)

ICEBERG RB126 CA=2.00 CW=1.60



(Towing Removed)

ICEBERG SK045 CA=0.20 CW=0.60



Removed

APPENDIX 5.

Computer Printouts for 38 Modelled Iceberg Drift Tracks
and for 12 Tracks With Towing Removed

INITIAL V [illegible] M/S [illegible] DEG [illegible] KNOTS
CA= .060 [illegible] .0026
SAIL AREA 12000 [illegible] DRIFT AREA 55000 M**2 MASS .250E+03 METRIC TONS

HOUR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	[illegible]	[illegible]	-.[illegible]	-.[illegible]	.130		10.20	60	.15	240	12.78	59	0.000	0.	0.000	0
1	0	[illegible]	[illegible]	-.[illegible]	-.[illegible]	.212		10.20	60	.23	250	11.48	59	.610	47.	0.000	0
2	0	[illegible]	[illegible]	-.[illegible]	-.[illegible]	.266		11.22	60	.30	250	10.56	59	.049	5.	0.000	0
3	0	[illegible]	[illegible]	-.[illegible]	-.174	.405		12.75	60	.27	270	8.89	60	.451	27.	0.000	0
4	0	[illegible]	4.773	-.[illegible]	-.349	.425		10.20	60	.24	270	7.59	58	.230	17.	0.000	0
5	0	[illegible]	4.215	-.[illegible]	-.198	.395		10.20	50	.22	270	6.67	55	.501	50.	0.000	0
6	0	4.31[illegible]	3.911	-.[illegible]	-.054	.320		9.18	50	.09	250	5.74	53	.405	43.	0.000	0
7	0	3.329	3.772	-.244	-.027	.247		10.20	50	.08	240	5.00	49	.162	22.	0.000	0
8	0	[illegible]	3.701	-.[illegible]	-.010	.206		7.65	50	.07	260	4.26	46	.269	34.	0.000	0
-9	0	1.938	3.673	-.172	-.012	.176		2.13	55	.12	240	3.52	42	.317	40.	0.000	0
-10	0	[illegible]	3.673	0.000	0.000	0.000		12.24	60	.13	240	3.52	42	0.000	0.	0.000	0
-11	0	[illegible]	3.673	0.000	0.000	0.000		12.75	60	.21	210	3.52	42	0.000	0.	0.000	0
-12	0	1.938	3.673	0.000	0.000	0.000		12.75	55	.21	250	3.52	42	0.000	0.	0.000	0
-13	0	[illegible]	3.673	0.000	0.000	0.000		12.24	60	.21	290	3.52	42	0.000	0.	0.000	0
-14	0	[illegible]	3.673	0.000	0.000	0.000		12.75	60	.29	270	3.52	42	0.000	0.	0.000	0
-15	0	[illegible]	3.673	0.000	0.000	0.000		11.75	50	.35	260	3.52	42	0.000	0.	0.000	0
-16	0	[illegible]	3.673	0.000	0.000	0.000		10.20	60	.31	270	3.52	41	.061	100.	0.000	0
-17	0	[illegible]	3.673	0.000	0.000	0.000		10.20	70	.23	280	3.52	41	0.000	0.	0.000	0
-18	0	[illegible]	3.673	0.000	0.000	0.000		9.18	50	.18	290	3.52	41	0.000	0.	0.000	0
-19	0	[illegible]	3.673	0.000	0.000	0.000		10.20	60	.12	310	3.52	41	0.000	0.	0.000	0
-20	0	[illegible]	3.673	0.000	0.000	0.000		10.20	60	.10	320	3.52	41	0.000	0.	0.000	0
-21	0	[illegible]	3.673	0.000	0.000	0.000		12.75	60	.07	300	3.52	41	0.000	0.	0.000	0
-22	0	[illegible]	3.673	0.000	0.000	0.000		7.65	40	.05	240	3.52	41	0.000	0.	0.000	0
-23	0	[illegible]	3.673	0.000	0.000	0.000		12.75	60	.09	200	3.52	41	0.000	0.	0.000	0
-24	0	[illegible]	3.673	0.000	0.000	0.000		12.75	70	.17	200	3.52	41	0.000	0.	0.000	0
-25	0	[illegible]	3.673	0.000	0.000	0.000		12.75	50	.13	260	3.52	41	0.000	0.	0.000	0
-26	0	[illegible]	3.673	0.000	0.000	0.000		12.24	50	.18	280	3.52	41	0.000	0.	0.000	0
-27	0	[illegible]	3.673	0.000	0.000	0.000		7.65	40	.18	250	3.52	41	0.000	0.	0.000	0
-28	0	[illegible]	3.673	0.000	0.000	0.000		10.20	20	.16	270	3.52	41	0.000	0.	0.000	0
29	0	[illegible]	3.397	-.[illegible]	-.140	.152		10.20	30	.15	270	2.96	36	.477	77.	0.000	0
30	0	[illegible]	2.727	-.[illegible]	-.226	.275		11.22	40	.20	270	2.22	20	.698	68.	0.000	0
31	0	[illegible]	1.896	-.245	-.210	.319		10.20	40	.10	240	1.85	358	.595	69.	0.000	0
32	0	-.[illegible]	1.[illegible]	-.[illegible]	-.161	.295		11.22	30	.09	250	1.85	330	.406	45.	0.000	0
33	0	-1.151	.[illegible]	-.244	-.121	.272		9.16	35	.08	260	1.85	303	.273	32.	0.000	0
34	0	-[illegible]	.[illegible]	-.[illegible]	-.053	.230		9.16	40	.03	220	2.04	284	.453	68.	0.000	0
35	0	-[illegible]	.[illegible]	-.[illegible]	-.045	.183		10.20	35	.07	210	2.41	269	.455	66.	0.000	0
36	0	-[illegible]	.[illegible]	-.14[illegible]	-.054	.157		7.65	30	.12	230	3.15	260	.342	40.	0.000	0
37	0	-[illegible]	-.[illegible]	-.[illegible]	-.064	.147		11.22	60	.13	200	3.89	257	.229	30.	0.000	0
38	0	-[illegible]	-.[illegible]	-.[illegible]	-.092	.166		12.24	45	.11	230	5.00	255	.542	48.	0.000	0
39	0	-[illegible]	-.[illegible]	-.[illegible]	-.125	.224		12.24	40	.11	260	6.85	256	1.131	61.	0.000	0
40	0	-[illegible]	-1.[illegible]	-.[illegible]	-.141	.300		12.75	40	.12	250	7.59	255	.267	35.	0.000	0
41	0	-[illegible]	-1.[illegible]	-.[illegible]	-.1[illegible]	.371		12.75	40	.22	290	8.89	257	.576	43.	0.000	0
42	0	-[illegible]	-2.[illegible]	-.[illegible]	-.133	.400		11.22	30	.15	300	10.19	258	.449	34.	0.000	0
43	0	-[illegible]	-[illegible]	-.[illegible]	-.107	.372		11.22	20	.16	290	10.93	258	.658	89.	0.000	0
44	0	-10.[illegible]	-[illegible]	-.[illegible]	-.114	.316		12.75	30	.14	230	11.67	259	.605	79.	0.000	0
45	0	-11.7[illegible]	-[illegible]	-.[illegible]	-.133	.305		11.22	30	.14	270	12.78	257	.198	17.	0.000	0
46	0	-12.[illegible]	-4.1[illegible]	-.[illegible]	-.134	.303		11.22	30	.12	250	13.33	256	.527	88.	0.000	0
47	0	-13.[illegible]	-4.[illegible]	-.[illegible]	-.111	.252		10.20	30	.09	210	13.89	255	.440	73.	0.000	0
48	0	-14.4[illegible]	-[illegible]	-.[illegible]	-.132	.246		11.73	30	.13	250	14.45	254	.297	49.	0.000	0
49	0	-1[illegible]	-[illegible]	-.[illegible]	-.133	.250		12.75	20	.20	240	15.19	252	.295	33.	0.000	0
50	0	-16.[illegible]	-6.[illegible]	-.[illegible]	-.241	.348		10.20	20	.25	260	16.11	250	.156	15.	0.000	0
51	0	-17.[illegible]	-7.[illegible]	-.[illegible]	-.261	.339		11.22	10	.20	270	17.22	250	.540	49.	0.000	0
52	0	-1[illegible]	-[illegible]	-.[illegible]	-.267	.398		12.75	10	.20	250	18.1[illegible]	249	.449	46.	0.000	0
53	0	-1[illegible]	-[illegible]	-.[illegible]	-.277	.407		12.24	0	.24	250	19.08	249	.703	76.	0.000	0
54	0	-20.1[illegible]	-10.[illegible]	-.[illegible]	-.314	.413		12.75	10	.20	240	19.82	248	.668	82.	0.000	0

RMS [illegible] IN COMPUTED DRIFT [illegible] .3912 KM RMS ERROR IN POSITION 1.2494 KM 54.0RS

ICEBERG KOG7 CA=0.20 CW=1.50 X RANGE -25.000 TO 15.000 KM Y RANGE -20.000 TO 20.000 KM 3 TRACKS TOTVN= 37 KOFVN= 0

INITIAL V [illegible] M/S [illegible] LATITUDE [illegible] HOURS
CA= .100 [illegible] .0020
SAIL AREA [illegible] KEEL AREA 5000 SURFACE AREA 4700 M**2 MASS .175E+06 METRIC TONS

HOUR	DAYS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	[illegible]	[illegible]	[illegible]	-.006	.[illegible]	4.00	25	.17	330	15.93	88	0.000	0.	0.000	0
1	0	[illegible]	.[illegible]	-.147	.066	.141	5.00	25	.16	340	15.19	88	.326	44.	0.000	0
2	0	[illegible]	[illegible]	[illegible]	.011	.146	5.00	65	.14	300	14.82	88	.243	66.	0.000	0
3	0	[illegible]	[illegible]	[illegible]	-.001	.115	7.00	80	.08	310	15.00	86	.841	152.	0.000	0
4	0	[illegible]	[illegible]	[illegible]	.005	.063	6.00	90	.03	310	14.82	86	.138	75.	0.000	0
5	0	[illegible]	.044	[illegible]	.011	.032	4.00	125	.01	330	14.26	88	.674	90.	0.000	0
6	0	[illegible]	[illegible]	[illegible]	.010	.028	5.00	90	.01	320	13.70	88	.468	84.	0.000	0
7	0	[illegible]	1.[illegible]	[illegible]	.010	.037	5.00	100	.02	320	13.15	88	.449	81.	0.000	0
8	0	[illegible]	1.[illegible]	[illegible]	-.025	.063	4.50	100	.09	270	12.78	88	.210	57.	0.000	0
9	0	[illegible]	[illegible]	[illegible]	-.045	.093	5.00	140	.09	260	12.59	88	.140	75.	0.000	0
10	0	[illegible]	[illegible]	[illegible]	-.062	.123	7.50	140	.15	270	12.22	88	.190	51.	0.000	0
11	0	12.497	[illegible]	-.179	.046	.155	6.00	140	.19	330	11.85	86	.494	88.	0.000	0
12	0	11.771	.742	[illegible]	-.019	.223	9.00	140	.23	290	11.48	86	.390	105.	0.000	0
13	0	[illegible]	[illegible]	[illegible]	-.009	.252	6.00	140	.24	300	10.56	84	.391	39.	0.000	0
14	0	[illegible]	[illegible]	-.290	-.008	.206	5.00	130	.18	300	10.00	83	.303	52.	0.000	0
15	0	[illegible]	.744	-.143	.016	.143	.01	140	.12	320	10.00	81	.673	193.	0.000	0
16	0	[illegible]	.739	[illegible]	.031	.075	.01	140	.05	340	10.00	82	.488	279.	0.000	0
17	0	[illegible]	[illegible]	[illegible]	.095	.107	6.00	145	.12	20	9.82	82	.222	120.	0.000	0
18	0	[illegible]	1.277	[illegible]	.064	.088	7.00	145	.06	330	9.63	82	.369	199.	0.000	0
19	0	[illegible]	1.476	[illegible]	.052	.065	8.50	160	.03	350	8.89	84	.786	97.	0.000	0
20	0	[illegible]	1.757	[illegible]	.051	.068	8.00	160	.05	330	8.52	85	.431	108.	0.000	0
21	0	[illegible]	1.974	[illegible]	.073	.087	9.00	170	.06	350	8.15	84	.232	58.	0.000	0
22	0	[illegible]	2.171	[illegible]	.091	.106	10.00	170	.08	350	7.78	82	.227	49.	0.000	0

RMS ERROR IN COMPUTED DRIFT [illegible] .4417 KM RMS ERROR IN POSITION .7835 KM 22.08S

[illegible] X RANGE 5.000 TO 20.000 KM Y RANGE 0.000 TO 15.000 KM DEVN= 37 KDEVN= 0

THE CA LIMIT 1.000. THE CK LIMIT 2.400

INITIAL V .050 M/S 270 DEG LATITUDE 59 DEG 37 HOURS
CA= .100 CW=2.400 CS= .0020 CX= .0020
SAIL AREA 1020 KEEL AREA 4080 SURFACE AREA 4700 M**2 MASS .175E+05 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	15.917	.556	-.050	-.000	.050	4.00	25	.17	330	15.93	88	0.000	0.	0.000	0
1	0	15.454	.793	-.137	.082	.160	5.00	25	.16	340	15.19	88	.382	52.	0.000	0
2	0	14.954	1.024	-.142	.028	.145	5.00	65	.14	300	14.82	88	.276	75.	0.000	0
3	0	14.468	1.070	-.115	.011	.115	7.00	80	.08	310	15.00	86	.805	146.	0.000	0
4	0	14.151	1.114	-.062	.011	.063	6.00	90	.03	310	14.82	86	.144	78.	0.000	0
5	0	13.993	1.156	-.029	.014	.032	4.00	125	.01	330	14.26	88	.686	91.	0.000	0
6	0	13.904	1.204	-.025	.011	.028	5.00	90	.01	320	13.70	88	.472	85.	0.000	0
7	0	13.796	1.243	-.035	.012	.037	5.00	100	.02	320	13.15	88	.451	81.	0.000	0
8	0	13.632	1.248	-.061	-.018	.064	4.50	100	.08	270	12.78	88	.207	56.	0.000	0
9	0	13.376	1.140	-.076	-.037	.084	5.00	140	.09	260	12.59	88	.124	67.	0.000	0
10	0	13.040	.984	-.121	-.049	.131	7.50	140	.15	270	12.22	88	.147	40.	0.000	0
11	0	12.497	.969	-.176	.067	.188	8.00	140	.19	330	11.85	86	.442	79.	0.000	0
12	0	11.782	1.187	-.225	.008	.226	9.00	140	.23	290	11.48	86	.423	114.	0.000	0
13	0	10.904	1.210	-.255	.020	.256	8.00	140	.24	300	10.56	84	.290	29.	0.000	0
14	0	10.056	1.281	-.207	.015	.207	5.00	130	.18	300	10.00	83	.278	48.	0.000	0
15	0	9.432	1.357	-.139	.033	.143	.01	140	.12	320	10.00	81	.636	182.	0.000	0
16	0	9.064	1.498	-.065	.039	.075	.01	140	.05	340	10.00	82	.503	288.	0.000	0
17	0	8.894	1.715	-.039	.100	.107	6.00	145	.12	20	9.82	82	.244	131.	0.000	0
18	0	8.738	2.076	-.054	.071	.089	8.00	145	.06	330	9.63	82	.388	209.	0.000	0
19	0	8.558	2.288	-.036	.055	.066	8.50	160	.03	350	8.89	84	.809	100.	0.000	0
20	0	8.429	2.488	-.043	.056	.071	8.00	160	.05	330	8.52	85	.448	112.	0.000	0
21	0	8.264	2.723	-.044	.078	.089	9.00	170	.06	350	8.15	84	.252	63.	0.000	0
22	0	8.100	3.041	-.051	.098	.110	10.00	170	.08	350	7.78	82	.253	55.	0.000	0
23	0	7.859	3.502	-.088	.164	.186	13.00	180	.16	350	7.32	78	.307	44.	0.000	0
24	0	7.372	3.876	-.186	.027	.188	13.00	180	.21	290	6.98	72	.264	32.	0.000	0
25	0	6.661	4.036	-.186	.078	.201	13.00	190	.20	310	7.04	69	.654	176.	0.000	0
-26	0	6.056	4.290	-.160	.055	.169	13.00	180	.16	300	7.26	66	.709	163.	0.000	0
-27	0	6.056	4.290	0.000	0.000	0.000	11.00	180	.09	330	7.96	64	.752	100.	0.000	0
-28	0	6.056	4.290	0.000	0.000	0.000	11.00	180	.09	350	7.87	64	.093	100.	0.000	0
-29	0	6.056	4.290	0.000	0.000	0.000	13.00	180	.06	340	7.78	65	.165	100.	0.000	0
-30	0	6.056	4.290	0.000	0.000	0.000	12.50	170	.06	340	7.93	66	.202	100.	0.000	0
31	0	5.936	4.545	-.036	.085	.092	12.00	190	.06	340	8.13	64	.204	59.	0.000	0
32	0	5.797	4.826	-.044	.071	.083	10.00	180	.06	330	8.32	62	.183	54.	0.000	0
33	0	5.594	5.026	-.071	.039	.081	9.00	175	.08	300	8.32	57	.456	63.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .4295 KM RMS ERROR IN POSITION 1.2335 KM 34.08S

ICEBERG F018 CA=0.1 CW=2.4 X RANGE 0.000 TO 20.000 KM Y RANGE 0.000 TO 20.000 KM 0 TRACKS

IDEVN= 30 KDEVN= 0

INITIAL V .097 M/S 291 DEG LATITUDE 54 DEG 24 HOURS
CA= .400 CN= .800 CS= .0020 CX= .0020
SAIL AREA 5660 KEEL AREA 22644 SURFACE AREA 15300 M**2 MASS .300E+07 METRIC TONS

HOUR	POSE	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-7.076	-17.515	-.091	.035	.097	0.00	203	.08	250	18.89	202	0.000	0.	0.000	0
1	0	-7.307	-17.486	-.050	-.004	.050	2.50	183	.07	270	16.89	202	.232	0.	0.000	0
2	0	-7.493	-17.439	-.063	.009	.064	3.50	178	.11	340	19.26	202	.343	93.	0.000	0
3	0	-7.725	-17.387	-.097	.046	.107	4.00	178	.15	340	19.26	204	.365	54.	0.000	0
4	0	-8.172	-17.151	-.114	.087	.144	3.50	183	.16	360	19.45	206	.325	46.	0.000	0
5	0	-8.533	-16.795	-.110	.101	.149	2.50	158	.13	330	19.45	208	.199	29.	0.000	0
6	0	-8.970	-16.455	-.107	.093	.142	4.50	163	.14	330	18.89	210	.475	55.	0.000	0
7	0	-9.320	-16.084	-.074	.115	.137	7.50	173	.04	350	18.89	212	.217	33.	0.000	0
8	0	-9.511	-15.636	-.046	.131	.139	7.00	163	.08	350	18.71	213	.116	31.	0.000	0
9	0	-9.684	-15.201	-.047	.100	.111	6.00	153	.06	310	18.89	214	.459	122.	0.000	0
10	0	-9.853	-14.868	-.047	.096	.107	7.00	153	.04	340	18.89	214	.374	0.	0.000	0
11	0	-10.024	-14.482	-.050	.112	.129	8.50	148	.04	350	18.71	214	.359	194.	0.000	0
12	0	-10.205	-14.052	-.050	.113	.123	11.50	158	.05	260	18.52	216	.263	39.	0.000	0
13	0	-10.412	-13.620	-.075	.136	.155	12.00	153	.06	310	17.96	218	.397	47.	0.000	0
14	0	-10.707	-13.067	-.076	.170	.187	14.00	163	.05	310	17.59	222	.677	52.	0.000	0
15	0	-10.954	-12.387	-.083	.208	.224	15.00	163	.08	330	17.59	226	.631	51.	0.000	0
16	0	-11.358	-11.629	-.131	.206	.244	14.00	158	.14	320	16.67	228	.715	65.	0.000	0
17	0	-11.590	-10.836	-.153	.244	.288	15.50	168	.16	330	16.67	230	.385	66.	0.000	0
18	0	-12.303	-9.984	-.121	.215	.247	14.00	168	.11	320	16.11	234	.457	36.	0.000	0
19	0	-12.861	-9.239	-.112	.207	.236	15.00	153	.07	330	16.11	237	.086	10.	0.000	0
20	0	-13.148	-8.489	-.070	.208	.220	14.00	168	.05	345	14.08	239	1.956	93.	0.000	0
21	0	-13.248	-7.754	-.009	.198	.198	13.00	183	.04	359	13.89	241	.227	43.	0.000	0
22	0	-13.212	-7.081	.051	.174	.182	12.50	203	.03	15	15.19	242	1.711	130.	0.000	0
23	0	-12.816	-6.525	.114	.132	.174	13.00	228	.02	30	15.00	242	.488	263.	0.000	0
24	0	-12.528	-6.183	.083	.056	.101	7.00	233	.03	310	15.19	241	.786	244.	0.000	0

RMS ERROR IN COMPUTED OPTIMUM SEGMENTS .6718 KM. RMS ERROR IN POSITION .9660 KM 24.OBS

ICEBERG TOW

X RANGE -15.000 TO 0.000 KM Y RANGE -20.000 TO -5.000 KM DEVN= 37 KDEVN= 0

THE CA LIMIT 1.000. THE CL LIMIT 2.400

STATISTICS
PROGRAM LENGTH 1153B 603
CM LABELED COMMON LENGTH 5720B 3024
52000B CM USED

ICEBERG R016A X RANGE -15.000 TO 0.000 KM Y RANGE 15.000 TO 30.000 KM DEVN= 37 KDEVN= 0

THE CA LIMIT 1.000. THE CW LIMIT 2.400

INITIAL V .250 M/S 170 DEG LATITUDE 59 DEG 9 HOURS
CA= .100 CW= .100 CS= .6020 CX= .6020
SAIL AREA 9450 KEEL AREA 37900 SURFACE AREA 24053 M**2 MASS .600E+07 METRIC TONS

HOUR	POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0 0	-7.190	26.833	.043	-.246	.250	8.00	340	.20	230	27.78	345	0.000	0.	0.000	0
1 0	-7.030	25.851	.018	-.298	.299	7.00	350	.26	230	26.85	345	.157	17.	0.000	0
2 0	-7.066	24.705	-.012	-.335	.335	5.00	360	.28	230	25.37	346	.817	53.	0.000	0
3 0	-7.154	23.469	-.033	-.347	.349	5.00	350	.32	220	23.71	347	.938	54.	0.000	0
4 0	-7.305	22.223	-.054	-.343	.347	6.00	360	.27	220	22.78	345	.439	36.	0.000	0
5 0	-7.5[illegible]	21.000	-.084	-.339	.350	3.00	340	.28	240	21.48	341	.970	48.	0.000	0
6 0	-7.940	19.805	-.121	-.315	.339	3.00	325	.20	230	20.93	338	.542	44.	0.000	0
7 0	-8.4[illegible]	18.763	-.165	-.267	.314	3.00	320	.19	250	20.74	334	.779	53.	0.000	0
8 0	-8.086	17.876	-.169	-.226	.282	6.00	330	.25	230	20.56	332	.399	54.	0.000	0
9 0	-8.277	17.192	-.154	-.193	.247	5.00	330	.17	240	20.37	332	.884	477.	0.000	0

RMS ERROR IN COMPUTED OBTEL SECTORS .7108 KM RMS ERROR IN POSITION .9944 KM 9.OBS

INITIAL V .150 M/S 190 DEG LATITUDE 59 DEG 36 HOURS
CA=1.00 CB=1.00 CD= .0020 CX= .0020
SAIL AREA 9450 KEEL AREA 37800 SURFACE AREA 24053 M**2 MASS .600E+07 METRIC TONS

HOUR																			
			EAST	KE	NORTH	VEL	EAST	M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-13.660	17.365		-.027		-.149		.150		2.00	240	.06	210	21.67	323	0.000	0.	0.000	0
1	0	-13.110	16.911		-.011		-.034		.034		2.00	240	.06	195	21.11	322	.295	44.	0.000	0
2	0	-13.137	16.262		.015		-.056		.058		2.00	230	.09	180	20.37	320	.792	76.	0.000	0
3	0	-12.773	16.425		.046		-.049		.067		2.00	235	.09	190	19.63	318	.851	84.	0.000	0
4	0	-12.283	16.357		.071		-.050		.087		2.00	250	.11	170	18.89	315	1.138	91.	0.000	0
5	0	-12.490	16.114		.087		-.062		.107		2.00	230	.10	190	18.52	311	1.365	101.	0.000	0
6	0	-12.179	15.475		.079		-.071		.099		2.00	220	.05	190	18.15	308	.953	93.	0.000	0
7	0	-12.305	15.522		.037		-.089		.096		.10	210	.10	230	18.52	308	.698	188.	0.000	0
8	0	-11.[illegible]	15.215		.034		-.122		.126		.01	210	.18	210	19.08	301	2.224	94.	0.000	0
9	0	-11.832	14.700		-.027		-.162		.164		.01	210	.19	260	19.45	299	.727	95.	0.000	0
10	0	-12.025	14.115		-.068		-.152		.167		2.00	200	.13	240	20.00	298	.706	108.	0.000	0
11	0	-12.237	13.642		-.074		-.110		.133		3.00	210	.11	270	20.37	297	.411	80.	0.000	0
12	0	-12.[illegible]	13.355		-.074		-.044		.086		3.00	210	.05	320	20.37	295	.355	50.	0.000	0
13	0	-12.762	13.331		-.015		.036		.039		6.00	230	.02	40	20.37	293	.641	90.	0.000	0
14	0	-12.594	13.251		.057		.062		.115		6.00	250	.04	110	19.82	291	1.075	120.	0.000	0
15	0	-12.144	13.631		.141		.012		.141		5.00	290	.07	110	19.45	287	1.649	116.	0.000	0
16	0	-11.[illegible]	13.[illegible]		.135		-.039		.140		5.00	280	.05	160	18.71	282	1.757	96.	0.000	0
17	0	-11.221	13.490		.072		-.035		.098		5.00	300	.06	60	18.52	279	.929	94.	0.000	0
18	0	-10.550	13.427		.002		-.065		.094		4.00	295	.07	230	18.33	275	1.174	90.	0.000	0
19	0	-10.266	13.306		.076		-.106		.109		6.00	280	.11	270	18.52	271	1.044	80.	0.000	0
20	0	-10.278	12.[illegible]		.035		-.104		.110		9.00	300	.06	320	19.26	268	1.021	83.	0.000	0
21	0	-10.550	12.[illegible]		.022		-.096		.098		10.00	310	.11	330	20.74	276	3.534	112.	0.000	0
22	0	-10.702	12.227		-.115		.112		.161		10.00	310	.40	360	20.74	266	3.581	99.	0.000	0
23	0	-10.9[illegible]	12.[illegible]16		-.004		-.013		.018		11.00	310	.12	330	20.74	265	.714	197.	0.000	0
24	0	-10.[illegible]	12.[illegible]		-.005		-.028		.028		9.00	310	.16	360	21.11	264	.427	82.	0.000	0
25	0	-10.[illegible]	12.219		.023		-.058		.064		9.00	325	.05	30	21.11	263	.250	68.	0.000	0
26	0	-10.[illegible]	11.942		.040		-.084		.093		7.00	325	.03	40	21.11	261	.459	62.	0.000	0
27	0	-10.651	11.[illegible]		.040		-.055		.068		4.00	360	.09	110	21.30	259	.533	70.	0.000	0
28	0	-10.477	11.[illegible]		.045		-.050		.067		2.00	340	.08	170	21.11	255	1.278	86.	0.000	0
29	0	-10.[illegible]	11.[illegible]		.025		-.043		.049		2.00	20	.03	60	22.78	251	2.189	97.	0.000	0
30	0	-10.[illegible]	11.193		-.001		-.032		.039		.10	20	.05	250	21.30	249	1.625	97.	0.000	0
31	0	-10.[illegible]	11.034		-.045		-.047		.077		2.00	20	.10	310	22.59	245	1.834	91.	0.000	0
32	0	-10.[illegible]	10.[illegible]		-.002		-.044		.102		.10	20	.12	300	22.96	244	.368	66.	0.000	0
33	0	-11.050	10.[illegible]		-.126		-.059		.140		.10	20	.20	290	23.52	244	.132	24.	0.000	0
34	0	-11.[illegible]	10.427		-.142		-.065		.156		2.00	240	.15	290	24.08	243	.427	62.	0.000	0
35	0	-12.047	10.[illegible]		-.143		-.035		.147		3.00	210	.15	310	24.82	244	.420	49.	0.000	0
36	0	-12.[illegible]	10.249		-.0[illegible]		.024		.065		7.00	225	.09	260	25.00	244	.261	141.	0.000	0

RMS ERROR IN COMPUTED DRIFT SPEEDS 1.3249 KM RMS ERROR IN POSITION15.1314 KM 36.0HS

ICONFIG FOR B CA=1.00 CB=1.00 X RANGE -30.000 TO 5.000 KM Y RANGE -15.000 TO 20.000 KM 3 TRACKS

IDEVN= 37 KD VN= 0

INITIAL V .190 M/S 210 DEG LATITUDE 57 DEG 23 HOURS
CA=1.000 CW= .300 CS= .0020 CX= .0020
SAIL AREA 18750 KEEL AREA 50000 SURFACE AREA 62500 M**2 MASS .700E+07 METRIC TONS

HOUR	POSN EAST	KM NORTH	VEL EAST	M/S NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	18.077	35.478	-.095	-.165	.190	9.00	343	.18	130	39.82	27	0.000	0.	0.000	0
1	0	17.920	34.462	-.026	-.375	.376	11.22	348	.22	120	38.89	27	.325	35.	0.000	0
2	0	17.877	33.027	.019	-.394	.394	11.22	343	.12	130	37.97	29	.793	49.	0.000	0
3	0	18.027	31.615	.043	-.400	.402	12.24	353	.11	150	37.04	30	.286	25.	0.000	0
4	0	18.270	30.177	.103	-.393	.407	11.73	353	.05	250	36.30	31	.480	49.	0.000	0
5	0	18.638	28.702	.215	-.436	.487	13.26	343	.02	310	35.74	32	.745	89.	0.000	0
6	0	19.614	27.149	.188	-.413	.454	11.22	353	.04	290	33.71	33	1.446	68.	0.000	0
7	0	20.219	25.743	.161	-.369	.402	9.18	343	.05	350	32.04	41	3.381	69.	0.000	0
8	0	20.945	24.316	.266	-.451	.524	13.26	338	.07	10	31.48	42	.936	119.	0.000	0
9	0	21.779	22.715	.143	-.409	.435	9.18	338	.13	90	31.11	44	.651	56.	0.000	0
10	0	22.074	21.353	.035	-.354	.356	8.67	338	.16	110	30.19	45	.651	61.	0.000	0
11	0	22.211	20.048	.065	-.387	.393	11.22	338	.14	110	29.63	46	.568	75.	0.000	0
12	0	22.535	18.448	.102	-.514	.524	12.24	343	.21	80	28.89	48	.387	31.	0.000	0
13	0	22.729	16.806	-.004	-.334	.334	10.20	343	.21	160	28.34	50	.526	46.	0.000	0
14	0	22.642	15.858	-.032	-.228	.231	10.20	348	.23	170	27.97	51	.352	57.	0.000	0
15	0	22.480	15.105	-.062	-.190	.200	9.18	358	.22	180	27.59	53	.525	51.	0.000	0
16	0	22.285	14.306	-.032	-.280	.282	10.20	358	.10	160	26.85	57	1.362	67.	0.000	0
17	0	22.190	13.217	-.033	-.297	.299	10.20	358	.15	170	26.67	60	.700	49.	0.000	0
18	0	22.016	12.234	-.065	-.247	.255	9.18	358	.18	170	26.11	62	.163	15.	0.000	0
19	0	21.943	11.291	.064	-.300	.307	10.71	363	.17	290	25.93	65	.627	46.	0.000	0
20	0	22.451	9.950	.191	-.449	.488	12.75	363	.15	310	25.00	70	1.182	49.	0.000	0
21	0	23.047	8.239	.110	-.479	.492	11.22	373	.08	340	24.08	73	1.084	68.	0.000	0
22	0	23.295	6.574	.047	-.441	.444	10.20	368	.06	350	23.52	77	.364	21.	0.000	0
23	0	23.499	4.984	.079	-.454	.461	10.50	363	.11	350	23.15	80	.454	36.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS 1.0145 KM RMS ERROR IN POSITION 1.2618 KM 23.0BS

ICEBERG S012 X RANGE 10.000 TO 50.000 KM Y RANGE 0.000 TO 40.000 KM DEVN= 217 KDEVN= 337

INITIAL V .300 M/S 190 DEG LATITUDE 59 DEG 18 HOURS
CA= .600 CW= .600 CS= .0020 CX= .0020
SAIL AREA 600 KEEL AREA 2400 SURFACE AREA 4900 M**2 MASS .500E+05 METRIC TONS

HOUR	POSN EAST	KM NORTH	VEL EAST	M/S NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-2.580	13.271	-.052	-.295	.300	0.00	240	.13	140	13.52	349	0.000	0.	0.000	0
1	0	-2.320	12.951	.075	-.077	.107	0.00	235	.10	189	11.67	345	1.821	89.	0.000	0
2	0	-2.114	12.598	.041	-.123	.130	0.00	250	.15	210	9.82	341	1.681	84.	0.000	0
3	0	-1.991	12.092	.031	-.153	.156	0.00	260	.17	210	8.70	329	1.927	86.	0.000	0
4	0	-1.941	11.469	-.014	-.198	.198	0.00	230	.22	230	8.89	318	1.533	90.	0.000	0
5	0	-2.083	10.712	-.062	-.216	.225	0.00	230	.23	240	9.45	310	1.167	84.	0.000	0
6	0	-2.397	9.917	-.114	-.227	.254	0.00	210	.27	250	11.11	305	1.901	101.	0.000	0
7	0	-2.828	9.110	-.113	-.214	.242	0.00	210	.22	240	12.04	302	1.057	96.	0.000	0
8	0	-3.205	8.446	-.102	-.144	.176	0.00	220	.14	260	13.33	301	1.429	109.	0.000	0
9	0	-3.536	8.109	-.075	-.043	.086	0.00	220	.05	300	13.33	299	.118	25.	0.000	0
10	0	-3.632	8.146	.033	.062	.070	0.00	220	.12	80	14.08	298	.677	87.	0.000	0
11	0	-3.407	8.486	.078	.123	.146	0.00	240	.18	70	14.08	295	1.143	155.	0.000	0
12	0	-3.025	8.918	.146	.092	.172	0.00	215	.18	110	13.52	291	1.555	140.	0.000	0
13	0	-2.461	9.170	.154	.055	.164	0.00	220	.14	110	13.70	287	1.513	156.	0.000	0
14	0	-1.947	9.303	.131	.016	.132	0.00	280	.11	130	14.08	283	1.486	143.	0.000	0
15	0	-1.560	9.234	.078	-.059	.098	0.00	280	.10	190	14.45	279	1.259	119.	0.000	0
16	0	-1.376	8.921	.025	-.108	.111	0.00	280	.12	220	15.37	277	1.176	111.	0.000	0
17	0	-1.415	8.473	-.052	-.139	.148	0.00	280	.17	250	17.04	276	1.687	100.	0.000	0
18	0	-1.853	8.010	-.200	-.104	.225	0.00	280	.26	290	18.52	277	1.371	91.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS 1.4284 KM RMS ERROR IN POSITION10.6260 KM 18.0BS

ICEBERG K024 CA=0.6 CW=0.6 X RANGE -20.000 TO 0.000 KM Y RANGE 0.000 TO 20.000 KM 3 TRACKS
IDEVN= 37 KDEVN= 0

PROGRAM ICEDRIF, P MCCARTHY LAST MOD 3 18 1982

ICEBERG K026 CA=0.6 CW=0.6 X RANGE -15.000 TO 5.000 KM Y RANGE -5.000 TO 15.000 KM 3 TRACKS

IDEVN= 0 KDEVN= 180 * WINDS REVERSED 180°

INITIAL V .180 M/S 250 DEG LATITUDE 59 DEG 18 HOURS
CA= .600 CW= .600 CS= .0020 CX= .0020
SAIL AREA 600 KEEL AREA 2400 SURFACE AREA 2206 M**2 MASS .170E+06 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	3.075	8.931	-.169	-.062	.180	11.32	250	.08	200	9.45	19	0.000	0.	0.000	0
1	0	2.257	8.610	-.254	-.084	.268	8.23	250	.13	250	9.07	16	.269	44.	0.000	0
2	0	1.445	8.388	-.184	-.043	.189	4.12	340	.15	230	8.33	11	.336	32.	0.000	0
3	0	.899	8.242	-.128	-.049	.138	2.57	15	.18	230	8.26	6	.255	35.	0.000	0
4	0	.465	7.988	-.119	-.094	.152	1.03	80	.21	230	7.87	1	.306	38.	0.000	0
5	0	.017	7.584	-.130	-.126	.181	.51	65	.22	230	7.78	358	.310	74.	0.000	0
6	0	-.484	7.111	-.151	-.131	.200	1.03	20	.21	240	7.50	355	.208	43.	0.000	0
7	0	-1.046	6.666	-.156	-.113	.193	1.03	360	.16	230	6.69	350	.446	44.	0.000	0
8	0	-1.603	6.297	-.158	-.093	.183	0.00	0	.17	250	6.19	346	.308	46.	0.000	0
9	0	-2.184	6.012	-.160	-.066	.173	2.57	180	.13	260	5.59	342	.529	73.	0.000	0
9	30	-2.470	5.894	-.158	-.068	.172	2.57	180	.15	250	5.24	336	.430	64.	22.000	190
10	0	-2.918	4.965	-.273	-.616	.673	2.57	180	.18	240	4.87	330	.387	60.	22.000	190
11	0	-3.919	2.780	-.282	-.593	.657	2.57	100	.18	250	4.67	314	1.212	90.	0.000	0
12	0	-4.622	2.072	-.159	-.103	.190	3.09	20	.14	230	4.30	298	.582	45.	22.000	190
13	0	-5.405	.088	-.214	-.567	.606	3.60	60	.10	250	4.74	275	.408	22.	22.000	190
14	0	-6.223	-1.896	-.244	-.536	.589	4.63	100	.14	270	5.72	264	.984	70.	22.000	190
15	0	-7.168	-3.723	-.280	-.478	.554	4.12	135	.18	290	6.93	259	1.115	84.	0.000	0
16	0	-7.892	-4.058	-.177	-.018	.178	2.06	180	.13	280	7.87	257	.185	19.	0.000	0
17	0	-8.482	-4.067	-.151	.010	.151	2.57	245	.09	280	8.52	254	.573	74.	0.000	0
18	0	-8.953	-4.006	-.106	.022	.108	2.06	245	.04	280	9.63	251	.959	79.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6008 KM RMS ERROR IN POSITION 1.0816 KM 19.OBS

INITIAL V .180 M/S 250 DEG LATITUDE 59 DEG 18 HOURS
CA= .600 CW= .600 CS= .0020 CX= .0020
SAIL AREA 600 KEEL AREA 2400 SURFACE AREA 2206 M**2 MASS .170E+06 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	3.075	8.931	-.169	-.062	.180	11.32	250	.08	200	9.45	19	0.000	0.	0.000	0
1	0	2.257	8.610	-.254	-.084	.268	8.23	250	.13	250	9.07	16	.269	44.	0.000	0
2	0	1.445	8.388	-.184	-.043	.189	4.12	340	.15	230	8.33	11	.336	32.	0.000	0
3	0	.899	8.242	-.128	-.049	.138	2.57	15	.18	230	8.26	6	.255	35.	0.000	0
4	0	.465	7.988	-.119	-.094	.152	1.03	80	.21	230	7.87	1	.306	38.	0.000	0
5	0	.017	7.584	-.130	-.126	.181	.51	65	.22	230	7.78	358	.310	74.	0.000	0
6	0	-.484	7.111	-.151	-.131	.200	1.03	20	.21	240	7.50	355	.208	43.	0.000	0
7	0	-1.046	6.666	-.156	-.113	.193	1.03	360	.16	230	6.69	350	.446	44.	0.000	0
8	0	-1.603	6.297	-.158	-.093	.183	0.00	0	.17	250	6.19	346	.308	46.	0.000	0
9	0	-2.184	6.012	-.160	-.066	.173	2.57	180	.13	260	5.59	342	.529	73.	0.000	0
9	30	-2.470	5.894	-.158	-.068	.172	2.57	180	.15	250	5.24	336	.430	64.	0.000	190
10	0	-2.755	5.761	-.157	-.081	.177	2.57	180	.18	240	4.87	330	.437	68.	0.000	190
11	0	-3.310	5.439	-.150	-.092	.176	2.57	100	.18	250	4.67	314	.750	56.	0.000	0
12	0	-3.818	5.137	-.128	-.068	.145	3.09	20	.14	230	4.30	298	.925	71.	0.000	190
13	0	-4.202	4.966	-.082	-.030	.087	3.60	60	.10	250	4.74	275	1.533	83.	0.000	190
14	0	-4.432	4.864	-.059	-.032	.067	4.63	100	.14	270	5.72	264	1.172	84.	0.000	190
15	0	-4.722	4.762	-.109	-.017	.111	4.12	135	.18	290	6.93	259	1.027	78.	0.000	0
16	0	-5.175	4.717	-.136	-.012	.136	2.06	180	.13	280	7.87	257	.580	59.	0.000	0
17	0	-5.677	4.692	-.140	.001	.140	2.57	245	.09	280	8.52	254	.553	71.	0.000	0
18	0	-6.133	4.730	-.105	.018	.107	2.06	245	.04	280	9.63	251	.945	78.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6946 KM RMS ERROR IN POSITION 3.8957 KM 19.OBS

ICEBERG K026 CA=0.6 CW=0.6 X RANGE -15.000 TO 5.000 KM Y RANGE -5.000 TO 15.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 180

PROGRAM ICEDRIF, S D SMITH LAST MOD 9 07 1981

ICEBERG NO.39 CA=0.5 CW=0.6 X RANGE -15.000 TO 0.000 KM Y RANGE -10.000 TO 5.000 KM 3 TRACKS

IDEVN= 37 KDEVN= 15

INITIAL V .750 M/S 149 DEG LATITUDE 56 DEG 11 HOURS
CA= .500 CW= .600 CS= .0020 CX= .0020
SAIL AREA 5000 KEEL AREA 20000 SURFACE AREA 9000 M**2 MASS .200E+07 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST	M/S NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-10.997	4.896	.386	-.643	.750	16.46	280	.19	250	12.04	294	0.000	0.	0.000	0
1	0	-10.447	3.678	.148	-.257	.296	16.46	275	.12	250	10.74	289	.343	21.	0.000	0
2	0	-9.718	2.832	.265	-.221	.345	16.46	275	.10	180	9.63	284	.332	23.	0.000	0
3	0	-8.670	2.003	.300	-.252	.392	17.49	280	.13	190	8.52	280	.095	7.	0.000	0
4	0	-7.576	.932	.307	-.351	.466	23.15	290	.13	210	7.78	276	.598	64.	0.000	0
5	0	-6.563	-.377	.253	-.363	.442	18.52	290	.17	210	6.67	265	.118	7.	0.000	0
6	0	-5.738	-1.681	.207	-.363	.417	18.00	280	.22	230	6.20	254	.228	17.	0.000	0
7	0	-5.048	-2.956	.181	-.342	.386	20.58	285	.17	250	5.74	243	.410	33.	0.000	0
8	0	-4.553	-4.096	.085	-.291	.303	17.49	280	.22	270	5.93	231	.023	2.	0.000	0
9	0	-4.157	-5.113	.160	-.277	.320	18.52	280	.13	250	6.67	220	.369	26.	0.000	0
10	0	-3.535	-6.047	.171	-.241	.295	19.03	280	.11	270	6.89	207	.544	35.	0.000	0
11	0	-2.801	-7.068	.242	-.350	.426	19.55	285	.20	220	8.00	198	.456	28.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .3654 KM RMS ERROR IN POSITION .4108 KM 11.OBS

ICEBERG CA009 CA=0.6 CW=0.6 X RANGE 0.000 TO 10.000 KM Y RANGE -5.000 TO 5.000 KM 3 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .480 M/S 90 DEG LATITUDE 60 DEG 11 HOURS
CA= .600 CW= .600 CS= .0020 CX= .0020
SAIL AREA 45 KEEL AREA 180 SURFACE AREA 79 M**2 MASS .200E+04 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST	M/S NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	1.429	1.702	.480	.000	.480	10.29	135	.56	110	2.22	40	0.000	0.	0.000	0
1	0	2.813	1.350	.368	-.150	.397	9.77	135	.57	120	3.52	61	.443	27.	0.000	0
2	0	3.804	.914	.178	-.090	.200	9.26	164	.33	140	4.54	74	.294	22.	0.000	0
3	0	4.158	.629	.021	-.070	.073	8.74	168	.23	170	5.00	77	.222	42.	0.000	0
4	0	3.990	.369	-.113	-.076	.136	5.14	185	.22	220	4.57	79	.213	47.	0.000	0
5	0	3.492	.410	-.157	.108	.190	5.14	190	.19	280	4.13	80	.210	47.	0.000	0
6	0	2.805	.557	-.227	-.064	.236	7.72	335	.30	280	3.70	82	.453	101.	0.000	0
7	0	1.940	.482	-.244	.036	.247	6.17	310	.35	290	2.94	75	.324	38.	0.000	0
8	0	1.467	.589	-.008	.019	.021	11.83	315	.23	320	2.37	62	.370	45.	0.000	0
9	0	1.658	.598	.110	-.015	.111	10.29	320	.13	0	2.57	58	.262	98.	0.000	0
10	0	2.796	.744	.537	.106	.548	11.32	300	.45	60	3.96	70	.432	28.	0.000	0
11	0	5.066	.968	.711	.007	.711	15.43	310	.55	70	5.74	80	.675	34.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .3789 KM RMS ERROR IN POSITION .8011 KM 11.OBS

PROGRAM ICEDRIF, P MCCARTHY LAST MOD 3 18 1982

ICEBERG CA035 CA=0.9 CW=0.4 X RANGE -10.000 TO 15.000 KM Y RANGE -5.000 TO 20.000 KM 3 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V 1.140 M/S 118 DEG LATITUDE 60 DEG 8 HOURS
CA= .900 CW= .400 CS= .0020 CX= .0020
SAIL AREA 154 KEEL AREA 616 SURFACE AREA 380 M**2 MASS .300E+04 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-6.824	12.310	1.007	-.535	1.140	15.43	300	.63	120	14.08	331	0.000	0.	0.000	0
1	0	-3.691	10.333	.856	-.587	1.038	14.92	295	.67	130	11.02	342	.322	8.	0.000	0
2	0	-.832	8.183	.732	-.607	.951	15.43	295	.58	140	8.43	357	.135	4.	0.000	0
3	0	1.505	5.931	.566	-.644	.858	15.95	300	.49	155	6.95	15	.554	20.	4.000	753
4	0	4.306	4.384	.683	-.407	.795	16.45	298	.40	180	7.13	38	.503	18.	9.000	75
4	30	5.917	3.930	.877	-.207	.901	17.49	295	.31	190	7.59	53	.598	30.	9.000	90
5	0	7.470	3.248	.837	-.364	.913	16.98	293	.30	200	9.07	63	.523	25.	9.000	90
6	0	10.266	2.239	.717	-.197	.743	15.43	285	.26	235	11.02	79	1.010	30.	0.000	0
7	0	10.912	1.653	.169	-.072	.184	14.40	280	.21	270	11.67	90	1.531	68.	0.000	0
7	30	11.253	1.553	.210	-.041	.214	14.40	280	.17	280	11.85	94	.750	89.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .7630 KM RMS ERROR IN POSITION 1.2346 KM 9.OBS

INITIAL V 1.140 M/S 118 DEG LATITUDE 60 DEG 7 HOURS
CA= .900 CW= .400 CS= .0020 CX= .0020
SAIL AREA 154 KEEL AREA 616 SURFACE AREA 380 M**2 MASS .300E+04 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-6.824	12.310	1.007	-.535	1.140	15.43	300	.63	120	14.08	331	0.000	0.	0.000	0
1	0	-3.691	10.333	.856	-.587	1.038	14.92	295	.67	130	11.02	342	.322	8.	0.000	0
2	0	-.832	8.183	.732	-.607	.951	15.43	295	.58	140	8.43	357	.135	4.	0.000	0
3	0	1.505	5.931	.566	-.644	.858	15.95	300	.49	155	6.95	15	.554	20.	0.000	0
4	0	3.214	3.697	.383	-.596	.709	16.45	298	.40	180	7.13	38	1.446	51.	0.000	0
4	30	3.885	2.711	.364	-.498	.617	17.49	295	.31	190	7.59	53	1.005	51.	0.000	0
5	0	4.495	1.857	.312	-.453	.550	16.98	293	.30	200	9.07	63	1.469	71.	0.000	0
6	0	5.390	.579	.186	-.256	.317	15.43	285	.26	235	11.02	79	1.979	58.	0.000	0
7	0	6.027	-.011	.169	-.072	.184	14.40	280	.21	270	11.67	90	1.528	67.	0.000	0
7	30	6.368	-.111	.210	-.041	.214	14.40	280	.17	280	11.85	94	.750	89.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS 1.1785 KM RMS ERROR IN POSITION 3.7440 KM 9.OBS

ICEBERG CA035 CA=0.9 CW=0.4 X RANGE -10.000 TO 15.000 KM Y RANGE -5.000 TO 20.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

PROGRAM ICEDRIF, P MCCARTHY LAST MOD 3 18 1982

ICEBERG CA036 CA=0.5 CW=0.2 X RANGE -15.000 TO 5.000 KM Y RANGE -15.000 TO 5.000 KM 3 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .740 M/S 154 DEG LATITUDE 60 DEG 8 HOURS
CA= .500 CW= .200 CS= .0020 CX= .0020
SAIL AREA 237 KEEL AREA 947 SURFACE AREA 556 M**2 MASS .200E+05 METRIC TONS

HOUR	POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0 -10.964	3.991	.324	-.665	.740	16.46	298	.40	180	11.67	290	0.000	0.	0.000	0
1	0 -9.694	1.931	.325	-.496	.593	16.98	293	.30	200	10.00	280	.248	10.	0.000	0
2	0 -8.737	.487	.204	-.303	.365	15.43	285	.26	235	9.26	270	.471	26.	0.000	0
3	0 -8.053	-.270	.182	-.119	.217	14.40	280	.21	270	8.43	265	.183	16.	0.000	0
4	0 -7.289	-.566	.245	-.059	.252	16.20	280	.20	285	7.50	258	.606	45.	4.000	150
5	0 -5.875	-1.931	.455	-.320	.557	14.40	275	.22	355	6.48	249	.615	41.	9.000	150
6	0 -3.467	-4.256	.779	-.718	1.059	11.32	260	.26	70	5.46	221	.529	17.	15.000	150
7	0 .059	-7.988	1.060	-1.119	1.541	11.06	250	.41	100	6.85	180	1.004	22.	15.000	150
8	0 3.913	-12.400	1.075	-1.335	1.714	11.32	258	.50	125	10.98	157	1.236	23.	15.000	150

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6960 KM RMS ERROR IN POSITION 1.0485 KM 8.OBS

INITIAL V .740 M/S 154 DEG LATITUDE 60 DEG 8 HOURS
CA= .500 CW= .200 CS= .0020 CX= .0020
SAIL AREA 237 KEEL AREA 947 SURFACE AREA 556 M**2 MASS .200E+05 METRIC TONS

HOUR	POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0 -10.964	3.991	.324	-.665	.740	16.46	298	.40	180	11.67	290	0.000	0.	0.000	0
1	0 -9.694	1.931	.325	-.496	.593	16.98	293	.30	200	10.00	280	.248	10.	0.000	0
2	0 -8.737	.487	.204	-.303	.365	15.43	285	.26	235	9.26	270	.471	26.	0.000	0
3	0 -8.053	-.270	.182	-.119	.217	14.40	280	.21	270	8.43	265	.183	16.	0.000	0
4	0 -7.289	-.566	.245	-.059	.252	16.20	280	.20	285	7.50	258	.606	45.	0.000	0
5	0 -6.202	-.474	.364	.124	.384	14.40	275	.22	355	6.48	249	.877	59.	0.000	0
6	0 -4.584	.012	.534	.124	.549	11.32	260	.26	70	5.46	221	2.439	80.	0.000	0
7	0 -2.406	.313	.673	.035	.674	11.06	250	.41	100	6.85	180	3.341	74.	0.000	0
8	0 .089	.054	.705	-.194	.731	11.32	258	.50	125	10.98	157	3.494	65.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS 1.9614 KM RMS ERROR IN POSITION 5.0189 KM 8.OBS

ICEBERG CA036 CA=0.5 CW=0.2 X RANGE -15.000 TO 5.000 KM Y RANGE -15.000 TO 5.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

PROGRAM ICEDRIF, P MCCARTHY LAST MOD 3 18 1982

CA062 CURRENTS ROTATED CA=.9 CW=2.4 X RANGE -10.000 TO 5.000 KM Y RANGE -10.000 TO 5.000 KM 3 TRACKS

IDEVN= 345 KDEVN= 0

INITIAL V .470 M/S 87 DEG LATITUDE 60 DEG 9 HOURS
CA= .900 CW=2.400 CS= .0020 CX= .0020
SAIL AREA 54 KEEL AREA 216 SURFACE AREA 254 M**2 MASS .200E+04 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST	M/S NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-6.539	.687	.469	.025	.470	3.09	290	.17	80	6.57	276	0.000	0.	0.000	0
1	0	-5.254	.397	.518	-.142	.537	3.09	290	.53	90	5.00	279	.498	31.	0.000	0
2	0	-3.118	-.202	.655	-.186	.680	2.57	300	.67	90	2.69	277	.199	9.	0.000	0
3	0	-.783	-.947	.632	-.231	.673	3.60	295	.64	95	.80	196	.365	14.	0.000	0
4	0	1.448	-1.871	.608	-.282	.670	5.14	295	.62	100	2.94	136	.431	16.	0.000	0
5	0	3.456	-2.988	.506	-.340	.610	4.12	295	.57	110	4.93	137	.785	40.	0.000	0
6	0	4.562	-4.060	.103	-.252	.272	2.57	290	.25	150	6.48	142	.643	39.	0.000	0
7	0	4.403	-4.536	-.186	-.005	.186	2.57	300	.22	260	6.20	146	.571	109.	0.000	0
8	0	3.479	-4.498	-.326	.017	.326	2.57	300	.36	260	5.93	150	.419	83.	0.000	0
9	0	2.725	-4.025	-.073	.260	.270	3.09	315	.31	330	5.17	153	.147	18.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .4897 KM RMS ERROR IN POSITION .7959 KM 9.0BS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG BJARNI 8E5 CA=1.0 CW=0.2 X RANGE -13.000 TO -3.000 KM Y RANGE -3.000 TO 7.000 KM 0 TRACKS

IDEVN= 35 KDEVN= 0

INITIAL V .470 M/S 170 DEG LATITUDE 55 DEG 13 HOURS
CA=1.000 CW= .200 CS= .0020 CX= .0020
SAIL AREA 2625 KEEL AREA 17000 SURFACE AREA 30625 M**2 MASS .900E+06 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST	M/S NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-4.841	5.917	.069	-.453	.460	4.12	210	.32	170	7.59	320	0.000	0.	0.000	0
1	0	-4.638	5.155	.123	-.049	.132	6.70	220	.12	170	6.09	315	.908	56.	10.000	180
2	0	-3.988	4.732	.109	-.157	.253	7.21	215	.08	170	5.11	306	1.002	76.	30.000	204
3	0	-3.912	3.342	-.069	-.530	.537	7.21	220	.28	210	4.56	290	.229	16.	30.000	215
4	0	-4.576	1.394	-.248	-.540	.594	9.27	215	.36	230	5.00	272	.567	36.	30.000	215
5	0	-5.619	-.382	-.327	-.424	.537	9.79	200	.28	240	5.85	259	.567	38.	30.000	215
6	0	-6.904	-1.545	-.311	-.211	.435	11.33	200	.20	280	7.22	254	.302	20.	30.000	230
7	0	-8.357	-1.826	-.367	-.012	.368	11.33	210	.13	270	8.24	252	.621	59.	30.000	230
8	0	-7.633	-1.879	-.362	-.033	.364	11.33	190	.20	240	10.19	256	.780	38.	0.000	0
9	0	-7.845	-1.636	.162	.024	.164	12.36	240	.25	240	10.74	256	.500	90.	0.000	0
10	0	-9.628	-1.512	.244	-.090	.260	12.36	247	.24	247	10.56	257	.788	300.	0.000	0
11	0	-8.133	-2.187	.251	-.115	.276	12.88	254	.23	254	10.19	258	.850	206.	0.000	0
12	0	-7.229	-2.639	.254	-.137	.289	13.39	260	.23	260	9.82	257	.626	153.	0.000	0
13	0	-6.334	-3.166	.242	-.154	.286	12.36	255	.25	250	8.52	254	.616	45.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6779 KM RMS ERROR IN POSITION 1.4411 KM 13.0BS

ICEBERG BJARNI B55 CA=1.0 CW=0.2 X RANGE -15.000 TO 5.000 KM Y RANGE -5.000 TO 15.000 KM 0 TRACKS

IDEVN= 35 KDEVN= 0

INITIAL V .460 M/S 170 DEG LATITUDE 55 DEG 13 HOURS
CA=1.000 CW= .200 CS= .0020 CX= .0020
SAIL AREA 2625 KEEL AREA 17000 SURFACE AREA 30625 M**2 MASS .900E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT TOWFORCE	DIR
0	0	-4.881	5.817	.080	-.453	.460	4.12	210	.02	170	7.59	320	0.000	0.	0.000	0
1	0	-4.638	5.155	.123	-.049	.132	6.70	220	.12	170	6.09	315	.908	56.	0.000	180
2	0	-3.955	5.233	.222	.063	.230	7.21	215	.08	170	5.11	306	1.473	112.	0.000	204
3	0	-3.186	5.302	.201	-.065	.211	7.21	220	.28	210	4.56	290	1.770	122.	0.000	215
4	0	-2.553	4.868	.142	-.148	.205	9.27	215	.36	230	5.00	272	1.650	106.	0.000	215
5	0	-2.162	4.472	.076	-.047	.089	9.79	200	.28	240	5.85	259	1.449	97.	0.000	215
6	0	-1.987	4.650	.024	.155	.157	11.33	200	.20	280	7.22	254	1.730	117.	0.000	230
7	0	-1.838	5.369	.083	.211	.227	11.33	210	.13	270	8.24	252	1.648	156.	0.000	230
8	0	-1.539	6.030	.058	.155	.166	11.33	190	.20	240	10.19	256	2.414	118.	0.000	0
9	0	-1.179	6.350	.189	.004	.189	12.36	240	.25	240	10.74	256	1.008	181.	0.000	0
10	0	-.339	6.144	.245	-.092	.261	12.36	247	.24	247	10.56	257	.824	314.	0.000	0
11	0	.551	5.767	.251	-.115	.276	12.88	254	.23	254	10.19	258	.852	207.	0.000	0
12	0	1.461	5.314	.254	-.137	.289	13.39	260	.23	260	9.82	257	.626	153.	0.000	0
13	0	2.357	4.788	.242	-.154	.286	12.36	255	.25	250	8.52	254	.616	45.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS 1.4053 KM RMS ERROR IN POSITION 9.8145 KM 13.08S

PROGRAM ICEDRIF, B GARRETT LAST MOD 12 10 1982

ICEBERG BV34 CA= . CW= . X RANGE -30.000 TO 30.000 KM Y RANGE -20.000 TO 40.000 KM DEVN= 27 KDEVN= 180

THE CA LIMIT 2.000, THE CW LIMIT 2.400

INITIAL V .120 M/S 208 DEG LATITUDE 56 DEG 48 HOURS
CA= .200 CW= .100 CF= .0020 CX= .0020
SATI AR A 1000 REF AREA 21000 SURFACE AREA 30000 M**2 MASS .500E+07 METRIC TONS

HOUR		EAST KM	NORTH KM	VEL EAST M/S	NORTH M/S	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-22.194	-1.163	-.106	.056	.120	9.30	150	.30	90	22.22	267	0.000	0.	0.000	0
1	0	-21.967	-.911	.164	.055	.173	9.30	150	.31	100	22.41	269	.680	85.	0.000	0
2	0	-21.210	-.865	.243	-.037	.245	10.80	160	.31	100	22.41	270	.836	214.	0.000	0
3	0	-20.321	-1.106	.239	-.080	.252	9.30	180	.32	100	22.41	271	1.088	278.	0.000	0
4	0	-19.543	-1.376	.183	-.065	.199	9.80	210	.32	100	22.41	271	.824	0.	0.000	0
5	0	-18.979	-1.477	.125	.024	.127	9.80	270	.32	100	22.41	271	.573	0.	0.000	0
6	0	-18.581	-1.276	.105	.075	.129	7.70	210	.26	90	22.22	272	.260	60.	0.000	0
7	0	-18.161	-1.019	.126	.055	.136	9.30	210	.33	100	22.22	272	.465	0.	0.000	0
8	0	-17.690	-.853	.139	.042	.145	8.20	200	.30	90	22.22	273	.522	135.	0.000	0
9	0	-17.174	-.674	.139	.063	.153	6.20	210	.30	90	22.22	273	.528	0.	0.000	0
10	0	-16.712	-.440	.121	.053	.132	9.80	210	.29	90	22.04	273	.384	207.	0.000	0
11	0	-16.316	-.312	.106	.021	.108	9.30	210	.28	100	20.74	275	1.085	73.	0.000	0
12	0	-15.957	-.247	.089	.023	.092	9.30	220	.28	90	21.48	276	1.126	136.	0.000	0
13	0	-15.690	-.096	.059	.067	.089	9.30	230	.29	80	21.30	277	.201	48.	0.000	0
14	0	-15.489	.254	.062	.127	.141	9.30	230	.34	80	20.93	277	.429	116.	0.000	0
15	0	-15.230	.763	.080	.147	.167	9.30	240	.31	90	20.37	278	.405	61.	0.000	0
16	0	-14.911	1.265	.097	.126	.159	9.30	220	.31	90	19.45	279	.713	72.	0.000	0
17	0	-14.596	1.644	.065	.084	.106	11.30	230	.28	90	19.08	280	.151	30.	0.000	0
18	0	-14.357	1.909	.067	.069	.096	8.20	225	.26	100	18.71	281	.216	44.	0.000	0
19	0	-14.103	2.157	.087	.071	.112	8.20	235	.27	100	18.33	280	.633	129.	0.000	0
20	0	-13.789	2.415	.084	.071	.110	8.20	235	.25	100	18.15	281	.076	21.	0.000	0
21	0	-13.479	2.702	.094	.096	.134	6.70	235	.29	90	17.78	281	.361	98.	0.000	0
22	0	-13.079	3.089	.116	.109	.159	6.70	205	.27	90	17.41	282	.166	35.	0.000	0
23	0	-12.644	3.453	.133	.093	.166	7.20	195	.30	90	17.22	283	.235	66.	0.000	0
24	0	-12.122	3.751	.149	.075	.167	7.20	195	.29	90	16.67	284	.171	27.	0.000	0
25	0	-11.606	4.010	.138	.070	.154	8.80	200	.33	80	16.11	286	.226	28.	0.000	0
26	0	-11.137	4.284	.120	.084	.146	9.80	210	.35	80	15.74	288	.158	24.	0.000	0
27	0	-10.772	4.619	.084	.104	.134	10.30	230	.33	80	15.19	289	.349	56.	0.000	0
28	0	-10.540	4.922	.041	.092	.100	12.40	220	.31	80	14.63	291	.484	64.	0.000	0
29	0	-10.363	5.266	.062	.079	.100	11.30	220	.34	90	13.33	293	1.270	92.	0.000	0
30	0	-10.097	5.579	.091	.082	.123	11.30	225	.36	90	12.96	296	.385	49.	0.000	0
31	0	-9.737	5.830	.107	.065	.127	11.30	225	.35	100	12.04	296	.831	90.	0.000	0
32	0	-9.014	6.133	.346	.108	.362	11.30	200	.72	100	11.48	297	.371	63.	0.000	0
33	0	-7.704	6.373	.310	-.012	.310	12.40	200	.31	90	10.93	300	.542	67.	0.000	0
34	0	-7.002	6.154	.153	-.046	.159	11.30	205	.31	80	10.19	302	.115	14.	0.000	0
35	0	-6.295	6.373	.244	.110	.267	12.40	215	.64	90	9.63	305	.147	19.	0.000	0
36	0	-5.215	6.903	.321	.227	.394	12.40	220	.70	80	8.89	312	.284	21.	0.000	0
37	0	-4.183	7.652	.314	.158	.299	10.30	220	.36	100	8.33	316	.748	91.	0.000	0
38	0	-3.496	7.956	.132	.038	.138	13.40	230	.33	100	7.78	319	.464	66.	0.000	0
39	0	-3.130	8.042	.063	-.001	.063	11.60	230	.29	105	7.41	325	.559	64.	0.000	0
40	0	-2.987	8.015	.031	-.014	.034	11.80	230	.25	105	6.67	330	.790	82.	0.000	0
41	0	-2.992	7.929	.009	-.039	.040	11.30	220	.21	110	6.30	337	.815	93.	0.000	0
42	0	-3.158	7.730	.014	-.067	.071	11.30	200	.20	100	5.93	348	1.211	99.	0.000	0
43	0	-3.427	7.473	-.007	-.062	.062	10.30	210	.17	80	5.56	356	.814	92.	0.000	0
44	0	-3.659	7.314	-.003	-.027	.029	9.30	200	.19	90	5.19	3	.730	97.	0.000	0
45	0	-3.817	7.261	.033	.003	.032	6.20	210	.19	100	5.19	11	.667	92.	0.000	0
46	0	-3.773	7.260	.040	-.022	.046	9.30	200	.16	110	5.37	18	.527	79.	0.000	0
47	0	-3.591	7.274	-.002	-.073	.073	7.30	210	.11	100	5.74	25	.741	96.	0.000	0
48	0	-3.279	7.245	-.033	-.037	.052	12.40	220	.23	80	6.48	30	1.106	121.	0.000	0

AT POSITION 3.8437 KM 48 DAYS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG BV47 CA=0.1 CW=0.4 X RANGE -6.000 TO 6.000 KM Y RANGE -6.000 TO 6.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .180 M/S 60 DEG LATITUDE 56 DEG 13 HOURS
CA= .100 CW= .400 CS= .0020 CX= .0020
SAIL AREA 710 KEEL AREA 3120 SURFACE AREA 2500 M**2 MASS .134E+06 METRIC TONS

HOUR	POS?	EAST KM	NORTH VEL	EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-5.095	-4.126	.156	.090	.180	10.30	250	.10	90	6.56	231	0.000	0.	0.000	0
1	0	-4.405	-3.860	.219	.082	.234	8.80	240	.19	60	5.91	230	.136	21.	0.000	0
2	0	-3.537	-3.534	.260	.084	.273	11.80	240	.17	80	5.00	226	.061	6.	0.000	0
3	0	-2.619	-3.286	.240	.057	.247	8.20	230	.16	80	4.39	221	.218	30.	0.000	0
4	0	-1.732	-3.067	.265	.070	.274	8.80	230	.22	80	3.54	216	.248	27.	0.000	0
5	0	-.799	-2.769	.233	.103	.255	6.20	220	.21	50	2.59	201	.259	21.	0.000	0
5	0	-.057	-2.279	.187	.174	.255	9.30	220	.22	30	2.19	179	.340	34.	0.000	0
7	0	.663	-1.721	.229	.083	.242	5.10	200	.24	100	2.11	150	.359	33.	0.000	0
8	0	1.526	-1.592	.237	.018	.238	6.70	180	.20	100	2.48	131	.086	10.	0.000	0
9	0	2.347	-1.480	.210	.056	.225	9.30	170	.20	90	2.80	120	.293	49.	0.000	0
10	0	3.073	-1.233	.165	.069	.179	9.30	180	.10	90	3.22	111	.121	19.	0.000	0
11	0	3.538	-.967	.109	.083	.137	9.30	180	.06	70	3.67	105	.077	14.	0.000	0
12	0	3.916	-.647	.114	.089	.145	10.30	200	.08	90	4.19	99	.216	33.	0.000	0
13	0	4.323	-.220	.119	.169	.207	15.40	190	.09	40	4.80	92	.231	28.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .2247 KM RMS ERROR IN POSITION .2722 KM 13.0BS

PROGRAM ICEBERG, B CARRETT LAST MOD 12 10 1982

ICEBERG CIOS CA=0.1 CW=1.3 W+CUR RUN X RANGE 10.000 TO 35.000 KM Y RANGE -25.000 TO 0.000 KM DEVN= 54 KDEVN= -17

THE CA LIMIT 2.000. THE CW LIMIT 2.400

INITIAL V .366 M/S 293 DEG LATITUDE 60 DEG 17 HOURS
CA= .100 CW=1.300 CS= .0020 CX= .0020
SAIL AREA 23000 KEEL AREA 92000 SURFACE AREA 99000 M**2 MASS .200E+08 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	30.250	-16.790	-.315	.175	.360	12.36	140	.26	330	34.63	119	0.000	0.	0.000	0
1	0	29.269	-16.379	-.271	.075	.281	12.88	140	.26	320	33.52	119	.137	12.	0.000	0
2	0	28.291	-16.147	-.275	.065	.284	12.36	140	.26	330	32.04	120	.594	37.	0.000	0
3	0	27.315	-15.924	-.273	.049	.277	10.30	115	.26	320	30.00	120	1.107	54.	0.000	0
4	0	26.291	-15.753	-.270	.052	.295	9.79	120	.28	340	29.26	120	.414	56.	0.000	0
5	0	25.334	-15.519	-.234	.079	.295	6.70	120	.23	340	28.34	120	.339	37.	0.000	0
6	0	24.369	-15.178	-.237	.114	.265	6.70	140	.20	360	28.15	119	1.042	198.	0.000	0
7	0	23.433	-14.710	-.177	.141	.228	4.12	150	.16	10	27.97	119	.704	380.	0.000	0
-8	0	23.060	-14.201	-.112	.136	.176	2.58	105	.10	20	27.97	119	.731	0.	0.000	0
-9	0	23.060	-14.201	0.000	0.000	0.000	1.55	115	.09	20	28.34	119	.370	100.	0.000	0
-10	0	23.060	-14.201	0.000	0.000	0.000	0.00	360	.03	100	28.22	120	.506	100.	0.000	0
11	0	23.014	-14.167	.007	.004	.007	0.00	360	.03	220	28.11	121	.518	103.	0.000	0
12	0	23.001	-14.217	-.035	-.021	.041	11.33	300	.14	330	28.00	122	.471	94.	0.000	0
13	0	22.930	-14.356	-.061	-.063	.089	11.85	310	.15	290	27.89	123	.263	53.	0.000	0
14	0	22.857	-14.477	-.154	-.106	.187	9.27	310	.28	310	27.78	124	.030	6.	0.000	0
15	0	21.756	-15.044	-.231	-.691	.259	7.73	330	.28	320	26.85	126	.586	44.	0.000	0
16	0	20.913	-15.234	-.254	.605	.256	6.18	340	.23	350	25.56	128	.714	45.	0.000	0
17	0	20.004	-15.509	-.174	.118	.213	5.15	330	.18	30	24.63	129	.189	18.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .5653 KM RMS ERROR IN POSITION 1.2489 KM 17.085

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG GI7B CA=0.10 CW=0.10 X RANGE -40.000 TO 10.000 KM Y RANGE -10.000 TO 40.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .010 M/S 87 DEG LATITUDE 54 DEG 44 HOURS
CA= .100 CW= .100 CS= .0020 CX= .0020
SAIL AREA 14000 KEEL AREA 56000 SURFACE AREA 38013 M**2 MASS .500E+07 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	.904	-10.332	.010	.001	.010	8.80	147	.46	330	10.37	175	0.000	0.	0.000	0
1	0	.449	-9.930	-.215	.192	.288	9.30	146	.45	330	9.82	175	.434	78.	0.000	0
2	0	-.506	-9.009	-.306	.322	.444	11.80	155	.49	330	9.63	176	1.076	428.	0.000	0
3	0	-1.687	-7.628	-.338	.440	.554	10.30	155	.48	330	8.70	175	1.343	143.	0.000	0
4	0	-2.859	-5.891	-.304	.516	.599	10.30	150	.43	330	8.15	177	1.468	234.	0.000	0
5	0	-3.832	-4.012	-.235	.510	.562	10.30	150	.36	320	7.22	178	1.248	133.	0.000	0
6	0	-4.541	-2.266	-.153	.460	.485	11.30	155	.23	330	6.11	178	.924	83.	0.000	0
7	0	-4.962	-.704	-.091	.406	.416	11.80	155	.22	320	5.37	178	.912	123.	30.000	270
8	0	-5.525	.684	-.200	.366	.417	10.30	165	.13	320	4.82	182	.858	130.	30.000	225
9	0	-6.306	1.764	-.252	.255	.359	10.30	160	.21	320	4.82	193	.969	105.	30.000	225
10	0	-7.386	2.604	-.345	.219	.409	10.30	160	.24	320	5.19	202	.981	113.	30.000	225
11	0	-8.769	3.374	-.422	.210	.471	10.30	165	.29	310	5.56	215	.532	42.	0.000	0
12	0	-10.167	4.349	-.360	.321	.482	8.20	160	.35	320	5.46	228	.530	42.	0.000	0
13	0	-11.388	5.652	-.322	.403	.516	11.30	160	.40	320	5.00	244	.804	53.	0.000	0
14	0	-12.500	7.254	-.295	.486	.569	11.30	155	.45	330	5.17	262	.506	32.	0.000	0
15	0	-13.490	9.108	-.247	.531	.585	9.80	154	.41	330	6.15	283	.274	12.	0.000	0
16	0	-14.268	10.986	-.188	.501	.535	11.30	153	.34	320	7.63	298	.323	14.	0.000	0
17	0	-14.858	12.696	-.139	.452	.473	10.30	141	.27	330	8.70	311	.865	41.	0.000	0
18	0	-15.279	14.175	-.099	.354	.368	9.30	127	.19	300	10.37	320	.822	37.	0.000	0
19	0	-15.576	15.293	-.063	.286	.292	8.80	131	.11	340	11.67	325	.564	35.	0.000	0
20	0	-15.731	16.261	-.027	.249	.250	9.80	140	.08	310	13.15	331	1.083	55.	0.000	0
21	0	-15.803	17.126	-.018	.245	.245	12.90	146	.09	335	15.00	339	1.958	73.	0.000	0
22	0	-15.870	18.029	-.018	.249	.250	11.80	146	.10	310	15.37	341	.576	89.	0.000	0
23	0	-15.949	18.892	-.029	.230	.232	10.80	140	.14	310	17.22	344	1.208	59.	0.000	0
24	0	-16.131	19.707	-.062	.228	.242	12.40	140	.27	310	18.89	344	.834	50.	0.000	0
25	0	-16.547	20.542	-.143	.232	.273	10.80	146	.30	300	18.89	340	1.498	114.	0.000	0
26	0	-17.133	21.373	-.190	.231	.293	10.30	145	.31	300	21.48	342	1.894	71.	0.000	0
27	0	-17.825	22.193	-.203	.219	.298	9.30	150	.33	290	27.78	346	5.736	88.	0.000	0
28	0	-18.580	22.947	-.215	.204	.296	9.30	145	.30	290	28.71	347	1.050	100.	0.000	0
29	0	-19.365	23.746	-.220	.256	.337	11.30	140	.21	330	28.71	348	1.449	289.	0.000	0
30	0	-20.100	24.780	-.181	.302	.352	10.30	140	.17	310	32.04	350	2.693	77.	0.000	0
31	0	-20.639	25.933	-.117	.276	.300	9.80	140	.10	300	33.71	351	1.076	61.	0.000	0
32	0	-20.936	26.748	-.048	.232	.237	9.30	145	.03	290	33.71	352	1.207	205.	0.000	0
33	0	-20.997	27.496	.012	.183	.183	7.20	150	.01	240	33.71	352	.751	0.	0.000	0
34	0	-20.870	28.058	.055	.129	.140	5.10	175	.02	250	34.26	352	.204	37.	0.000	0
35	0	-20.638	28.409	.069	.065	.094	3.10	150	.05	250	34.08	352	.573	309.	0.000	0
36	0	-20.413	28.525	.051	.002	.051	2.60	255	.08	270	33.89	352	.360	194.	0.000	0
37	0	-20.308	28.439	.000	-.050	.050	7.20	360	.12	290	33.89	352	.135	0.	0.000	0
38	0	-20.454	28.146	-.065	-.115	.143	11.80	5	.16	285	33.71	351	.411	66.	0.000	0
39	0	-20.950	27.625	-.192	-.168	.255	13.40	15	.18	280	34.08	348	1.431	79.	0.000	0
40	0	-21.816	27.011	-.282	-.162	.325	11.30	13	.21	280	34.45	345	1.113	61.	0.000	0
41	0	-22.926	26.537	-.326	-.090	.339	8.80	24	.19	295	35.19	343	.890	63.	0.000	0
42	0	-24.090	26.352	-.309	-.022	.310	11.30	15	.11	300	35.19	343	1.178	0.	0.000	0
43	0	-25.088	26.348	-.238	.021	.239	8.80	12	.03	330	34.63	342	.918	111.	0.000	0
44	0	-25.795	26.461	-.159	.033	.162	10.80	0	.03	35	33.34	341	1.628	114.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS 1.3824 KM RMS ERROR IN POSITION12.2516 KM 44.OBS

PROGRAM ICEDRIF, B GARRETT LAST MOD 12 10 1982

ICEBERG GI41 CA=2.0 CW=0.6 X RANGE -15.000 TO 15.000 KM Y RANGE -20.000 TO 10.000 KM DEVN= 38 KDEVN= -38

THE CA LIMIT 2.000, THE CW LIMIT 2.400

INITIAL V .320 M/S 302 DEG LATITUDE 59 DEG 40 HOURS
CA=2.000 CW= .600 CS= .0020 CX= .0020
SAIL AREA 1500 KEEL AREA 6000 SURFACE AREA 4300 M**2 MASS .200E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	13.851	-15.934	-.271	.170	.320	6.70	80	.06	353	21.11	139	0.000	0.	0.000	0
1	0	13.178	-16.253	-.152	-.147	.211	6.70	70	.03	353	20.37	140	.653	79.	0.000	0
2	0	12.816	-16.396	-.062	.099	.117	4.60	200	.03	73	19.82	142	.550	61.	0.000	0
3	0	12.745	-15.904	.002	.122	.122	3.60	210	.01	123	19.63	142	.350	189.	0.000	0
4	0	12.717	-15.522	-.027	.093	.097	4.10	200	.04	233	18.89	144	.974	97.	0.000	0
5	0	12.599	-15.236	-.033	.066	.073	2.60	200	.03	263	17.78	145	.899	78.	0.000	0
6	0	12.352	-14.888	-.121	.141	.186	5.10	180	.05	323	16.85	147	.777	70.	0.000	0
7	0	11.915	-14.348	-.108	.154	.188	3.10	180	.09	3	16.48	147	.329	89.	0.000	0
8	0	11.407	-13.839	-.198	.121	.232	4.10	160	.13	320	15.93	150	.697	69.	0.000	0
9	0	10.615	-13.382	-.224	.146	.267	5.10	160	.11	340	14.45	155	1.093	55.	0.000	0
10	0	9.732	-12.935	-.277	.087	.290	6.20	140	.10	320	13.70	155	.612	83.	0.000	0
11	0	8.718	-12.601	-.280	.112	.301	7.70	140	.07	360	12.59	155	.866	78.	0.000	0
12	0	7.675	-12.151	-.302	.135	.331	7.70	150	.09	330	11.30	158	.492	34.	0.000	0
13	0	6.601	-11.605	-.292	.170	.338	10.30	150	.04	50	10.37	160	.430	43.	0.000	0
14	0	5.691	-11.054	-.211	.132	.249	7.70	150	.03	70	9.26	163	.346	28.	0.000	0
15	0	4.880	-10.607	-.246	.117	.272	7.70	150	.03	330	8.33	164	.564	60.	0.000	0
16	0	4.043	-10.158	-.214	.136	.254	7.70	160	.01	300	7.00	166	.804	59.	0.000	0
17	0	4.000	-9.952	.293	-.065	.300	10.30	320	.01	210	6.41	163	.510	74.	0.000	0
18	0	4.328	-9.900	-.215	.169	.286	10.30	170	.05	260	5.63	164	.930	118.	0.000	0
19	0	3.558	-9.180	-.161	.208	.263	10.30	180	.07	183	5.00	165	.531	83.	0.000	0
20	0	2.818	-8.532	-.265	.144	.302	7.70	180	.16	283	4.82	170	.627	134.	0.000	0
21	0	1.849	-7.688	-.254	.347	.430	10.30	200	.17	323	3.30	179	.631	38.	0.000	0
22	0	.912	-6.387	-.273	.366	.457	10.30	200	.20	323	2.69	196	.603	56.	0.000	0
23	0	-.023	-5.073	-.242	.364	.437	10.30	195	.14	333	2.37	218	.638	63.	0.000	0
24	0	-.725	-3.617	-.142	.450	.472	11.30	210	.14	353	2.44	245	.624	55.	0.000	0
25	0	-1.221	-2.080	-.142	.398	.423	10.30	200	.10	3	2.83	260	.999	127.	0.000	0
26	0	-1.631	-.872	-.081	.271	.283	7.70	200	.03	13	3.48	269	.826	101.	0.000	0
27	0	-1.916	.105	-.083	.280	.292	7.70	200	.05	13	4.07	272	.833	133.	0.000	0
28	0	-2.144	1.142	-.039	.296	.299	8.20	210	.04	23	4.69	275	.854	131.	0.000	0
29	0	-2.259	2.173	-.029	.274	.275	7.70	210	.03	23	5.15	277	.876	177.	0.000	0
30	0	-2.392	3.207	-.047	.304	.307	7.70	210	.07	13	5.63	281	.652	107.	0.000	0
31	0	-2.655	4.374	-.103	.344	.359	6.70	210	.17	3	6.04	279	1.308	287.	0.000	0
32	0	-3.183	5.415	-.195	.225	.298	5.10	190	.17	330	6.61	281	.724	118.	0.000	0
33	0	-3.799	6.315	-.118	.295	.318	6.20	210	.14	360	7.22	281	.783	128.	0.000	0
34	0	-4.207	7.361	-.127	.278	.306	5.10	180	.15	20	7.91	282	.816	117.	0.000	0
35	0	-4.432	8.152	.038	.156	.161	5.10	290	.12	350	8.46	283	.603	105.	0.000	0
36	0	-4.241	8.518	.042	.066	.078	2.60	340	.11	20	9.20	282	1.013	134.	0.000	0
37	0	-4.200	8.714	-.020	.047	.051	1.50	90	.08	20	9.45	281	.436	150.	0.000	0
38	0	-4.382	8.820	-.067	.007	.067	2.60	90	.03	50	10.19	281	.546	74.	0.000	0
39	0	-4.679	8.690	-.101	-.062	.130	5.10	70	.04	30	10.93	280	.472	62.	0.000	0
40	0	-5.151	8.493	-.171	-.008	.171	5.10	120	.03	360	10.74	279	.623	235.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .7295 KM RMS ERROR IN POSITION 4.7997 KM 40.08S

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG GI43 CA=1.70 CW=0.10 X RANGE 0.000 TO 15.000 KM Y RANGE -5.000 TO 10.000 KM 0 TRACKS

IDEVN= 32 KDEVN= 0

INITIAL V .170 M/S 179 DEG LATITUDE 49 DEG 33 HOURS
CA=1.700 CW= .100 CS= .0020 CX= .0020
SAIL AREA 6000 KEEL AREA 24000 SURFACE AREA 20500 M**2 MASS .250E+07 METRIC TONS

HOUR		POSN EAST KM	NORTH VEL	EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT TOWFORCE	DIR
0	0	14.435	6.731	.003	-.170	.170	1.00	310	0.00	0	15.93	65	0.000	0.	0.000	0
1	0	14.349	6.205	-.047	-.122	.131	0.00	0	0.00	0	15.56	65	.446	120.	0.000	0
2	0	14.133	5.867	-.067	-.056	.087	2.60	190	0.00	0	15.19	66	.061	13.	0.000	0
3	0	13.913	5.937	-.050	.035	.061	2.60	190	0.00	0	14.82	67	.357	79.	0.000	0
4	0	13.750	6.032	-.019	.061	.064	.50	300	0.00	0	15.37	66	.591	96.	0.000	0
5	0	13.773	6.239	.009	.052	.053	1.00	320	0.00	0	15.00	67	.636	140.	0.000	0
6	0	13.889	6.330	.070	-.029	.075	4.60	320	0.00	0	15.00	71	1.099	105.	0.000	0
7	0	14.199	5.999	.075	-.130	.150	2.60	325	.04	0	14.82	72	.404	127.	0.000	0
8	0	14.363	5.525	.020	-.124	.126	1.50	280	.02	40	14.45	73	.456	101.	0.000	0
9	0	14.376	5.124	-.009	-.100	.101	1.50	310	.02	110	13.70	75	.651	73.	0.000	0
10	0	14.307	4.800	-.028	-.080	.085	1.00	290	0.00	0	13.15	78	.578	64.	0.000	0
11	0	14.173	4.558	-.045	-.053	.069	.50	5	.02	110	12.96	79	.019	6.	0.000	0
12	0	13.999	4.426	-.048	-.022	.053	.50	80	.03	160	12.59	81	.388	67.	0.000	0
13	0	13.847	4.392	-.034	.001	.034	0.00	0	.04	190	12.04	82	.449	75.	0.000	0
14	0	13.757	4.410	-.016	.006	.017	.50	210	.04	250	11.11	83	.871	92.	0.000	0
15	0	13.721	4.433	-.005	.009	.010	1.00	210	0.00	0	10.19	84	.918	97.	0.000	0
16	0	13.713	4.464	-.002	.004	.005	1.00	230	.07	320	9.82	84	.367	99.	0.000	0
17	0	13.717	4.462	.010	-.002	.010	1.00	230	.06	200	9.26	84	.559	101.	0.000	0
18	0	13.765	4.453	.005	-.002	.006	1.00	270	.11	20	8.89	83	.452	112.	0.000	0
19	0	13.737	4.448	-.014	-.005	.015	1.50	265	.08	330	8.33	83	.527	95.	0.000	0
20	0	13.691	4.408	-.003	-.016	.018	2.10	275	.06	350	7.78	85	.562	90.	0.000	0
21	0	13.655	4.347	-.017	-.015	.022	0.00	0	.03	40	7.04	86	.703	94.	0.000	0
22	0	13.576	4.315	-.025	-.003	.025	0.00	0	0.00	0	6.30	87	.666	89.	0.000	0
23	0	13.490	4.320	-.022	.006	.023	.50	240	0.00	0	6.11	91	.451	96.	0.000	0
24	0	13.430	4.347	-.009	.004	.010	1.00	270	.05	270	5.19	91	.866	94.	0.000	0
25	0	13.433	4.331	.011	-.015	.018	1.00	315	.06	230	4.82	96	.562	98.	0.000	0
26	0	13.485	4.241	.011	-.035	.037	1.50	25	0.00	0	4.07	100	.836	104.	0.000	0
27	0	13.469	4.066	-.024	-.065	.070	2.60	45	.05	230	3.74	104	.367	85.	0.000	0
28	0	13.240	3.784	-.119	-.082	.145	4.10	85	.09	250	3.19	107	.437	75.	0.000	0
29	0	12.564	3.600	-.250	.001	.250	4.60	120	.11	290	2.74	110	.272	58.	0.000	0
30	0	11.595	3.872	-.259	.147	.298	4.10	150	.08	300	2.22	113	.484	91.	0.000	0
31	0	10.766	4.622	-.207	.264	.336	5.10	145	.09	310	1.94	117	.923	294.	0.000	0
32	0	10.153	5.671	-.121	.298	.321	5.70	160	.13	240	1.46	120	.910	186.	0.000	0
33	0	9.870	6.696	-.047	.271	.275	5.10	155	.10	240	1.15	120	.868	276.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6177 KM RMS ERROR IN POSITION 7.0016 KM 33.OBS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG HE04A CA=.0.7 CW=0.5 X RANGE -35.000 TO -10.000 KM Y RANGE 5.000 TO 30.000 KM 0 TRACKS

IDEVN= -22 KDEVN= 22

INITIAL V 0.000 M/S 0 DEG LATITUDE 55 DEG 30 HOURS
CA= .700 CW= .500 CS= .0020 CX= .0020
SAIL AREA 1969 KEEL AREA 11070 SURFACE AREA 6724 M**2 MASS .210E+06 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-31.702	9.692	0.000	0.000	0.000	7.73	250	.09	30	33.15	287	0.000	0.	0.000	0
1	0	-31.250	9.785	.098	.030	.103	1.55	250	.06	30	32.78	289	.923	76.	0.000	0
2	0	-30.840	9.928	.129	.058	.141	6.19	190	.09	90	32.22	291	.911	72.	0.000	0
3	0	-30.403	10.180	.133	.083	.157	6.70	200	.04	60	31.48	292	.415	45.	0.000	0
4	0	-29.802	10.543	.216	.115	.245	11.33	210	.06	70	31.48	293	.416	76.	0.000	0
5	0	-29.076	11.035	.177	.162	.240	11.33	200	.04	30	30.93	294	.214	27.	0.000	0
6	0	-28.243	11.607	.275	.147	.312	12.36	215	.10	50	30.37	295	.323	42.	0.000	0
7	0	-27.337	11.998	.243	.069	.253	12.36	225	.04	90	29.82	297	.310	26.	0.000	0
8	0	-26.386	12.189	.289	.039	.291	13.90	235	.05	80	29.17	298	.142	17.	0.000	0
9	0	-25.348	12.321	.285	.036	.288	11.85	235	.08	70	28.52	298	.638	98.	0.000	0
10	0	-24.318	12.443	.286	.032	.288	12.88	240	.06	60	27.78	297	1.082	122.	0.000	0
11	0	-23.278	12.508	.280	.002	.280	11.33	245	.08	70	27.22	299	.528	48.	0.000	0
12	0	-22.242	12.533	.279	.016	.279	11.85	240	.07	70	26.67	301	.514	47.	0.000	0
13	0	-21.417	12.645	.205	.047	.210	10.30	225	.03	90	26.30	302	.330	56.	0.000	0
14	0	-20.723	12.834	.185	.054	.193	10.30	220	.03	120	26.11	302	.609	329.	0.000	0
15	0	-20.256	13.175	.051	.147	.159	9.27	180	.03	270	26.11	305	.853	62.	0.000	0
16	0	-20.034	13.818	.014	.203	.210	10.30	185	.06	300	26.85	306	.542	62.	0.000	0
17	0	-19.913	14.592	.039	.226	.230	10.30	185	.09	300	26.67	307	.569	113.	0.000	0
18	0	-19.829	15.507	.006	.285	.285	9.27	170	.14	320	27.22	308	.314	43.	0.000	0
19	0	-19.824	16.493	.002	.256	.257	8.27	170	.12	320	27.97	309	.322	36.	0.000	0
20	0	-19.851	17.475	-.021	.295	.296	9.79	170	.15	310	27.97	312	.987	67.	0.000	0
21	0	-19.927	18.620	.043	.343	.346	9.79	170	.18	340	28.15	315	.854	58.	0.000	0
22	0	-19.815	19.901	.071	.364	.371	8.24	165	.23	350	28.15	317	.771	79.	0.000	0
23	0	-19.329	21.239	.058	.379	.389	9.27	170	.23	350	28.34	319	.630	63.	0.000	0
24	0	-18.592	22.490	.161	.304	.344	8.76	170	.20	20	28.34	321	.685	69.	0.000	0
25	0	-17.943	23.402	.395	.199	.442	11.33	240	.27	30	28.52	324	.170	11.	0.000	0
26	0	-16.642	23.941	.305	.108	.324	6.70	270	.24	30	28.71	327	.490	32.	0.000	0
27	0	-15.620	24.208	.267	.044	.272	4.12	270	.21	50	28.34	330	.486	32.	0.000	0
28	0	-14.613	24.304	.299	.016	.300	6.70	250	.19	60	27.59	331	.546	62.	0.000	0
29	0	-13.586	24.348	.263	.010	.269	6.19	250	.16	60	27.04	333	.112	10.	0.000	0
30	0	-12.657	24.391	.245	.008	.246	8.24	240	.10	70	26.48	334	.411	57.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .5941 KM RMS ERROR IN POSITION 1.5530 KM 30.OBS

PROGRAM ICEDRTF, B GARRETT LAST MOD 6 10 1982

ICEBERG NB12B CA=0.20 CW=0.40 X RANGE -30.000 TO 5.000 KM Y RANGE -10.000 TO 25.000 KM 0 TRACKS

IDEVN= 34 KDEVN= 0

INITIAL V .150 M/S 194 DEG LATITUDE 56 DEG 33 HOURS
CA= .200 CW= .400 CS= .0020 CX= .0020
SAIL AREA 7200 KEEL AREA 28800 SURFACE AREA 32400 M**2 MASS .650E+07 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	.762	10.900	-.010	-.150	.150	7.70	300	.02	230	10.93	4	0.000	0.	0.000	0
1	0	.722	10.392	-.001	-.143	.143	11.80	295	.08	220	10.37	4	.046	8.	0.000	0
2	0	.782	9.839	.030	-.163	.166	10.30	300	.10	200	10.19	4	.375	203.	0.000	0
3	0	.910	9.220	.036	-.180	.183	10.30	300	.08	220	9.63	5	.051	9.	0.000	0
4	0	1.026	8.570	.029	-.176	.179	10.30	300	.06	190	8.89	7	.176	22.	0.000	0
5	0	1.124	7.968	.025	-.158	.160	6.70	300	.10	180	8.33	9	.123	19.	0.000	0
6	0	1.209	7.425	.021	-.146	.148	5.70	320	.11	190	7.78	12	.242	35.	0.000	0
7	0	1.280	6.899	.018	-.148	.149	6.20	320	.11	200	7.04	15	.315	38.	0.000	0
8	0	1.344	6.336	.018	-.170	.171	5.70	310	.17	230	6.11	15	.449	49.	0.000	0
9	0	1.368	5.643	-.014	-.216	.217	3.10	320	.24	250	5.19	14	.394	42.	0.000	0
10	0	1.219	4.787	-.067	-.256	.265	3.10	10	.27	250	4.44	8	.537	60.	25.000	290
11	0	.710	3.908	-.208	-.227	.308	5.70	360	.29	250	3.89	356	.522	51.	40.000	290
12	0	-.385	3.263	-.395	-.121	.414	4.60	310	.29	290	4.07	342	.650	66.	40.000	290
13	0	-1.967	3.053	-.446	-.011	.446	1.50	310	.27	270	4.82	326	.359	25.	40.000	270
14	0	-3.535	3.016	-.428	-.000	.428	2.60	270	.21	280	5.56	318	.570	55.	40.000	270
15	0	-5.034	3.082	-.403	.038	.405	3.60	295	.16	290	7.96	312	1.334	53.	40.000	270
16	0	-6.436	3.282	-.378	.072	.385	4.10	310	.14	300	8.15	309	1.065	231.	40.000	270
17	0	-7.727	3.586	-.334	.094	.347	4.10	330	.08	300	9.07	307	.378	39.	40.000	270
18	0	-8.868	3.947	-.307	.107	.325	3.60	340	.08	310	9.82	308	.689	91.	40.000	270
19	0	-9.935	4.325	-.284	.097	.300	2.60	350	.08	270	10.37	308	.631	114.	40.000	270
20	0	-10.925	4.640	-.269	.082	.281	4.10	360	.06	270	10.93	307	.453	77.	40.000	270
21	0	-11.904	4.926	-.280	.078	.291	2.10	30	.09	280	11.48	306	.431	73.	40.000	270
22	0	-12.927	5.205	-.283	.076	.293	2.10	40	.08	270	11.85	305	.645	153.	40.000	270
23	0	-13.967	5.481	-.301	.079	.311	0.00	0	.11	290	12.22	305	.739	200.	40.000	270
24	0	-15.061	5.771	-.298	.079	.308	1.50	140	.09	270	13.33	303	.085	7.	40.000	270
25	0	-16.145	6.049	-.314	.079	.324	3.60	140	.13	290	14.08	301	.355	40.	0.000	0
26	0	-17.042	6.348	-.201	.086	.218	3.60	140	.11	300	14.82	301	.275	37.	0.000	0
27	0	-17.591	6.639	-.097	.068	.118	2.10	140	.08	210	15.56	302	.327	42.	0.000	0
28	0	-17.820	6.838	-.049	.044	.066	2.10	140	.10	310	16.30	302	.444	60.	0.000	0
29	0	-17.989	6.960	-.045	.027	.052	4.10	140	.07	300	17.04	304	.781	83.	0.000	0
30	0	-18.149	7.044	-.046	.020	.051	5.10	140	.08	310	17.41	306	.653	92.	0.000	0
31	0	-18.339	7.106	-.062	.014	.063	5.10	120	.10	320	17.59	308	.675	106.	0.000	0
32	0	-18.613	7.184	-.095	.041	.103	12.90	130	.06	300	17.96	308	.152	41.	0.000	0
33	0	-19.018	7.426	-.128	.085	.153	12.40	130	.14	300	18.33	309	.392	80.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .5396 KM RMS ERROR IN POSITION 3.1916 KM 33.0HRS

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PROGRAM ICEDRIF, B GARRETT     LAST MOD 6 10 1982

ICEBERG NB12  CA=0.20  CW=0.40              X RANGE  -20.000 TO   5.000 KM  Y RANGE   -5.000 TO  20.000 KM   0 TRACKS

                                               IDEVN=  34 KDEVN=   0



INITIAL V  .150 M/S 184 DEG  LATITUDE  56 DEG 33 HOURS
CA= .200  CW= .400  CS= .0020  CX= .0020
SAIL AREA  7200  KEEL AREA 28800  SURFACE AREA 32400 M**2  MASS   .650E+07 METRIC TONS

HOUR   POSN EAST KM NORTH VEL EAST M/S NORTH TOTAL WIND M/S FROM CURRENT M/S TO  RANGE(KM) AZIM      KM ERROR PCT TOWFORCE DIR
  0   0       .762    10.900       -.010      -.150   .150    7.70   300         .02     230      10.93       4         0.000      0.     0.000    0
  1   0       .722    10.392       -.001      -.143   .143   11.80   295         .08     220      10.37       4          .046      8.     0.000    0
  2   0       .782     9.839        .030      -.163   .166   10.30   300         .10     200      10.19       4          .375    203.     0.000    0
  3   0       .910     9.220        .036      -.180   .183   10.30   300         .08     220       9.63       5          .051      9.     0.000    0
  4   0      1.026     8.570        .029      -.176   .179   10.30   300         .06     190       8.89       7          .176     22.     0.000    0
  5   0      1.124     7.968        .025      -.158   .160    6.70   300         .10     180       8.33       9          .123     19.     0.000    0
  6   0      1.209     7.425        .021      -.146   .148    5.70   320         .11     190       7.78      12          .242     35.     0.000    0
  7   0      1.280     6.899        .018      -.148   .149    6.20   320         .11     200       7.04      15          .315     38.     0.000    0
  8   0      1.344     6.336        .018      -.170   .171    5.70   310         .17     230       6.11      15          .449     49.     0.000    0
  9   0      1.368     5.643       -.014      -.216   .217    3.10   320         .24     250       5.19      14          .394     42.     0.000    0
 10   0      1.219     4.787       -.067      -.256   .265    3.10    10         .27     250       4.44       8          .537     60.     0.000  290
 11   0       .901     3.809       -.109      -.286   .306    5.70   360         .29     250       3.89     356          .731     71.     0.000  290
 12   0       .371     2.787       -.201      -.261   .329    4.60   310         .29     290       4.07     342         1.116    113.     0.000  290
 13   0      -.498     1.945       -.260      -.215   .337    1.50   310         .27     270       4.82     326         1.118     78.     0.000  270
 14   0     -1.448     1.248       -.271      -.166   .318    2.60   270         .21     280       5.56     318          .836     81.     0.000  270
 15   0     -2.411      .769       -.260      -.100   .278    3.60   295         .16     290       7.96     312         2.086     83.     0.000  270
 16   0     -3.305      .517       -.236      -.044   .240    4.10   310         .14     300       8.15     309          .482    105.     0.000  270
 17   0     -4.091      .442       -.196       .001   .196    4.10   330         .08     300       9.07     307          .428     44.     0.000  270
 18   0     -4.719      .503       -.156       .030   .159    3.60   340         .08     310       9.82     308          .540     71.     0.000  270
 19   0     -5.209      .632       -.113       .037   .119    2.60   350         .08     270      10.37     308          .220     40.     0.000  270
 20   0     -5.539      .747       -.073       .027   .078    4.10   360         .06     270      10.93     307          .237     40.     0.000  270
 21   0     -5.757      .814       -.051       .009   .052    2.10    30         .09     280      11.48     306          .361     61.     0.000  270
 22   0     -5.920      .808       -.040      -.012   .042    2.10    40         .08     270      11.85     305          .263     62.     0.000  270
 23   0     -6.061      .727       -.043      -.035   .055    0.00     0         .11     290      12.22     305          .335     90.     0.000  270
 24   0     -6.236      .566       -.052      -.052   .073    1.50   140         .09     270      13.33     303         1.078     90.     0.000  270
 25   0     -6.445      .358       -.069      -.064   .094    3.60   140         .13     290      14.08     301          .701     79.     0.000    0
 26   0     -6.749      .119       -.100      -.064   .119    3.60   140         .11     300      14.82     301          .703     95.     0.000    0
 27   0     -7.123     -.071       -.094      -.039   .102    2.10   140         .08     210      15.56     302          .813    103.     0.000    0
 28   0     -7.425     -.170       -.084      -.023   .087    2.10   140         .10     310      16.30     302          .590     80.     0.000    0
 29   0     -7.754     -.242       -.097      -.013   .098    4.10   140         .07     300      17.04     304          .963    102.     0.000    0
 30   0     -8.116     -.253       -.104       .007   .105    5.10   140         .08     310      17.41     306          .822    116.     0.000    0
 31   0     -8.507     -.192       -.114       .025   .117    5.10   120         .10     320      17.59     308          .814    128.     0.000    0
 32   0     -8.943     -.043       -.129       .066   .145   12.90   130         .06     300      17.96     308          .164     44.     0.000    0
 33   0     -9.433      .283       -.142       .105   .177   12.40   130         .14     300      18.33     309          .426     87.     0.000    0
RMS ERROR IN COMPUTED DRIFT SEGMENTS  .6925 KM   RMS ERROR IN POSITION 6.9721 KM  33.OBS
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PROGRAM ICEDRIF, R GARRETT LAST MOD 6 10 1982

ICEBERG NB19 CA=0.8 CW=2.4 X RANGE -5.000 TO 10.000 KM Y RANGE -5.000 TO 10.000 KM 0 TRACKS

IDEVN= -15 KDEVN= 15

INITIAL V .520 M/S 325 DEG LATITUDE 56 DEG 15 HOURS
CA= .800 CW=2.400 CS= .0020 CX= .0020
SAIL AREA 4000 KEEL AREA 16000 SURFACE AREA 13273 M**2 MASS .220E+07 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	3.219	-4.597	-.298	.426	.520	19.00	150	.12	300	5.61	145	0.000	0.	0.000	0
1	0	2.648	-3.655	-.168	.228	.283	15.90	100	.14	330	4.44	141	.250	21.	0.000	0
2	0	2.129	-2.757	-.103	.292	.309	17.00	145	.14	330	3.39	139	.055	5.	0.000	0
3	0	1.862	-1.709	-.054	.280	.285	13.90	155	.14	330	2.24	131	.269	22.	0.000	0
4	0	1.731	-.710	-.018	.278	.278	14.40	160	.13	340	1.52	108	.115	11.	80.000	360
5	0	1.741	.561	.017	.338	.339	15.40	165	.08	350	1.69	59	.068	5.	80.000	360
6	0	1.806	1.816	.016	.363	.364	17.00	170	.10	340	3.04	35	.432	26.	80.000	360
7	0	1.821	3.146	-.009	.375	.375	16.40	180	.13	320	4.35	32	.563	42.	80.000	360
8	0	1.842	4.415	.027	.326	.328	15.00	190	.08	330	5.33	29	.392	39.	80.000	360
9	0	1.950	5.624	.041	.353	.355	12.90	275	.19	330	5.96	28	.618	97.	0.000	0
10	0	2.237	6.188	.090	.083	.123	12.90	290	.16	340	6.19	29	.428	174.	0.000	0
11	0	2.589	6.313	.104	-.018	.106	15.40	305	.10	350	6.67	31	.198	37.	0.000	0
12	0	2.944	6.375	.097	.073	.122	13.40	300	.20	350	6.48	34	.435	111.	0.000	0
13	0	3.438	6.643	.183	.064	.194	18.00	290	.19	360	6.67	38	.389	79.	0.000	0
14	0	4.138	6.721	.196	-.030	.198	18.00	300	.12	20	7.22	45	.376	37.	0.000	0
15	0	4.805	6.560	.176	-.050	.183	15.40	300	.10	30	7.78	53	.512	43.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .3797 KM RMS ERROR IN POSITION 1.0993 KM 15.0BS

ICEBERG NB19C CA=0.60 CW=2.20 X RANGE -5.000 TO 10.000 KM Y RANGE -5.000 TO 10.000 KM 0 TRACKS

IDEVN= -15 KDEVN= 15

INITIAL V .520 M/S 325 DEG LATITUDE 56 DEG 15 HOURS
CA= .600 CW=2.200 CS= .0020 CX= .0020
SAIL AREA 4000 KEEL AREA 16000 SURFACE AREA 13273 M**2 MASS .220E+07 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	3.219	-4.597	-.298	.426	.520	19.00	150	.12	300	5.61	145	0.000	0.	0.000	0
1	0	2.672	-3.688	-.153	.221	.269	15.90	100	.14	330	4.44	141	.265	22.	0.000	0
2	0	2.190	-2.827	-.098	.276	.293	17.00	145	.14	330	3.39	139	.098	9.	0.000	0
3	0	1.937	-1.830	-.051	.267	.272	13.90	155	.14	330	2.24	131	.293	24.	0.000	0
4	0	1.812	-.877	-.017	.264	.265	14.40	160	.13	340	1.52	108	.132	13.	0.000	360
5	0	1.810	.016	.015	.228	.229	15.40	165	.08	350	1.69	59	.445	33.	0.000	360
6	0	1.881	.868	.021	.252	.253	17.00	170	.10	340	3.04	35	.800	49.	0.000	360
7	0	1.930	1.793	.004	.259	.259	16.40	180	.13	320	4.35	32	.586	44.	0.000	360
8	0	1.991	2.649	.039	.209	.213	15.00	190	.08	330	5.33	29	.248	25.	0.000	360
9	0	2.176	3.291	.061	.146	.158	12.90	275	.19	330	5.96	28	.050	8.	0.000	0
10	0	2.426	3.706	.077	.088	.117	12.90	290	.16	340	6.19	29	.275	112.	0.000	0
11	0	2.738	3.868	.095	-.005	.095	15.40	305	.10	350	6.67	31	.188	35.	0.000	0
12	0	3.056	3.961	.086	.079	.117	13.40	300	.20	350	6.48	34	.453	116.	0.000	0
13	0	3.497	4.260	.166	.073	.182	18.00	290	.19	360	6.67	38	.420	85.	0.000	0
14	0	4.146	4.380	.183	-.016	.184	18.00	300	.12	20	7.22	45	.443	44.	0.000	0
15	0	4.771	4.262	.165	-.040	.170	15.40	300	.10	30	7.78	53	.570	48.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .4035 KM RMS ERROR IN POSITION 1.4399 KM 15.0BS

PROGRAM ICEDRIF, R GARRETT LAST MOD 12 10 1982

ICEBERG N838 CA=2.00 CW=0.50 X RANGE 4.000 TO 10.000 KM Y RANGE 3.000 TO 9.000 KM DEVN= 0 KDEVN= 0

THE CA LIMIT 2.000, THE CW LIMIT 2.400

INITIAL V .160 M/S 131 DEG LATITUDE 55 DEG 18 HOURS
CA=2.000 CW= .500 CS= .0020 CX= .0020
SAIL AREA 8000 KEEL AREA 32000 SURFACE AREA 40000 M**2 MASS .100E+03 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	7.831	8.398	.121	-.105	.160	4.60	360	.05	205	11.40	43	0.000	0.	0.000	0
1	0	8.087	7.907	.021	-.149	.149	2.60	30	.05	250	11.30	46	.072	11.	0.000	0
2	0	7.979	7.375	-.083	-.152	.173	5.10	30	.09	270	10.93	47	.140	33.	0.000	0
3	0	7.519	6.844	-.159	-.133	.208	4.60	35	.05	250	10.37	47	.161	29.	0.000	0
4	0	6.896	6.456	-.183	-.080	.200	3.10	55	.07	260	9.63	47	.143	19.	0.000	0
5	0	6.249	6.269	-.170	-.035	.172	3.10	15	.04	310	8.89	44	.222	25.	0.000	0
6	0	5.680	6.233	-.150	-.002	.150	5.10	30	.04	360	8.33	41	.156	22.	0.000	0
7	0	5.164	6.249	-.133	.016	.134	4.10	15	.08	10	8.15	38	.133	28.	0.000	0
8	0	4.740	6.370	-.101	.052	.114	3.60	40	.09	40	8.15	35	.155	36.	0.000	0
9	0	4.493	6.615	-.025	.078	.082	2.60	40	.14	90	8.52	35	.463	125.	0.000	0
10	0	4.575	6.860	.067	.045	.081	2.60	40	.17	130	8.65	36	.254	128.	0.000	0
11	0	4.916	6.950	.114	.015	.115	3.10	40	.21	100	8.76	37	.178	95.	0.000	0
12	0	5.343	6.981	.118	-.002	.118	2.60	46	.10	110	8.89	38	.226	112.	0.000	0
13	0	5.760	6.925	.117	-.027	.120	3.10	15	.17	110	8.89	41	.247	53.	0.000	0
14	0	6.193	6.792	.123	-.047	.132	2.60	25	.16	120	8.70	47	.647	69.	0.000	0
15	0	6.657	6.564	.137	-.087	.162	2.60	20	.20	150	8.52	50	.382	78.	0.000	0
16	0	7.167	6.121	.143	-.164	.217	2.60	355	.23	170	7.96	52	.772	123.	0.000	0
17	0	7.623	5.402	.100	-.228	.249	2.60	25	.16	180	7.78	54	.586	177.	0.000	0
18	0	7.844	4.538	.023	-.245	.246	3.10	33	.13	180	7.41	56	.572	126.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .3682 KM RMS ERROR IN POSITION .7759 KM 18.0BS

ICEBERG N958B X RANGE -20.000 TO 15.000 KM Y RANGE -10.000 TO 25.000 KM DEVN= 35 KDEVN= 0

THE CA LIMIT 2.000, THE CW LIMIT 2.400

INITIAL V .230 M/S 188 DEG LATITUDE 56 DEG 24 HOURS
CA= .600 CW= .300 CS= .0020 CX= .0020
SAIL AREA 1340 KEEL AREA 5360 SURFACE AREA 3217 M**2 MASS .500E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-6.410	19.727	-.032	-.228	.230	8.80	320	.11	150	20.74	342	0.000	0.	0.000	0
1	0	-6.197	18.893	.124	-.253	.282	7.70	300	.16	190	19.82	340	.641	55.	0.000	0
2	0	-5.702	17.895	.120	-.299	.322	8.20	310	.16	230	18.71	337	1.103	74.	0.000	0
3	0	-5.345	16.786	.091	-.310	.323	8.20	315	.13	210	18.15	335	.795	94.	0.000	0
4	0	-5.074	15.679	.049	-.306	.310	5.10	330	.18	220	17.78	333	.837	115.	0.000	0
5	0	-4.997	14.625	-.000	-.270	.270	7.20	330	.08	240	17.41	334	.933	194.	0.000	0
6	0	-5.070	13.818	-.041	-.170	.175	3.10	340	.03	270	17.41	333	.700	230.	0.000	0
7	0	-5.253	13.342	-.054	-.092	.107	2.10	310	.01	250	17.41	334	.747	246.	0.000	0
8	0	-5.433	13.120	-.044	-.046	.064	2.60	300	.02	30	17.04	335	.611	128.	0.000	0
9	0	-5.568	13.024	-.030	-.007	.031	2.10	330	.06	70	16.30	337	1.027	109.	0.000	0
10	0	-5.619	13.010	.011	-.022	.025	7.20	330	.10	60	15.74	339	.830	105.	0.000	0
11	0	-5.492	12.788	.051	-.101	.113	7.20	355	.12	120	14.82	340	.710	74.	0.000	0
12	0	-5.277	12.341	.068	-.139	.155	5.10	320	.08	160	13.70	340	.620	56.	0.000	0
13	0	-5.017	11.875	.075	-.105	.129	2.60	300	.12	130	12.59	341	.602	53.	0.000	0
14	0	-4.664	11.542	.147	-.093	.174	7.70	270	.08	170	11.30	340	.966	74.	0.000	0
15	0	-4.003	11.180	.190	-.106	.217	7.70	270	.04	210	10.00	340	.883	68.	0.000	0
16	0	-3.278	10.732	.227	-.158	.277	10.30	290	.07	190	9.07	337	1.038	99.	20.000	195
17	0	-2.972	8.973	.012	-.584	.584	11.80	290	.09	190	7.96	331	.723	51.	20.000	195
18	0	-2.901	6.792	.036	-.631	.632	14.40	300	.10	200	6.30	331	1.033	62.	20.000	195
19	0	-2.747	4.605	.045	-.570	.571	14.40	300	.03	150	4.82	311	.753	31.	20.000	195
20	0	-2.514	2.621	.093	-.539	.547	15.40	290	.04	130	3.70	292	.215	12.	20.000	195
21	0	-2.178	.706	.077	-.526	.532	14.40	290	.02	120	2.96	265	.307	18.	20.000	195
22	0	-1.919	-1.133	.076	-.492	.498	14.40	295	.07	80	2.96	223	.675	32.	0.000	0
23	0	-1.069	-2.198	.350	-.266	.440	17.00	300	.06	130	4.44	191	1.176	47.	0.000	0
24	0	.290	-3.181	.389	-.273	.475	17.50	300	.06	120	4.44	169	1.039	61.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .8229 KM RMS ERROR IN POSITION 2.0221 KM 24.0BS

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PROGRAM ICEDRIF, B GARRETT    LAST MOD 6 10 1982

ICEBERG NB68B CA=0.60  CW=0.30           X RANGE  -20.000 TO  10.000 KM  Y RANGE  -10.000 TO  20.000 KM   0 TRACKS

                                        IDEVN=  35 KDEVN=   0


INITIAL V  .230 M/S 188 DEG  LATITUDE  56 DEG 24 HOURS
CA= .600  CW= .300  CS= .0020  CX= .0020
SAIL AREA  1340  KEEL AREA  5360  SURFACE AREA  3217 M**2  MASS   .500E+06 METRIC TONS

HOUR  POSN EAST KM NORTH VEL EAST M/S NORTH TOTAL WIND M/S FROM CURRENT M/S TO  RANGE(KM) AZIM      KM ERROR PCT TOWFORCE DIR
  0  0   -6.410   19.727     -.032     -.228  .230   8.80  320       .11   150    20.74   342      0.000     0.   0.000   0
  1  0   -6.197   18.893      .124     -.253  .282   7.70  300       .16   190    19.82   340       .641    55.   0.000   0
  2  0   -5.702   17.895      .120     -.299  .322   8.20  310       .16   230    18.71   337      1.103    74.   0.000   0
  3  0   -5.345   16.786      .091     -.310  .323   8.20  315       .13   210    18.15   335       .795    94.   0.000   0
  4  0   -5.074   15.679      .049     -.306  .310   5.10  330       .18   220    17.78   333       .837   115.   0.000   0
  5  0   -4.997   14.625     -.000     -.270  .270   7.20  330       .08   240    17.41   334       .933   194.   0.000   0
  6  0   -5.070   13.818     -.041     -.170  .175   3.10  340       .03   270    17.41   333       .700   230.   0.000   0
  7  0   -5.253   13.362     -.054     -.092  .107   2.10  310       .01   250    17.41   334       .747   246.   0.000   0
  8  0   -5.433   13.120     -.044     -.046  .064   2.60  300       .02    30    17.04   335       .611   128.   0.000   0
  9  0   -5.568   13.024     -.030     -.007  .031   2.10  330       .06    70    16.30   337      1.027   109.   0.000   0
 10  0   -5.619   13.010      .011     -.022  .025   7.20  330       .10    60    15.74   339       .830   105.   0.000   0
 11  0   -5.492   12.788      .051     -.101  .113   7.20  355       .12   120    14.82   340       .710    74.   0.000   0
 12  0   -5.277   12.341      .068     -.139  .155   5.10  320       .08   160    13.70   340       .620    56.   0.000   0
 13  0   -5.017   11.875      .075     -.105  .129   2.60  300       .12   130    12.59   341       .602    53.   0.000   0
 14  0   -4.664   11.542      .147     -.093  .174   7.70  270       .08   170    11.30   340       .966    74.   0.000   0
 15  0   -4.003   11.180      .190     -.106  .217   7.70  270       .04   210    10.00   340       .883    68.   0.000   0
 16  0   -3.278   10.732      .227     -.158  .277  10.30  290       .07   190     9.07   337      1.038    99.   0.000 195
 17  0   -2.371   10.032      .272     -.222  .352  11.80  290       .09   190     7.96   331      1.403    99.   0.000 195
 18  0   -1.333    9.111      .300     -.297  .422  14.40  300       .10   200     6.30   331       .583    35.   0.000 195
 19  0    -.277    8.043      .285     -.272  .394  14.40  300       .03   150     4.82   311      2.079    86.   0.000 195
 20  0     .823    7.159      .338     -.221  .404  15.40  290       .04   130     3.70   292      1.264    71.   0.000 195
 21  0    2.054    6.429      .330     -.190  .381  14.40  290       .02   120     2.96   265      1.183    69.   0.000 195
 22  0    3.228    5.778      .328     -.172  .370  14.40  295       .07    80     2.96   223      1.281    60.   0.000   0
 23  0    4.496    5.066      .381     -.243  .452  17.00  300       .06   130     4.44   191      1.487    60.   0.000   0
 24  0    5.894    4.114      .391     -.271  .476  17.50  300       .06   120     4.44   169       .997    59.   0.000   0
RMS ERROR IN COMPUTED DRIFT SEGMENTS 1.0310 KM   RMS ERROR IN POSITION 4.8593 KM  24.OBS
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PROGRAM ICEDRIF. R GARRETT LAST MOD 6 10 1982

ICEBERG RB04 CA=0.20 CW=0.10 X RANGE -10.000 TO 10.000 KM Y RANGE -10.000 TO 10.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 33

INITIAL V .080 M/S 225 DEG LATITUDE 55 DEG 26 HOURS
CA= .200 CW= .100 CS= .0020 CX= .0020
SAIL AREA 240 KEEL AREA 960 SURFACE AREA 2630 M**2 MASS .250E+05 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	6.442	6.908	-.057	-.057	.080	5.10	50	.10	210	9.45	43	0.000	0.	0.000	0
1	0	6.038	6.711	-.155	-.043	.161	5.70	60	.08	210	7.41	38	1.716	79.	0.000	0
2	0	5.382	6.617	-.210	-.010	.211	6.70	65	.10	230	5.93	34	1.019	66.	0.000	0
3	0	4.654	6.572	-.179	-.026	.180	5.10	20	.06	220	4.28	28	1.235	71.	0.000	0
4	0	4.013	6.334	-.195	-.121	.229	8.80	10	.06	200	2.76	5	1.376	67.	0.000	0
5	0	3.347	5.880	-.160	-.101	.189	4.10	20	.05	210	1.96	333	.718	48.	0.000	0
6	0	2.829	5.568	-.137	-.088	.163	6.20	20	.06	170	2.32	297	.760	56.	0.000	0
7	0	2.328	5.173	-.143	-.139	.199	7.20	30	.16	170	3.07	276	.596	48.	0.000	0
8	0	1.832	4.562	-.127	-.197	.235	7.70	30	.21	160	3.98	268	.452	44.	0.000	0
9	0	1.377	3.815	-.131	-.207	.245	7.70	30	.17	160	4.33	261	.259	42.	0.000	0
10	0	.941	3.074	-.103	-.212	.236	7.70	20	.19	150	4.50	256	.481	115.	0.000	0
11	0	.590	2.224	-.099	-.268	.286	8.20	30	.29	160	4.91	252	.425	81.	0.000	0
12	0	.156	1.173	-.147	-.306	.339	8.80	17	.21	170	5.13	248	.731	176.	0.000	0
13	0	-.459	.071	-.192	-.304	.360	8.80	20	.21	180	5.43	242	.751	120.	0.000	0
14	0	-1.179	-.915	-.202	-.228	.304	8.80	20	.09	180	5.93	239	.645	111.	0.000	0
15	0	-1.867	-1.679	-.175	-.223	.283	9.30	360	.09	170	6.67	234	.388	42.	0.000	0
16	0	-2.439	-2.467	-.147	-.197	.245	9.30	360	.03	110	8.33	235	.865	52.	0.000	0
17	0	-2.715	-3.038	.037	-.146	.151	9.30	255	.05	130	8.43	229	.764	87.	0.000	0
18	0	-2.398	-3.652	.054	-.206	.213	8.80	350	.09	110	9.59	227	1.053	87.	0.000	0
19	0	-2.333	-4.504	.025	-.260	.261	8.80	330	.15	120	10.37	226	.543	68.	0.000	0
20	0	-2.208	-5.500	.029	-.287	.288	8.20	350	.19	130	10.93	226	.805	145.	0.000	0
21	0	-2.168	-6.470	-.008	-.240	.240	7.70	355	.12	120	11.48	227	.931	158.	0.000	0
22	0	-2.285	-7.273	-.058	-.216	.224	8.20	350	.06	130	11.85	227	.571	154.	0.000	0
23	0	-2.550	-8.013	-.084	-.192	.210	6.70	350	.05	160	12.41	225	.167	24.	0.000	0
24	0	-2.891	-8.675	-.107	-.178	.208	7.70	355	.03	150	12.69	224	.433	122.	0.000	0
25	0	-3.318	-9.325	-.129	-.188	.228	8.80	350	.01	190	13.06	222	.509	87.	0.000	0
26	0	-3.768	-10.023	-.113	-.200	.230	8.80	350	.05	130	13.52	220	.497	76.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .7966 KM RMS ERROR IN POSITION 5.6496 KM 26.0BS

PROGRAM ICEDRIF, B GARRETT LAST MOD 12 10 1982

ICEBERG PP22X TOW ROT X RANGE -10.000 TO 20.000 KM Y RANGE -10.000 TO 20.000 KM DEVN= 355 KDEVN= 0

INITIAL V .570 M/S 68 DEG LATITUDE 55 DEG 37 HOURS
CA=1.700 CW=2.100 CS= .0020 CX= .0020
SAIL AREA 3800 KEEL AREA 15200 SURFACE AREA 32000 M**2 MASS .110E+07 METRIC TONS

HOUR	POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0 0	-9.788	-3.955	.528	.214	.570	7.20	100	.22	80	10.56	248	0.000	0.	0.000	0
1 0	-9.020	-3.742	.205	.021	.206	4.10	330	.23	70	9.45	246	.404	35.	40.000	147
2 0	-8.025	-3.988	.264	-.062	.271	3.60	340	.20	60	8.89	244	.405	63.	40.000	147
3 0	-7.115	-4.222	.244	-.069	.253	3.60	340	.18	60	8.33	241	.228	32.	40.000	147
4 0	-6.259	-4.410	.233	-.033	.236	2.10	340	.19	50	7.41	237	.293	27.	40.000	147
5 0	-5.320	-4.598	.293	-.076	.302	1.50	10	.23	70	6.67	233	.217	24.	40.000	147
6 0	-4.231	-4.871	.309	-.074	.317	0.00	0	.24	70	5.93	227	.263	27.	40.000	147
7 0	-3.087	-5.199	.327	-.111	.345	.50	220	.25	80	5.37	219	.272	28.	40.000	147
8 0	-1.910	-5.607	.326	-.114	.346	1.00	20	.25	80	5.00	211	.476	59.	40.000	147
9 0	-.746	-6.084	.319	-.153	.354	0.00	0	.24	90	4.63	197	.340	28.	40.000	147
10 0	.309	-6.525	.265	-.084	.278	2.60	170	.19	70	4.63	186	.322	36.	40.000	147
11 0	1.229	-6.808	.247	-.078	.259	3.60	150	.18	70	4.63	177	.328	45.	0.000	0
12 0	1.831	-6.625	.147	.096	.176	3.60	150	.18	70	4.82	158	.960	61.	0.000	0
13 0	2.370	-6.270	.153	.099	.182	1.50	150	.18	60	4.82	146	.369	37.	0.000	0
14 0	2.800	-5.742	.062	.221	.229	7.70	160	.14	30	4.82	141	.293	70.	0.000	0
15 0	2.967	-4.910	.044	.232	.236	7.70	160	.14	30	4.72	131	.412	49.	0.000	0
16 0	3.084	-3.992	.018	.281	.282	9.80	160	.15	20	4.63	121	.353	43.	0.000	0
17 0	3.147	-2.981	.019	.277	.278	9.30	160	.15	20	4.63	110	.382	43.	0.000	0
18 0	3.336	-2.156	.092	.176	.199	10.30	160	.15	80	4.69	107	.614	246.	0.000	0
19 0	3.685	-1.242	.099	.345	.359	13.90	170	.19	40	4.63	100	.440	77.	0.000	0
20 0	4.122	-.152	.145	.249	.288	10.30	170	.19	60	4.82	92	.491	72.	0.000	0
21 0	4.660	.786	.151	.279	.317	12.40	170	.20	60	5.09	82	.312	34.	0.000	0
22 0	5.169	1.899	.130	.340	.364	14.40	170	.20	50	5.74	74	.241	24.	0.000	0
23 0	5.737	2.959	.190	.244	.309	11.30	170	.23	70	6.67	68	.174	15.	0.000	0
24 0	6.381	3.804	.161	.229	.280	11.30	170	.19	70	7.78	62	.312	23.	0.000	0
25 0	6.796	4.640	.064	.236	.244	11.80	147	.17	60	8.89	59	.349	29.	0.000	0
26 0	7.015	5.530	.067	.261	.269	10.80	170	.13	40	10.00	55	.443	34.	0.000	0
27 0	7.292	6.455	.088	.251	.266	11.30	190	.09	30	11.11	52	.339	27.	0.000	0
28 0	7.521	7.290	.033	.214	.217	6.70	160	.12	20	12.41	49	.600	42.	0.000	0
29 0	7.811	8.096	.152	.241	.285	4.60	190	.25	40	13.70	49	.690	53.	0.000	0
30 0	8.517	8.897	.223	.196	.297	1.50	220	.28	50	14.82	49	.151	14.	0.000	0
31 0	9.356	9.603	.236	.209	.315	3.10	220	.28	40	15.93	50	.261	23.	0.000	0
32 0	10.258	10.359	.275	.196	.338	3.60	250	.29	50	17.04	50	.066	6.	0.000	0
33 0	11.223	10.956	.242	.128	.273	3.60	50	.29	60	17.96	51	.250	26.	0.000	0
34 0	12.051	11.359	.240	.116	.267	0.00	0	.29	60	19.45	51	.620	42.	0.000	0
35 0	12.937	11.762	.252	.092	.268	2.60	330	.26	60	20.37	52	.113	11.	0.000	0
36 0	13.832	12.081	.245	.098	.264	0.00	0	.28	60	21.67	51	.793	58.	0.000	0
37 0	14.712	12.459	.243	.108	.266	0.00	0	.27	60	22.78	52	.231	20.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .4152 KM RMS ERROR IN POSITION 1.9411 KM 37.OBS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG RB22X CA=1.70 CW=2.10 X RANGE -10.000 TO 20.000 KM Y RANGE -10.000 TO 20.000 KM 0 TRACKS

IDEVN= 355 KDEVN= 0

INITIAL V .570 M/S 68 DEG LATITUDE 55 DEG 37 HOURS
CA=1.700 CW=2.100 CS= .0020 CX= .0020
SAIL AREA 3800 KEEL AREA 15200 SURFACE AREA 32000 M**2 MASS .110E+07 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-9.788	-3.955	.528	.214	.570	7.20	100	.22	80	10.56	248	0.000	.0.	0.000	0
1	0	-9.020	-3.742	.205	.021	.206	4.10	330	.23	70	9.45	246	.404	35.	0.000	147
2	0	-8.239	-3.695	.203	.023	.204	3.60	340	.20	60	8.89	244	.175	27.	0.000	147
3	0	-7.559	-3.609	.179	.020	.180	3.60	340	.18	60	8.33	241	.230	32.	0.000	147
4	0	-6.952	-3.470	.160	.063	.172	2.10	340	.19	50	7.41	237	.487	45.	0.000	147
5	0	-6.344	-3.237	.187	.060	.197	1.50	10	.23	70	6.67	233	.351	40.	0.000	147
6	0	-5.614	-3.027	.213	.061	.222	0.00	0	.24	70	5.93	227	.353	36.	0.000	147
7	0	-4.803	-2.819	.238	.048	.243	.50	220	.25	80	5.37	219	.369	38.	0.000	147
8	0	-3.921	-2.682	.247	.030	.249	1.00	20	.25	80	5.00	211	.261	32.	0.000	147
9	0	-3.032	-2.615	.247	.004	.247	0.00	0	.24	90	4.63	197	.393	32.	0.000	147
10	0	-2.196	-2.584	.206	.036	.209	2.60	170	.19	70	4.63	186	.210	24.	0.000	147
11	0	-1.539	-2.316	.160	.097	.188	3.60	150	.18	70	4.63	177	.296	41.	0.000	0
12	0	-.991	-1.957	.150	.100	.180	3.60	150	.18	70	4.82	158	1.033	66.	0.000	0
13	0	-.448	-1.600	.153	.099	.182	1.50	150	.18	60	4.82	146	.364	36.	0.000	0
14	0	-.017	-1.071	.062	.221	.229	7.70	160	.14	30	4.82	141	.294	70.	0.000	0
15	0	.151	-.239	.044	.232	.236	7.70	160	.14	30	4.72	131	.412	49.	0.000	0
16	0	.267	.678	.018	.281	.282	9.80	160	.15	20	4.63	121	.353	43.	0.000	0
17	0	.330	1.689	.019	.277	.278	9.30	160	.15	20	4.63	110	.382	43.	0.000	0
18	0	.520	2.515	.092	.176	.199	10.30	160	.15	80	4.69	107	.614	246.	0.000	0
19	0	.868	3.428	.099	.345	.359	13.90	170	.19	40	4.63	100	.440	77.	0.000	0
20	0	1.306	4.519	.145	.249	.288	10.30	170	.19	60	4.82	92	.491	72.	0.000	0
21	0	1.843	5.457	.151	.279	.317	12.40	170	.20	60	5.09	82	.312	34.	0.000	0
22	0	2.352	6.569	.130	.340	.364	14.40	170	.20	50	5.74	74	.241	24.	0.000	0
23	0	2.920	7.630	.190	.244	.309	11.30	170	.23	70	6.67	68	.174	15.	0.000	0
24	0	3.564	8.474	.161	.229	.280	11.30	170	.19	70	7.78	62	.312	23.	0.000	0
25	0	3.979	9.311	.064	.236	.244	11.80	147	.17	60	8.89	59	.349	29.	0.000	0
26	0	4.198	10.201	.067	.261	.269	10.80	170	.13	40	10.00	55	.443	34.	0.000	0
27	0	4.476	11.125	.088	.251	.266	11.30	190	.09	30	11.11	52	.339	27.	0.000	0
28	0	4.704	11.961	.033	.214	.217	6.70	160	.12	20	12.41	49	.600	42.	0.000	0
29	0	4.994	12.767	.152	.241	.285	4.60	190	.25	40	13.70	49	.690	53.	0.000	0
30	0	5.700	13.568	.223	.196	.297	1.50	220	.28	50	14.82	49	.151	14.	0.000	0
31	0	6.539	14.274	.236	.209	.315	3.10	220	.28	40	15.93	50	.261	23.	0.000	0
32	0	7.442	15.029	.275	.196	.338	3.60	250	.29	50	17.04	50	.066	6.	0.000	0
33	0	8.406	15.626	.242	.128	.273	3.60	50	.29	60	17.96	51	.250	26.	0.000	0
34	0	9.235	16.029	.240	.116	.267	0.00	0	.29	60	19.45	51	.620	42.	0.000	0
35	0	10.120	16.432	.252	.092	.268	2.60	330	.26	60	20.37	52	.113	11.	0.000	0
36	0	11.015	16.751	.245	.098	.264	0.00	0	.28	60	21.67	51	.783	58.	0.000	0
37	0	11.895	17.129	.243	.108	.266	0.00	0	.27	60	22.78	52	.231	20.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .4202 KM RMS ERROR IN POSITION 5.0785 KM 37.0HS

PROGRAM ICEDRIF, R GARRETT LAST MOD 6 10 1982

ICEBERG RB30 CA= .2 CW= .1 X RANGE -20.000 TO 10.000 KM Y RANGE -10.000 TO 20.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .300 M/S 58 DEG LATITUDE 55 DEG 27 HOURS
CA= .200 CW= .100 CS= .0020 CX= .0020
SAIL AREA 1800 KEEL AREA 7200 SURFACE AREA 6360 M**2 MASS .370E+06 METRIC TONS

HOUR		POSN EAST KM	NORTH VEL	EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-15.392	-9.618	.254	.159	.300	10.80	170	.13	40	18.15	238	0.000	0.	0.000	0
1	0	-14.619	-8.813	.197	.270	.334	11.30	190	.09	30	17.22	239	.156	16.	0.000	0
2	0	-13.969	-7.847	.157	.251	.296	6.70	160	.12	20	16.30	240	.243	25.	0.000	0
3	0	-13.423	-6.954	.161	.256	.302	4.60	190	.25	40	15.56	241	.289	37.	0.000	0
4	0	-12.776	-6.015	.200	.258	.326	1.50	220	.28	50	14.63	241	.516	56.	0.000	0
5	0	-12.002	-5.109	.226	.246	.334	3.10	220	.28	40	13.89	245	.648	52.	0.000	0
6	0	-11.146	-4.245	.254	.233	.345	3.60	250	.29	50	12.41	247	.348	22.	0.000	0
7	0	-10.193	-3.450	.270	.204	.339	3.60	50	.29	60	11.30	247	.368	33.	0.000	0
8	0	-9.217	-2.768	.275	.179	.328	0.00	0	.29	60	9.63	252	.801	42.	0.000	0
9	0	-8.212	-2.166	.282	.151	.320	2.60	330	.26	60	8.52	257	.480	35.	0.000	0
10	0	-7.204	-1.679	.276	.125	.303	0.00	0	.28	60	7.22	260	.251	18.	0.000	0
11	0	-6.232	-1.249	.264	.114	.287	0.00	0	.27	60	5.74	268	.743	43.	0.000	0
12	0	-5.323	-.855	.235	.106	.257	4.10	90	.26	60	4.87	276	.316	28.	0.000	0
13	0	-4.580	-.481	.179	.102	.205	4.10	50	.26	50	4.07	296	1.004	58.	0.000	0
14	0	-4.033	-.110	.129	.106	.167	4.60	40	.26	50	3.98	312	.531	47.	0.000	0
15	0	-3.656	.296	.075	.123	.144	6.70	70	.25	50	4.54	335	1.235	69.	0.000	0
16	0	-3.525	.810	-.005	.169	.169	8.80	80	.27	40	5.28	346	.711	59.	0.000	0
17	0	-3.660	1.545	-.062	.239	.247	10.30	90	.27	40	6.30	354	.856	66.	0.000	0
18	0	-3.837	2.488	-.017	.275	.275	8.20	90	.28	50	7.59	360	.921	62.	0.000	0
19	0	-3.782	3.505	.040	.293	.296	7.70	110	.27	50	8.70	3	.409	34.	0.000	0
20	0	-3.615	4.584	.042	.302	.304	7.70	90	.27	40	10.56	7	.969	49.	0.000	0
21	0	-3.447	5.661	.065	.296	.303	6.20	100	.27	50	12.04	10	.704	44.	0.000	0
22	0	-3.145	6.709	.097	.287	.302	6.70	80	.32	50	13.15	12	.343	29.	0.000	0
23	0	-2.795	7.746	.094	.295	.310	5.70	90	.32	40	14.45	15	.657	44.	0.000	0
24	0	-2.443	8.840	.107	.311	.329	5.10	50	.39	40	15.56	18	.760	56.	0.000	0
25	0	-2.026	9.982	.120	.326	.347	5.70	70	.41	40	17.04	20	.608	38.	0.000	0
26	0	-1.619	11.192	.101	.345	.360	7.70	80	.41	40	18.15	21	.386	33.	0.000	0
27	0	-1.344	12.459	.047	.356	.360	10.30	80	.41	40	19.08	22	.640	65.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6457 KM RMS ERROR IN POSITION 5.5999 KM 27.OBS

PROGRAM ICEDRIF, R GARRETT LAST MOD 4 10 1982

ICEBERG RB126D CA=2.00 CW=1.60 X RANGE -5.000 TO 10.000 KM Y RANGE -5.000 TO 10.000 KM 0 TRACKS

IDEVN= 37 KDEVN= 0

INITIAL V .420 M/S 249 DEG LATITUDE 55 DEG 18 HOURS
CA=2.000 CW=1.600 CS= .0020 CX= .0020
SAIL AREA 800 KEEL AREA 3200 SURFACE AREA 8000 M**2 MASS .400E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	7.089	-2.721	-.392	-.151	.420	4.60	150	.14	360	7.59	111	0.000	0.	0.000	0
1	0	6.533	-2.350	-.072	.168	.183	4.60	150	.10	40	6.48	114	.675	58.	0.000	0
2	0	6.368	-1.719	-.036	.176	.180	4.10	150	.10	30	5.56	110	.546	54.	0.000	0
3	0	6.256	-1.055	-.022	.198	.200	4.60	160	.12	40	5.00	104	.258	33.	0.000	0
4	0	6.180	-.298	-.027	.220	.222	5.70	150	.12	40	4.63	89	.553	42.	0.000	0
5	0	6.075	.467	-.028	.199	.201	5.10	150	.10	40	4.94	80	.346	43.	0.000	0
6	0	5.922	1.076	-.067	.134	.149	4.10	140	.08	340	5.19	67	.561	48.	0.000	0
7	0	5.645	1.518	-.073	.122	.142	5.10	140	.04	20	5.56	69	.839	202.	0.000	0
8	0	5.381	1.893	-.084	.077	.114	4.60	150	.08	290	5.74	64	.281	53.	0.000	0
9	0	5.024	2.129	-.113	.062	.128	4.10	140	.09	300	5.83	62	.349	157.	0.000	0
10	0	4.558	2.344	-.149	.057	.160	4.10	140	.14	300	5.65	62	.427	231.	0.000	0
11	0	3.938	2.579	-.195	.080	.210	4.60	140	.17	310	5.56	59	.396	129.	0.000	0
12	0	3.153	2.991	-.240	.157	.287	5.10	130	.21	340	5.37	48	.321	30.	0.000	0
13	0	2.339	3.554	-.204	.131	.242	4.60	140	.16	320	4.44	40	.817	71.	0.000	0
14	0	1.610	4.037	-.207	.153	.258	5.10	130	.17	340	4.17	23	.503	39.	0.000	0
15	0	.775	4.737	-.263	.244	.359	7.20	130	.24	350	5.00	4	.634	37.	40.000	350
16	0	-.138	6.765	-.234	.611	.654	6.20	140	.27	360	6.48	355	.558	32.	40.000	350
17	0	-1.020	9.052	-.260	.660	.710	7.70	150	.32	360	8.15	350	.721	40.	0.000	0
18	0	-1.823	10.477	-.207	.337	.396	8.20	150	.23	360	9.82	351	.725	43.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .5572 KM RMS ERROR IN POSITION .9516 KM 18.OBS

ICEBERG RB126D CA=2.00 CW=1.60 X RANGE -5.000 TO 10.000 KM Y RANGE -5.000 TO 10.000 KM 0 TRACKS

IDEVN= 37 KDEVN= 0

INITIAL V .420 M/S 249 DEG LATITUDE 55 DEG 18 HOURS
CA=2.000 CW=1.600 CS= .0020 CX= .0020
SAIL AREA 800 KEEL AREA 3200 SURFACE AREA 8000 M**2 MASS .400E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	7.089	-2.721	-.392	-.151	.420	4.60	150	.14	360	7.59	111	0.000	0.	0.000	0
1	0	6.533	-2.350	-.072	.168	.183	4.60	150	.10	40	6.48	114	.675	58.	0.000	0
2	0	6.368	-1.719	-.036	.176	.180	4.10	150	.10	30	5.56	110	.546	54.	0.000	0
3	0	6.256	-1.055	-.022	.198	.200	4.60	160	.12	40	5.00	104	.258	33.	0.000	0
4	0	6.180	-.298	-.027	.220	.222	5.70	150	.12	40	4.63	89	.553	42.	0.000	0
5	0	6.075	.467	-.028	.199	.201	5.10	150	.10	40	4.94	80	.346	43.	0.000	0
6	0	5.922	1.076	-.067	.134	.149	4.10	140	.08	340	5.19	67	.561	48.	0.000	0
7	0	5.645	1.518	-.073	.122	.142	5.10	140	.04	20	5.56	69	.839	202.	0.000	0
8	0	5.381	1.893	-.084	.077	.114	4.60	150	.08	290	5.74	64	.281	53.	0.000	0
9	0	5.024	2.129	-.113	.062	.128	4.10	140	.09	300	5.83	62	.349	157.	0.000	0
10	0	4.558	2.344	-.149	.057	.160	4.10	140	.14	300	5.65	62	.427	231.	0.000	0
11	0	3.938	2.579	-.195	.080	.210	4.60	140	.17	310	5.56	59	.396	129.	0.000	0
12	0	3.153	2.991	-.240	.157	.287	5.10	130	.21	340	5.37	48	.321	30.	0.000	0
13	0	2.339	3.554	-.204	.131	.242	4.60	140	.16	320	4.44	40	.817	71.	0.000	0
14	0	1.610	4.037	-.207	.153	.258	5.10	130	.17	340	4.17	23	.503	39.	0.000	0
15	0	.775	4.737	-.263	.244	.359	7.20	130	.24	350	5.00	4	.634	37.	0.000	350
16	0	-.155	5.729	-.241	.301	.386	6.20	140	.27	360	6.48	355	.478	28.	0.000	350
17	0	-1.022	6.945	-.249	.377	.452	7.70	150	.32	360	8.15	350	.352	20.	0.000	0
18	0	-1.858	8.257	-.208	.337	.396	8.20	150	.23	360	9.82	351	.799	48.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .5386 KM RMS ERROR IN POSITION 1.0085 KM 18.OBS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG F022 CA=0.5 CW=1.7 X RANGE -5.000 TO 15.000 KM Y RANGE -10.000 TO 10.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .320 M/S 340 DEG LATITUDE 54 DEG 30 HOURS
CA= .500 CW=1.700 CS= .0020 CX= .0020
SAIL AREA 1780 KEEL AREA 7120 SURFACE AREA 6400 M**2 MASS .400E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	6.075	-5.866	-.109	.301	.320	14.00	170	.12	340	8.45	134	0.000	0.	0.000	0
1	0	5.785	-5.034	-.098	.206	.228	13.00	170	.12	310	7.59	135	.533	62.	0.000	0
2	0	5.437	-4.292	-.088	.209	.227	13.00	170	.11	320	6.67	132	.179	18.	0.000	0
3	0	5.205	-3.531	-.038	.214	.217	13.00	170	.09	350	6.04	128	.039	5.	0.000	0
4	0	5.130	-2.775	-.007	.205	.205	14.00	170	.07	10	5.44	121	.158	17.	0.000	0
5	0	5.162	-2.058	.026	.193	.195	13.00	180	.07	20	5.37	113	.244	32.	0.000	0
6	0	5.259	-1.424	.023	.157	.159	12.00	180	.04	20	5.37	108	.206	44.	0.000	0
7	0	5.345	-.860	.027	.159	.161	11.00	175	.06	30	5.44	102	.137	24.	0.000	0
8	0	5.484	-.365	.053	.112	.124	11.00	180	.05	90	5.61	96	.127	21.	0.000	0
9	0	5.627	.007	.019	.098	.100	11.00	180	.01	160	5.76	92	.035	8.	0.000	0
10	0	5.651	.326	-.002	.079	.078	12.00	190	.05	220	5.67	90	.163	74.	0.000	0
11	0	5.641	.576	-.002	.062	.062	11.00	200	.06	230	5.83	80	.768	76.	0.000	0
12	0	5.702	.943	.039	.150	.155	11.00	200	.06	360	5.83	74	.303	50.	0.000	0
13	0	5.851	1.549	.039	.183	.187	12.50	210	.09	340	5.89	67	.347	48.	0.000	0
14	0	5.961	2.155	.022	.149	.151	11.50	200	.05	330	6.28	59	.359	38.	0.000	0
15	0	6.058	2.689	.034	.150	.154	9.00	210	.08	350	6.85	55	.211	29.	0.000	0
16	0	6.219	3.195	.057	.127	.139	8.00	200	.06	30	6.85	53	.434	182.	0.000	0
17	0	6.498	3.543	.101	.063	.119	9.00	200	.08	110	7.19	51	.174	42.	0.000	0
18	0	6.888	3.846	.108	.119	.160	8.00	210	.09	40	7.54	52	.188	50.	0.000	0
19	0	7.280	4.355	.112	.158	.194	9.00	190	.12	50	7.87	52	.330	99.	0.000	0
20	0	7.638	4.864	.081	.118	.144	9.00	190	.06	60	8.13	52	.381	147.	0.000	0
21	0	7.837	5.135	.029	.028	.040	8.00	180	.06	170	8.22	52	.248	268.	0.000	0
22	0	7.882	5.263	-.001	.054	.054	7.50	180	.02	230	8.19	51	.167	113.	0.000	0
23	0	7.816	5.497	-.037	.074	.083	8.50	170	.04	260	8.19	49	.119	42.	0.000	0
24	0	7.603	5.859	-.081	.131	.154	8.50	160	.09	310	8.33	45	.177	30.	0.000	0
25	0	7.132	6.461	-.193	.202	.279	10.00	100	.22	330	8.63	40	.171	21.	0.000	0
26	0	6.541	7.212	-.119	.209	.241	10.00	155	.14	330	9.45	37	.750	80.	0.000	0
27	0	6.212	7.948	-.070	.197	.209	10.00	160	.11	340	10.19	34	.380	42.	0.000	0
28	0	6.067	8.621	-.008	.177	.177	11.50	165	.07	20	10.19	33	.575	324.	0.000	0
29	0	6.079	9.201	.008	.144	.145	11.00	170	.04	30	10.56	33	.329	89.	0.000	0
30	0	6.099	9.702	.001	.136	.136	11.00	162	.04	40	10.93	32	.090	22.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .3321 KM RMS ERROR IN POSITION .9700 KM 30.OBS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG K013 CA=0.6 CW=0.7 X RANGE -10.000 TO 10.000 KM Y RANGE -10.000 TO 10.000 KM 0 TRACKS

IDEVN= -15 KDEVN= 15

INITIAL V .200 M/S 210 DEG LATITUDE 59 DEG 16 HOURS
CA= .600 CW= .700 CS= .0020 CX= .0020
SAIL AREA 1800 KEEL AREA 7600 SURFACE AREA 1200 M**2 MASS .800E+06 METRIC TONS

HOUR	POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0 8.414	5.055	-.100	-.173	.200	7.00	350	.23	220	9.82	59	0.000	0.	0.000	0
1	0 7.933	4.358	-.139	-.176	.224	6.00	335	.11	220	9.63	60	.613	244.	0.000	0
2	0 7.469	3.802	-.127	-.142	.190	7.00	340	.11	240	8.89	62	.090	11.	0.000	0
3	0 6.914	3.223	-.202	-.194	.280	9.00	10	.21	230	8.15	65	.177	20.	0.000	0
4	0 5.932	2.436	-.346	-.234	.417	9.00	360	.38	240	6.85	70	.315	22.	0.000	0
5	0 4.502	1.593	-.432	-.231	.490	9.00	340	.45	244	5.74	81	.895	55.	0.000	0
6	0 2.879	.771	-.466	-.226	.517	9.00	340	.47	245	4.63	92	.626	42.	0.000	0
7	0 1.237	-.118	-.434	-.280	.516	9.00	340	.42	230	3.52	107	.381	25.	0.000	0
8	0 -.173	-1.069	-.343	-.220	.408	11.00	330	.31	250	2.41	135	.375	21.	0.000	0
9	0 -1.280	-1.777	-.281	-.184	.336	10.00	330	.27	250	2.19	162	.342	31.	0.000	0
10	0 -2.268	-2.379	-.276	-.146	.312	10.00	345	.25	260	2.96	207	1.033	49.	0.000	0
11	0 -3.237	-2.995	-.254	-.219	.335	12.00	340	.23	240	4.63	225	.960	47.	0.000	0
12	0 -4.048	-3.787	-.191	-.199	.276	10.00	340	.14	240	5.56	231	.615	58.	0.000	0
13	0 -4.754	-4.579	-.229	-.260	.346	13.00	360	.20	230	7.04	234	.687	45.	0.000	0
14	0 -5.622	-5.665	-.231	-.348	.417	12.00	320	.33	220	8.33	229	.366	25.	0.000	0
15	0 -6.514	-6.984	-.286	-.372	.469	13.00	320	.42	230	9.63	225	.372	26.	0.000	0
16	0 -7.657	-8.344	-.341	-.384	.514	13.00	325	.44	230	10.74	222	.788	64.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6043 KM RMS ERROR IN POSITION 1.2081 KM 16.0BS

ICEBERG LR1 CA=0.2 CW=1.3 X RANGE -10.000 TO 10.000 KM Y RANGE 0.000 TO 20.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .120 M/S 320 DEG LATITUDE 54 DEG 28 HOURS
CA= .200 CW=1.300 CS= .0020 CX= .0020
SAIL AREA 2520 KEEL AREA 10080 SURFACE AREA 10000 M**2 MASS .200E+07 METRIC TONS

HOUR	POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0 2.357	2.357	-.077	.092	.120	10.50	135	.11	60	3.33	45	0.000	0.	0.000	0
1	0 2.328	2.711	.020	.094	.096	11.00	120	.07	75	3.41	38	.231	55.	0.000	0
2	0 2.426	3.052	.036	.103	.109	10.50	130	.11	60	3.41	33	.379	128.	0.000	0
3	0 2.530	3.310	.001	.006	.006	14.50	115	.13	190	3.43	30	.289	161.	0.000	0
4	0 2.443	3.266	-.027	-.002	.027	14.50	117	.09	120	3.43	26	.199	83.	0.000	0
5	0 2.307	3.362	-.064	.058	.086	13.50	115	.05	343	3.46	10	.800	83.	0.000	0
6	0 1.953	3.628	-.134	.074	.153	13.00	115	.15	270	3.80	0	.274	38.	0.000	0
7	0 1.380	3.876	-.173	.067	.186	12.00	120	.13	270	4.44	357	.521	76.	0.000	0
8	0 .721	4.171	-.195	.107	.222	13.50	125	.15	300	6.00	341	1.418	67.	0.000	0
9	0 .034	4.620	-.178	.130	.221	13.00	135	.13	290	6.56	341	.512	92.	0.000	0
10	0 -.573	5.083	-.163	.128	.207	13.00	135	.13	290	6.56	341	.764	0.	0.000	0
11	0 -1.119	5.539	-.136	.124	.184	12.50	150	.10	290	6.93	343	.657	150.	0.000	0
12	0 -1.517	5.975	-.082	.118	.143	12.00	165	.05	300	7.22	342	.270	84.	0.000	0
13	0 -1.713	6.416	-.029	.132	.135	11.50	165	.06	10	7.59	344	.336	74.	0.000	0
14	0 -1.805	6.865	-.041	.103	.111	13.50	165	.10	270	7.59	346	.515	196.	0.000	0
15	0 -2.010	7.200	-.061	.092	.110	13.50	175	.08	270	7.59	347	.451	341.	0.000	0
16	0 -2.166	7.605	-.015	.143	.144	13.50	190	.08	12	7.96	348	.208	53.	0.000	0
17	0 -2.117	8.167	.031	.153	.157	14.00	185	.05	0	8.52	348	.165	30.	0.000	0
18	0 -2.048	8.797	-.011	.215	.215	13.00	185	.27	340	8.89	346	.561	117.	0.000	0
19	0 -2.243	9.734	-.095	.293	.313	12.00	185	.36	330	9.63	347	.253	33.	0.000	0
20	0 -2.621	10.917	-.098	.355	.369	13.00	185	.30	340	10.19	345	.733	112.	0.000	0
21	0 -2.829	12.174	-.002	.325	.325	14.00	190	.20	10	10.00	346	1.455	569.	0.000	0
22	0 -2.729	13.310	.035	.316	.318	15.00	200	.25	350	12.04	346	1.029	51.	0.000	0
23	0 -2.460	14.311	.152	.202	.253	14.50	200	.20	80	12.96	347	.278	29.	0.000	0
24	0 -1.676	14.747	.262	.050	.266	13.00	200	.26	110	13.52	350	.326	37.	0.000	0
25	0 -.693	14.524	.270	-.191	.331	13.00	205	.41	150	13.89	354	.728	71.	0.000	0
26	0 .090	13.456	.140	-.384	.409	13.00	210	.48	180	13.89	356	1.150	237.	0.000	0
27	0 .431	11.957	.069	-.431	.436	12.00	310	.37	180	13.33	359	1.053	116.	0.000	0
28	0 .480	10.496	-.061	-.360	.366	6.50	300	.30	210	13.33	2	1.593	228.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .7215 KM RMS ERROR IN POSITION 1.5048 KM 29.0BS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG L6X CA=0.6 CW=1.0 60,-60 X RANGE -5.000 TO 10.000 KM Y RANGE -15.000 TO 0.000 KM 0 TRACKS

IDEVN= 60 KDEVN= -60

INITIAL V .110 M/S 260 DEG LATITUDE 54 DEG 46 HOURS
CA= .600 CW=1.000 CS= .0020 CX= .0020
SAIL AREA 5720 KEEL AREA 22880 SURFACE AREA 15000 M**2 MASS .181E+07 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	9.032	-2.762	-.108	-.019	.110	5.00	150	.10	250	9.45	107	0.000	0.	0.000	0
1	0	8.723	-2.967	-.086	-.075	.114	4.50	145	.11	260	9.07	106	.466	115.	0.000	0
2	0	8.379	-3.255	-.106	-.081	.133	4.00	145	.11	275	8.89	105	.531	219.	0.000	0
3	0	7.961	-3.515	-.125	-.059	.138	4.50	155	.09	290	8.70	104	.533	221.	0.000	0
4	0	7.486	-3.666	-.139	-.025	.141	5.00	155	.08	310	8.70	103	.592	389.	0.000	0
5	0	6.980	-3.729	-.141	-.017	.142	5.00	140	.08	310	9.07	106	.889	149.	0.000	0
6	0	6.525	-3.749	-.104	.015	.105	5.00	150	.03	20	9.35	107	.709	221.	0.000	0
7	0	6.189	-3.631	-.090	.047	.102	5.00	140	.06	40	9.35	111	.746	114.	0.000	0
8	0	5.929	-3.445	-.045	.050	.068	4.50	150	.04	110	9.26	114	.601	121.	0.000	0
9	0	5.809	-3.281	-.030	.042	.051	5.00	140	.05	110	9.07	118	.734	110.	0.000	0
10	0	5.719	-3.180	-.020	.007	.021	4.50	120	.04	170	8.70	121	.563	95.	0.000	0
11	0	5.614	-3.237	-.046	-.037	.059	5.00	125	.05	240	8.15	123	.532	85.	0.000	0
12	0	5.443	-3.424	-.036	-.063	.072	4.50	105	.06	210	7.59	126	.545	79.	0.000	0
13	0	5.340	-3.680	-.026	-.079	.083	5.50	120	.08	205	7.04	130	.678	90.	0.000	0
14	0	5.191	-3.969	-.064	-.077	.100	6.50	140	.07	230	6.48	132	.637	106.	0.000	0
15	0	4.858	-4.255	-.122	-.089	.151	6.50	135	.11	268	5.93	135	.523	81.	0.000	0
16	0	4.398	-4.577	-.121	-.081	.146	5.50	135	.08	270	5.19	134	.910	122.	0.000	0
17	0	4.037	-4.852	-.075	-.077	.107	5.00	130	.08	235	5.00	133	.548	267.	0.000	0
18	0	3.805	-5.121	-.061	-.069	.092	3.50	155	.08	250	5.28	132	.519	178.	0.000	0
19	0	3.579	-5.332	-.066	-.046	.080	3.50	195	.08	270	5.74	131	.636	135.	0.000	0
20	0	3.331	-5.431	-.072	-.008	.072	3.00	220	.06	315	6.30	132	.690	122.	0.000	0
21	0	3.092	-5.392	-.055	.024	.060	5.00	230	.06	285	6.67	138	.781	101.	0.000	0
22	0	2.971	-5.263	-.006	.051	.052	5.50	275	.03	330	6.85	140	.429	143.	0.000	0
23	0	2.955	-5.079	-.022	.049	.054	5.00	205	.04	320	7.04	143	.575	141.	0.000	0
24	0	2.809	-4.900	-.050	.048	.069	4.50	205	.04	310	7.04	152	1.102	100.	0.000	0
25	0	2.627	-4.762	-.049	.026	.056	6.50	195	.05	230	7.04	159	.777	90.	0.000	0
26	0	2.502	-4.691	-.013	.019	.023	4.00	180	.05	170	6.95	162	.273	72.	0.000	0
27	0	2.497	-4.634	.003	.009	.009	4.50	165	.06	185	6.67	166	.535	97.	0.000	0
28	0	2.469	-4.660	-.025	-.027	.037	5.00	145	.07	230	6.39	168	.355	99.	0.000	0
29	0	2.366	-4.831	-.019	-.065	.068	5.00	145	.11	210	6.30	174	.589	88.	0.000	0
30	0	2.263	-5.105	-.052	-.084	.099	5.00	140	.10	245	6.02	175	.541	182.	0.000	0
31	0	2.028	-5.434	-.070	-.098	.120	4.00	130	.11	250	5.74	175	.641	231.	0.000	0
32	0	1.685	-5.792	-.136	-.094	.166	6.50	135	.10	290	5.74	174	.576	575.	0.000	0
33	0	1.117	-6.091	-.166	-.075	.183	5.50	110	.11	310	5.46	171	1.025	254.	0.000	0
34	0	.499	-6.335	-.178	-.058	.187	7.00	110	.10	330	5.56	168	.941	311.	0.000	0
35	0	-.137	-6.487	-.173	-.026	.175	6.00	130	.09	330	5.93	168	.744	201.	0.000	0
36	0	-.703	-6.494	-.137	.025	.140	6.00	170	.05	340	6.30	168	.734	198.	0.000	0
37	0	-1.135	-6.381	-.108	.025	.111	5.00	115	.05	5	6.85	171	.748	114.	0.000	0
38	0	-1.462	-6.299	-.069	.028	.074	4.00	110	.05	60	6.95	178	.563	66.	0.000	0
39	0	-1.608	-6.164	-.011	.046	.048	1.50	130	.06	105	7.04	181	.318	84.	0.000	0
40	0	-1.550	-6.016	.042	.025	.049	3.00	60	.08	150	7.22	186	.751	116.	0.000	0
41	0	-1.348	-6.045	.063	-.047	.079	7.00	85	.13	150	7.41	190	.737	136.	0.000	0
42	0	-.981	-6.308	.158	-.097	.186	8.50	45	.20	150	7.59	194	.937	169.	0.000	0
43	0	-.403	-6.770	.127	-.155	.200	7.50	55	.11	185	7.78	195	.818	358.	0.000	0
44	0	.014	-7.388	.130	-.185	.226	8.00	35	.15	185	7.96	196	.765	332.	0.000	0
45	0	.455	-8.132	.092	-.231	.249	12.50	35	.08	230	8.33	198	.948	203.	0.000	0
46	0	.706	-9.073	.055	-.291	.296	15.00	30	.12	260	8.89	197	.457	79.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6815 KM RMS ERROR IN POSITION 1.8046 KM 46.0RS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG RK018 CA=1.0 CW=1.1 X RANGE -10.000 TO 5.000 KM Y RANGE -5.000 TO 10.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .320 M/S 260 DEG LATITUDE 59 DEG 15 HOURS
CA=1.000 CW=1.100 CS= .0020 CX= .0020
SAIL AREA 12000 KEEL AREA 48000 SURFACE AREA 50000 M**2 MASS .120E+08 METRIC TONS

HOUR	POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0 -1.084	10.314	-.315	-.056	.320	8.00	300	.18	240	10.37	354	0.000	0.	0.000	0
1	0 -1.863	9.928	-.160	-.188	.247	11.00	340	.20	240	10.19	350	.140	19.	0.000	0
2	0 -2.380	9.057	-.129	-.262	.292	9.00	340	.16	220	9.82	349	.629	154.	0.000	0
3	0 -2.741	8.078	-.063	-.288	.295	12.00	330	.13	210	8.95	347	.230	25.	0.000	0
4	0 -2.909	6.936	-.051	-.350	.354	12.00	340	.20	210	7.95	346	.291	29.	0.000	0
5	0 -3.133	5.692	-.065	-.323	.330	11.00	325	.17	220	6.70	346	.525	42.	0.000	0
6	0 -3.297	4.617	-.016	-.277	.278	8.50	305	.15	190	5.35	344	.422	31.	0.000	0
7	0 -3.275	3.669	.019	-.252	.253	7.00	300	.15	190	4.26	340	.194	17.	0.000	0
8	0 -3.185	2.782	.031	-.245	.246	10.00	305	.13	210	3.19	328	.524	40.	0.000	0
9	0 -3.129	1.901	-.011	-.245	.245	9.00	330	.13	220	2.65	309	.453	41.	0.000	0
10	0 -3.238	1.002	-.040	-.257	.260	11.00	325	.14	230	2.59	288	.301	31.	0.000	0
11	0 -3.415	.160	-.057	-.195	.203	8.00	320	.09	250	3.41	269	.765	60.	0.000	0
12	0 -3.637	-.450	-.067	-.156	.170	7.00	320	.11	250	4.28	260	.588	56.	0.000	0
13	0 -3.914	-1.009	-.089	-.159	.182	7.00	330	.14	250	5.09	255	.430	47.	0.000	0
14	0 -4.259	-1.600	-.096	-.169	.195	6.00	325	.13	230	5.94	249	.361	35.	0.000	0
15	0 -4.561	-2.206	-.065	-.162	.175	4.50	320	.12	180	6.65	245	.188	23.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .4394 KM RMS ERROR IN POSITION 1.2434 KM 15.OBS

PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG SK024 CA=0.3 CW=0.2 X RANGE -10.000 TO 20.000 KM Y RANGE -15.000 TO 15.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .150 M/S 280 DEG LATITUDE 58 DEG 50 HOURS
CA= .300 CW= .200 CS= .0020 CX= .0020
SAIL AREA 1200 KEEL AREA 4800 SURFACE AREA 4200 M**2 MASS .300E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	9.649	9.992	-.148	.026	.150	5.70	260	.10	196	13.89	44	0.000	0.	0.000	0
1	0	9.444	9.995	.008	-.030	.031	6.20	285	.10	219	13.52	43	.249	56.	0.000	0
2	0	9.556	9.669	.033	-.163	.166	6.70	310	.21	214	12.96	44	.403	67.	0.000	0
3	0	9.664	8.882	.037	-.257	.259	8.20	287	.21	208	12.04	47	.451	40.	0.000	0
4	0	9.789	7.899	.022	-.284	.285	6.70	295	.21	208	11.30	53	.438	31.	0.000	0
5	0	9.832	6.887	.011	-.271	.271	10.30	300	.15	233	10.93	57	.191	22.	0.000	0
6	0	9.869	5.905	.003	-.287	.287	12.40	320	.15	245	10.56	60	.314	47.	0.000	0
7	0	9.870	4.854	.008	-.286	.286	13.40	330	.05	270	10.28	64	.294	38.	0.000	0
8	0	9.903	3.830	-.001	-.289	.289	13.40	340	.05	265	10.00	64	.946	341.	0.000	0
9	0	9.926	2.808	.030	-.274	.275	12.90	330	0.00	0	9.63	67	.427	67.	0.000	0
10	0	10.059	1.873	.026	-.245	.246	11.30	330	.05	274	9.07	67	.965	174.	0.000	0
11	0	10.078	1.028	-.016	-.228	.229	9.30	340	.05	244	8.70	69	.486	100.	0.000	0
12	0	10.005	.285	-.011	-.179	.179	7.70	300	.05	248	7.78	71	.716	74.	0.000	0
13	0	9.982	-.286	-.013	-.144	.144	6.20	346	0.00	0	7.04	73	.609	78.	0.000	0
14	0	9.886	-.750	-.040	-.112	.119	4.60	5	0.00	0	6.67	79	.334	41.	0.000	0
15	0	9.712	-1.245	-.051	-.195	.201	7.70	360	.21	195	6.30	85	.249	32.	0.000	0
16	0	9.415	-2.235	-.148	-.334	.366	9.30	10	.26	233	6.04	93	.137	15.	0.000	0
17	0	8.603	-3.323	-.286	-.234	.370	6.20	20	.26	264	5.89	101	.629	74.	0.000	0
18	0	7.613	-3.870	-.223	-.074	.235	4.60	10	.05	302	5.87	107	.825	134.	0.000	0
19	0	6.980	-3.938	-.150	.029	.153	4.10	15	.15	340	5.80	113	.598	97.	0.000	0
20	0	6.508	-3.735	-.107	.069	.127	4.60	360	.10	0	6.11	117	.920	176.	0.000	0
21	0	6.220	-3.495	-.054	.060	.081	4.10	320	.05	0	6.67	125	1.324	126.	0.000	0
22	0	6.106	-3.318	-.014	.037	.039	4.10	330	.05	21	7.04	128	.714	138.	0.000	0
23	0	6.091	-3.244	.003	.003	.004	4.60	345	.05	38	7.59	129	.639	112.	0.000	0
24	0	6.095	-3.303	-.005	-.036	.036	4.10	5	0.00	0	7.22	130	.420	107.	0.000	0
25	0	6.048	-3.497	-.021	-.070	.073	3.60	5	.05	197	6.85	134	.562	91.	0.000	0
26	0	5.934	-3.799	-.048	-.095	.107	2.60	10	.10	245	6.67	136	.324	108.	0.000	0
27	0	5.679	-4.165	-.095	-.106	.143	2.60	350	.15	255	6.43	137	.462	173.	0.000	0
28	0	5.265	-4.533	-.129	-.091	.158	2.60	350	.10	263	6.33	140	.239	69.	0.000	0
29	0	4.801	-4.759	-.120	-.026	.123	1.50	360	.05	330	6.57	143	.389	94.	0.000	0
30	0	4.418	-4.721	-.096	.043	.106	1.00	35	.10	348	6.65	143	.439	593.	0.000	0
31	0	4.113	-4.471	-.070	.091	.115	1.00	0	.10	6	6.85	147	.688	134.	10.000	160
32	0	4.263	-5.208	.071	-.287	.296	5.10	120	.15	3	7.22	150	.354	68.	10.000	160
33	0	4.534	-6.404	.083	-.400	.409	3.10	160	0.00	0	7.78	152	.627	102.	10.000	180
34	0	4.490	-7.841	-.044	-.358	.361	2.60	160	.10	20	8.89	155	.289	24.	10.000	190
35	0	4.164	-8.975	-.107	-.282	.301	2.60	170	.15	16	9.45	160	.374	38.	10.000	190
36	0	3.776	-10.018	-.107	-.311	.329	3.60	160	.10	31	10.56	167	.594	36.	10.000	190
37	0	3.370	-11.220	-.122	-.354	.374	5.10	160	.05	39	10.93	167	.973	263.	10.000	190
38	0	2.883	-12.572	-.149	-.398	.425	4.10	160	0.00	0	11.48	167	1.016	183.	10.000	180
39	0	2.503	-14.062	-.087	-.419	.428	5.10	165	0.00	0	12.04	168	.952	161.	10.000	180
40	0	2.203	-15.580	-.081	-.425	.432	4.10	165	0.00	0	12.41	168	1.215	328.	0.000	0
41	0	1.900	-16.225	-.090	-.057	.106	5.70	150	0.00	0	12.59	168	.576	311.	0.000	0
42	0	1.545	-16.161	-.106	.089	.138	7.20	150	.05	327	12.96	167	.754	174.	0.000	0
43	0	1.160	-15.608	-.105	.215	.240	7.20	155	.15	343	12.96	168	.624	276.	0.000	0
44	0	.833	-14.716	-.070	.261	.270	5.70	130	.15	4	12.96	170	.985	218.	0.000	0
45	0	.598	-13.737	-.074	.291	.300	7.20	120	.21	2	12.96	168	1.122	248.	0.000	0
46	0	.303	-12.588	-.083	.350	.359	6.70	145	.26	355	11.48	171	.633	39.	0.000	0
47	0	.022	-11.236	-.073	.396	.402	7.70	145	.26	354	12.04	171	1.936	348.	0.000	0
48	0	-.189	-9.821	-.037	.378	.379	7.20	140	.21	7	11.30	173	.795	94.	0.000	0
49	0	-.289	-8.469	-.027	.387	.388	7.70	141	.26	5	10.93	174	1.015	243.	0.000	0
50	0	-.417	-7.055	-.051	.388	.392	9.30	130	.21	2.	10.37	176	.939	141.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .7276 KM RMS ERROR IN POSITION 2.2603 KM 50.OBS

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PROGRAM ICEDRIF, B GARRETT    LAST MOD 6 10 1982
ICEBERG SK042 CA=2.0    CW=1.2             X RANGE    -5.000 TO  15.000 KM   Y RANGE   -10.000 TO   10.000 KM    0 TRACKS
                                         IDEVN=  20 KDEVN= -15


INITIAL V   .200 M/S 335 DEG  LATITUDE  58 DEG 45 HOURS
CA=2.000  CW=1.200  CS= .0020  CX= .0020
SAIL AREA   2250  KEEL AREA  9000  SURFACE AREA 14000 M**2  MASS   .500E+06 METRIC TONS
HOUR  POSN EAST KM NORTH VEL EAST M/S NORTH TOTAL WIND M/S FROM CURRENT M/S TO  RANGE(KM) AZIM     KM ERROR PCT TOWFORCE DIR
   0   0    15.993     -3.988       -.085       .181  .200    12.90   105         .36     333       16.48   104         0.000       0.      0.000    0
   1   0    14.132     -3.091       -.550       .272  .613    13.40    95         .41     342       15.93   101         1.504     148.      0.000    0
   2   0    12.225     -2.078       -.508       .291  .585    12.90   105         .36     343       15.00    98         1.129      92.      0.000    0
   3   0    10.523     -1.033       -.437       .289  .523    10.80   100         .36     348       14.26    97         1.219     156.      0.000    0
   4   0     9.121      -.108       -.341       .219  .406     8.80   100         .26     348       13.70    95          .978     132.      0.000    0
   5   0     8.508       .568        .014       .157  .158     7.70   105         .26      77       13.33    96          .903     206.      0.000    0
   6   0     8.373      1.137       -.119       .167  .205     6.20   110         .15      22       12.96    96          .580     156.      0.000    0
   7   0     7.874      1.668       -.147       .119  .189     6.70   105         .10      22       12.96    95          .604     267.      0.000    0
   8   0     7.494      2.068       -.057       .110  .124     3.10   110         .10      36       12.59    95          .368      99.      0.000    0
   9   0     7.423      2.457        .011       .105  .106     0.00     0         .10      44       12.22    96          .652     152.      0.000    0
  10   0     7.501      2.754        .021       .044  .049     0.00     0        0.00       0       11.30    96         1.019     110.      0.000    0
  11   0     7.494      2.758       -.033      -.039  .051     0.00     0         .10     248       10.56    97          .759      99.      0.000    0
  12   0     7.374      2.614       -.007      -.016  .018     3.10   260         .05     286        9.63    96          .887      94.      0.000    0
  13   0     7.104      2.543       -.180      -.043  .185     0.00     0         .26     279        8.52    92         1.114      87.      0.000    0
  14   0     6.209      2.332       -.303      -.070  .311     0.00     0         .36     279        7.41    89          .671      57.      0.000    0
  15   0     5.048      2.182       -.324       .014  .324     0.00     0         .31     303        6.48    85          .623      60.      0.000    0
  16   0     4.046      2.504       -.216       .163  .271     0.00     0         .26     342        6.02    79          .523      65.      0.000    0
  17   0     3.485      3.253       -.098       .243  .262     1.00   145         .26      11        5.93    75          .524     123.      0.000    0
  18   0     3.322      4.101        .004       .203  .204     2.10   160         .15      37        5.74    73          .706     257.      0.000    0
  19   0     3.398      4.662        .025       .106  .109     2.10   160         .05      59        5.57    71          .518     200.      0.000    0
  20   0     3.561      4.969        .082       .077  .112     3.10   150         .15     101        4.85    72         1.029     141.      0.000    0
  21   0     3.890      5.227        .087       .063  .108     2.60   165         .10     109        5.09    73          .278     109.      0.000    0
  22   0     4.213      5.303        .096      -.030  .101     2.10   160         .15     152        4.83    75          .612     196.      0.000    0
  23   0     4.449      5.127        .016      -.055  .057     2.60   140         .10     197        4.20    75          .844     134.      0.000    0
  24   0     4.288      4.933       -.102      -.058  .118     4.10   115         .10     219        3.41    69          .790      89.      0.000    0
  25   0     3.830      4.695       -.137      -.073  .156     2.10   120         .15     246        2.59    63          .464      53.      0.000    0
  26   0     3.240      4.394       -.207      -.100  .229     2.10    94         .26     264        2.13    43          .730      78.      0.000    0
  27   0     2.439      4.050       -.204      -.073  .217     2.10    85         .15     270        1.85    24          .488      69.      0.000    0
  28   0     1.808      3.822       -.152      -.062  .164     0.00     0         .15     258        2.04     9          .582     108.      0.000    0
  29   0     1.276      3.646       -.150      -.017  .151      .50   360         .15     303        2.04     0          .294      92.      0.000    0
  30   0      .851      3.606       -.061      -.041  .074     3.60    20        0.00       0        1.94   355          .263     133.      0.000    0
  31   0      .823      3.413        .037      -.046  .059     3.10   345         .05      80        1.72   350          .112      41.      0.000    0
  32   0     1.111      3.189        .123      -.089  .151     4.10   340         .10     118        1.26   344          .426      87.      0.000    0
  33   0     1.573      2.845        .120      -.097  .154     3.10   350         .10     128         .94   330          .589     143.      0.000    0
  34   0     2.062      2.410        .164      -.153  .224     5.10   350         .15     130         .83   309          .680     199.      0.000    0
  35   0     2.473      1.667        .031      -.269  .271     4.60   350         .21     214        1.02   290          .917     258.      0.000    0
  36   0     2.286       .638       -.124      -.286  .311     7.70   345         .26     259        1.45   278          .935     183.      0.000    0
  37   0     1.840      -.255       -.107      -.201  .228     6.70   355         .15     272        2.17   274          .881     123.      0.000    0
  38   0     1.496      -.881       -.088      -.151  .174     5.10   340         .15     273        2.78   274          .720     118.      0.000    0
  39   0     1.166     -1.433       -.102      -.163  .192     5.70   355         .15     274        3.33   276          .738     131.      0.000    0
  40   0      .744     -1.974       -.132      -.133  .187     5.10     5         .15     285        3.89   276          .613     110.      0.000    0
  41   0      .396     -2.415       -.045      -.115  .123     4.10   350         .05     261        4.07   273          .289     104.      0.000    0
  42   0      .371     -2.824        .021      -.112  .114     5.10   330         .05     266        4.26   270          .256      89.      0.000    0
  43   0      .542     -3.182        .077      -.083  .113     5.10   320        0.00       0        4.52   264          .422      80.      0.000    0
  44   0     1.054     -3.630        .212      -.181  .279     6.70   330         .15     141        4.69   258          .603     118.      0.000    0
  45   0     1.693     -4.224        .125      -.138  .186     3.10   330         .10     160        4.82   253          .680     157.      0.000    0
RMS ERROR IN COMPUTED DRIFT SEGMENTS  .7262 KM   RMS ERROR IN POSITION 4.1023 KM  46.OBS
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PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG SK045 CA=0.20 CW=0.60 X RANGE -15.000 TO 20.000 KM Y RANGE -15.000 TO 20.000 KM 0 TRACKS

IDEVN= 0 KDEVN= 0

INITIAL V .280 M/S 260 DEG LATITUDE 58 DEG 39 HOURS
CA= .200 CW= .600 CS= .0020 CX= .0020
SAIL AREA 900 KEEL AREA 3600 SURFACE AREA 2500 M**2 MASS .150E+06 METRIC TONS

HOUR		POSN EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	12.351	5.499	-.276	-.049	.280	9.80	156	0.00	0	13.52	66	0.000	0.	0.000	0
1	0	12.018	5.806	-.046	.162	.169	9.30	154	.10	4	12.59	65	.774	81.	0.000	0
2	0	11.840	6.519	-.066	.223	.233	9.30	145	.15	345	12.22	61	.556	59.	0.000	0
3	0	11.541	7.266	-.100	.178	.204	9.80	140	.10	318	11.48	57	.869	78.	0.000	0
4	0	11.126	7.808	-.128	.126	.180	8.20	127	.10	299	11.11	53	.357	41.	0.000	0
5	0	10.650	8.199	-.130	.094	.161	10.80	125	.05	281	10.93	51	.222	52.	0.000	0
6	0	10.199	8.560	-.117	.115	.164	11.30	125	.05	333	10.56	47	.323	39.	0.000	0
7	0	9.819	9.123	-.090	.209	.228	13.40	155	.10	343	10.19	43	.502	62.	0.000	0
8	0	9.515	9.815	-.091	.155	.179	11.80	130	.05	334	10.00	39	.509	70.	15.000	300
9	0	8.399	10.730	-.307	.258	.401	9.80	135	.05	15	9.82	31	.300	22.	15.000	300
10	0	7.331	11.650	-.288	.252	.383	8.80	140	.05	33	10.00	20	.570	30.	15.000	300
11	0	6.308	12.563	-.280	.256	.380	8.80	165	.05	34	10.74	14	.230	18.	15.000	300
12	0	5.336	13.483	-.259	.255	.363	10.80	185	.05	56	11.67	9	.269	20.	15.000	290
13	0	4.338	14.161	-.272	.163	.317	10.80	215	.05	104	12.41	3	.259	18.	15.000	250
14	0	3.330	13.959	-.263	-.071	.273	17.00	240	.05	82	12.78	357	.652	48.	15.000	250
15	0	2.313	13.592	-.301	-.138	.331	15.90	285	0.00	0	12.59	353	.184	20.	0.000	0
16	0	2.508	13.168	.154	-.167	.227	11.30	337	.15	120	12.59	354	.450	205.	15.000	250
17	0	1.869	12.177	-.202	-.331	.388	8.20	345	.26	146	12.22	354	.920	248.	15.000	250
18	0	1.016	10.921	-.276	-.358	.452	12.90	350	.21	164	11.67	350	.599	60.	15.000	250
19	0	.002	9.428	-.280	-.483	.558	17.00	340	.31	172	10.37	343	.079	4.	15.000	300
20	0	-1.091	8.642	-.336	-.192	.387	18.00	345	.31	185	8.52	340	1.654	86.	0.000	0
21	0	-1.379	7.177	-.045	-.419	.421	15.90	345	.26	198	7.04	338	.566	38.	0.000	0
22	0	-1.784	5.662	-.199	-.434	.477	16.40	355	.36	222	5.41	330	.470	25.	0.000	0
23	0	-2.714	4.293	-.302	-.312	.434	11.80	355	.36	242	4.41	318	.685	48.	0.000	0
24	0	-3.776	3.386	-.268	-.196	.332	10.80	350	.26	255	4.07	308	.813	100.	0.000	0
25	0	-4.472	2.940	-.101	-.049	.112	7.20	350	.05	323	4.26	300	.228	37.	0.000	0
26	0	-4.711	2.953	-.059	.055	.081	4.60	310	.15	331	4.72	301	.314	67.	0.000	0
27	0	-4.895	3.226	-.037	.085	.093	3.60	260	.10	343	5.19	303	.167	34.	0.000	0
28	0	-4.903	3.563	.048	.102	.113	6.70	260	.10	29	5.46	308	.210	39.	0.000	0
29	0	-4.562	3.988	.123	.146	.191	5.70	240	.21	28	5.46	313	.070	15.	0.000	0
30	0	-3.985	4.539	.208	.133	.247	6.20	275	.21	67	5.39	316	.516	176.	15.000	245
31	0	-4.146	4.173	.010	-.190	.190	7.20	255	.36	101	5.22	310	.181	31.	15.000	245
32	0	-4.211	3.181	-.058	-.359	.364	7.20	255	.36	131	5.07	299	.385	39.	15.000	245
33	0	-4.574	1.721	-.145	-.444	.467	8.20	255	.36	150	5.22	286	.491	42.	15.000	245
34	0	-5.185	-.071	-.192	-.555	.587	7.20	255	.45	162	5.94	269	.399	22.	15.000	245
35	0	-6.062	-2.021	-.299	-.512	.593	4.60	340	.36	175	7.04	258	.593	36.	0.000	0
36	0	-6.282	-3.098	-.029	-.147	.150	3.60	225	.05	215	7.41	253	.376	51.	15.000	270
37	0	-7.925	-3.375	-.580	-.101	.589	2.60	220	.26	240	8.70	252	.512	39.	15.000	270
38	0	-9.929	-3.537	-.519	.032	.520	0.00	0	.15	282	10.19	251	.799	54.	0.000	0
39	0	-10.808	-3.309	-.197	.088	.216	0.00	0	.21	306	10.56	251	.634	171.	0.000	0

RMS ERROR IN COMPUTED DRIFT SEGMENTS .5526 KM RMS ERROR IN POSITION 2.4409 KM 40.OBS

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MWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWMWM
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PROGRAM ICEDRIF. B GARRETT    LAST MOD 6 10 1982

ICEBERG SK045 CA=0.20  CW=0.60           X RANGE  -15.000 TO  20.000 KM  Y RANGE  -15.000 TO  20.000 KM   0 TRACKS

                                            IDEVN=   0 KDEVN=   0



INITIAL V  .280 M/S 260 DEG  LATITUDE  58 DEG 39 HOURS
CA= .200  CW= .600  CS= .0020  CX= .0020
SAIL AREA    900  KEEL AREA  3600  SURFACE AREA  2500 M**2  MASS   .150E+06 METRIC TONS

HOUR  POSN EAST KM NORTH VEL EAST M/S NORTH TOTAL WIND M/S FROM CURRENT M/S TO  RANGE(KM) AZIM     KM ERROR PCT TOWFORCE DIR
   0   0    12.351     5.499     -.276      -.049  .280     9.80   156      0.00     0      13.52     66       0.000      0.     0.000    0
   1   0    12.018     5.806     -.046       .162  .169     9.30   154       .10     4      12.59     65        .774     81.     0.000    0
   2   0    11.840     6.519     -.066       .223  .233     9.30   145       .15   345      12.22     61        .556     59.     0.000    0
   3   0    11.541     7.266     -.100       .178  .204     9.80   140       .10   318      11.48     57        .869     78.     0.000    0
   4   0    11.126     7.808     -.128       .126  .180     8.20   127       .10   299      11.11     53        .357     41.     0.000    0
   5   0    10.650     8.199     -.130       .094  .161    10.80   125       .05   281      10.93     51        .222     52.     0.000    0
   6   0    10.199     8.560     -.117       .115  .164    11.30   125       .05   333      10.56     47        .323     39.     0.000    0
   7   0     9.819     9.123     -.090       .209  .228    13.40   155       .10   343      10.19     43        .502     62.     0.000    0
   8   0     9.515     9.815     -.091       .155  .179    11.80   130       .05   334      10.00     39        .509     70.     0.000  300
   9   0     9.222    10.310     -.061       .130  .144     9.80   135       .05    15       9.82     31        .956     69.     0.000  300
  10   0     9.069    10.765     -.027       .122  .125     8.80   140       .05    33      10.00     20       1.574     82.     0.000  300
  11   0     9.027    11.215      .005       .130  .130     8.80   165       .05    34      10.74     14        .969     74.     0.000  300
  12   0     9.123    11.701      .051       .139  .148    10.80   185       .05    56      11.67      9       1.066     79.     0.000  290
  13   0     9.405    12.126      .107       .090  .140    10.80   215       .05   104      12.41      3       1.523    104.     0.000  250
  14   0     9.949    12.428      .200       .085  .217    17.00   240       .05    82      12.78    357       1.864    136.     0.000  250
  15   0    10.628    12.554      .167      -.029  .170    15.90   285      0.00     0      12.59    353       1.593    176.     0.000    0
  16   0    11.231    12.213      .171      -.161  .235    11.30   337       .15   120      12.59    354        .531    242.     0.000  250
  17   0    11.834    11.423      .163      -.272  .317     8.20   345       .26   146      12.22    354        .704    190.     0.000  250
  18   0    12.319    10.325      .092      -.329  .342    12.90   350       .21   164      11.67    350       1.307    130.     0.000  250
  19   0    12.616     8.924      .089      -.460  .468    17.00   340       .31   172      10.37    343       1.315     70.     0.000  300
  20   0    12.836     7.195      .023      -.490  .490    18.00   345       .31   185       8.52    340        .210     11.     0.000    0
  21   0    12.792     5.545     -.043      -.419  .421    15.90   345       .26   198       7.04    338        .363     24.     0.000    0
  22   0    12.389     4.030     -.199      -.434  .477    16.40   355       .36   222       5.41    330        .468     25.     0.000    0
  23   0    11.460     2.662     -.302      -.312  .434    11.80   355       .36   242       4.41    318        .685     48.     0.000    0
  24   0    10.398     1.754     -.268      -.196  .332    10.80   350       .26   255       4.07    308        .813    100.     0.000    0
  25   0     9.701     1.309     -.101      -.049  .112     7.20   350       .05   323       4.26    300        .228     37.     0.000    0
  26   0     9.463     1.322     -.059       .055  .081     4.60   310       .15   331       4.72    301        .314     67.     0.000    0
  27   0     9.279     1.595     -.037       .085  .093     3.60   260       .10   343       5.19    303        .167     34.     0.000    0
  28   0     9.270     1.931      .048       .102  .113     6.70   260       .10    29       5.46    308        .210     39.     0.000    0
  29   0     9.611     2.357      .123       .146  .191     5.70   240       .21    28       5.46    313        .070     15.     0.000    0
  30   0    10.198     2.907      .209       .133  .247     6.20   275       .21    67       5.39    316        .516    176.     0.000  245
  31   0    11.183     3.184      .354       .013  .354     7.20   255       .36   101       5.22    310       1.483    256.     0.000  245
  32   0    12.530     2.906      .356      -.171  .395     7.20   255       .36   131       5.07    299       1.889    189.     0.000  245
  33   0    13.680     2.073      .280      -.278  .395     8.20   255       .36   150       5.22    286       1.742    148.     0.000  245
  34   0    14.580      .897      .223      -.380  .441     7.20   255       .45   162       5.94    269       1.860    103.     0.000  245
  35   0    15.178     -.554      .098      -.405  .416     4.60   340       .36   175       7.04    258       1.541     93.     0.000    0
  36   0    15.296    -1.627     -.014      -.149  .150     3.60   225       .05   215       7.41    253        .489     67.     0.000  270
  37   0    15.072    -2.011     -.136      -.113  .177     2.60   220       .26   240       8.70    252        .979     75.     0.000  270
  38   0    14.463    -2.349     -.176      -.040  .181     0.00     0       .15   282      10.19    251        .799     54.     0.000    0
  39   0    13.838    -2.288     -.177       .066  .189     0.00     0       .21   306      10.56    251        .330     89.     0.000    0
RMS ERROR IN COMPUTED DRIFT SEGMENTS  .9883 KM   RMS ERROR IN POSITION13.7190 KM  40.OBS
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PROGRAM ICEDRIF, B GARRETT LAST MOD 6 10 1982

ICEBERG SN09 CA=0.3 CW=0.2 X RANGE -10.000 TO 0.000 KM Y RANGE 0.000 TO 10.000 KM 0 TRACKS

IDEVN= -32 KDEVN= 0

INITIAL V .170 M/S 0 DEG LATITUDE 57 DEG 13 HOURS
CA= .300 CW= .200 CS= .0020 CX= .0020
SAIL AREA 1600 KEEL AREA 6400 SURFACE AREA 6400 M**2 MASS .300E+06 METRIC TONS

HOUR	POSN	EAST KM	NORTH	VEL EAST M/S	NORTH	TOTAL	WIND M/S	FROM	CURRENT M/S	TO	RANGE(KM)	AZIM	KM ERROR	PCT	TOWFORCE	DIR
0	0	-2.270	1.905	0.000	.170	.170	7.00	205	.15	15	2.96	310	0.000	0.	0.000	0
1	0	-1.939	2.691	.169	.248	.300	6.00	200	.25	25	3.33	320	.246	37.	0.000	0
2	0	-1.429	3.339	.027	.065	.070	5.00	195	.20	220	4.26	328	.747	70.	0.000	0
3	0	-1.654	3.385	-.113	-.007	.114	5.00	220	.25	230	4.07	335	.761	141.	0.000	0
4	0	-2.081	3.364	-.110	-.002	.110	3.50	240	.15	240	3.89	339	.757	227.	0.000	0
5	0	-2.430	3.362	-.085	-.003	.085	3.50	240	.15	230	3.52	341	.669	171.	0.000	0
6	0	-2.758	3.360	-.107	.014	.108	1.00	160	.15	280	3.33	344	.567	220.	0.000	0
7	0	-3.162	3.504	-.102	.068	.123	3.50	175	.05	290	3.15	347	.676	269.	0.000	0
8	0	-3.442	3.843	-.051	.118	.128	4.50	220	.10	290	2.78	343	.771	182.	0.000	0
9	0	-3.497	4.316	.021	.138	.139	5.00	215	.05	320	2.59	338	.733	246.	0.000	0
10	0	-3.346	4.806	.049	.136	.144	6.00	195	.06	290	2.78	332	.655	195.	0.000	0
11	0	-3.227	5.309	.008	.145	.145	8.50	170	.06	220	2.96	328	.587	215.	15.000	270
12	0	-4.525	5.838	-.396	.152	.425	8.00	170	.10	30	3.70	323	.645	81.	15.000	270
13	0	-5.874	6.350	-.367	.119	.386	6.00	170	.10	50	4.37	323	.948	142.	15.000	270

RMS ERROR IN COMPUTED DRIFT SEGMENTS .6915 KM RMS ERROR IN POSITION 2.5362 KM 13.OBS

APPENDIX 6.

LISTING OF COMPUTER PROGRAM

```
      PROGRAM TCF3   (INPUT,OUTPUT,TAPE3)
C
C
C     :     THE PROCEDING PROGRAM IS SET UP TO READ IN AND PLOT THE      :
C     :  TRACK OF AN ACTUAL ICEBERG AND THEN TRY TO SIMULATE THAT        :
C     :  TRACK.    THE PERCENTAGE ERROR BETWEEN THE TWO TRACKS IS THEN   :
C     :  GIVEN.                                                          :
C     :                                                                  :
C
C
C     S. D. SMITH  18/04/72
C     LISTS AND PLOTS POSITION OF ICEBERG OR FLOE GIVEN WIND, CURRENT.
C     DATA CARDS
C     ANY NUMBER OF SETS OF TYPES 1,2,3.  BLANK CARD 1 TERMINATES JOB.
C
C       1    HEADING CARD
C   IMPORTANT VARIABLES
C   NAME      CC 1-40   (4A10)
C   XMIN      CC41-50   WEST LIMIT OF PLOT (KM). (F10.3)
C   XMAX      CC51-60   EAST LIMIT                SET TO 20 IF BLANK.
C   YMIN      CC61-70   SOUTH LIMIT               SET TO -20 IF BLANK.
C   YMAX      CC71-79   NORTH LIMIT
C   NTRACKS   CC 80     I1  NUMBER OF ICE TRACKS TO BE PLOTTED ON GRAPH
C   IDEVN     CC81-83   COMPASS DEVIATION,DEG.
C   KDEVN     CC84-86   DEGREES WIND SHIFTED CLOCKWISE.  (I3)
C
C       2    ONE OF THESE CARDS IS REQUIRED FOR EACH SET OF NTRACKS TRACKS
C          IF ISAIL, KEEL, AND ISURF ARE ALL 0, PROGRAM SETS FOR 5M HIGH * 50M DIAM
C   U         CC 1-5    WIND SPEED (M/SEC) F5.2
C   IDRU      CC 6-9    WINDS FROM(DEG) I4
C   W         CC 10-14  CURRENT (M/SEC) F5.2
C   IDRW      CC 15-18  CURRENT DIRECTION TO (DEG) I4
C   RANGE     CC 19-23  RANGE TO BERG NAUTICAL MILES F5.2
C   IBERG     CC 24-27  BEARING TO BERG FROM RIG (DEG) I4
C   V         CC 28-32  INITIAL ICE SPEED M/SEC       F5.2
C   IDR       CC 33-36  INITIAL ICE DIRECTION (TOWARDS) DEG. I4
C   LAT       CC 37-39  I3 LATITUDE (DEG) SET TO 60 IF BLANK
C   IMAX      CC 40-42  I3  HOURS OF DATA TO BE COMPUTED SET TO 24 IF BLANK
C   CA        CC 43-47  F5.3 AIR FORM DRAG COEFF. SET TO 1 IF BLANK
C   CW        CC 48-52  F5.3 WATER DRAG COEFF. SET TO CA IF BLANK
C   CS        CC 53-57  F5.3 AIR SURFACE DRAG COEFF.
C   CX        CC 58-62  F5.3 WATER SURFACE DRAG COEFF.
C   ISAIL     CC 63-67  I5 SAIL AREA IN AIR M**2
C   KEEL      CC 68-72  I5 KEEL AREA M**2
C   ISURF     CC 73-77  I5 PLAN VIEW SURFACE AREA IN AIR
C   SAM       CC 78-87  E10.3 MASS IN METRIC TONS
C   TOW       CC 88-92  F5.1 TOWING FORCE IN METRIC TONS
C   IDRT      CC 93-97  I5 DIRECTION OF TOWING FORCE (DEG)
C              ISAIL=250M**2, KEEL=1000M**2, ISURF=1964M**2, SAM=44000 TONS
C         3    NEW DATA EFFECTIVE AT ELAPSED TIME NEWHR, NEWMIN.
C   U         CC 1-5    F5.2
C   IDRU      CC 6-9    I4
C   W         CC 10-14  F5.2
C   IDRW      CC 15-18  I4
C   RANGE     CC 19-23  F5.2
C   IBRG      CC 24-27  I4
C   NEWHR     CC 28-31  I4
C   NEWMIN    CC 32-33  I2
```

```
C    TOW       CC 34-38 F5.1
C    IDRT      CC 39-43 I5
C                PUT ONE BLANK CARD AT THE END OF EACH ICE TRACK.
      DIMENSION NAME(4),XPL(1000),YPL(1000),XP(100),YP(100)
      PRINT 9999
9999  FORMAT(1H0,"PROGRAM ICEDRIF, P MCCARTHY   LAST MOD 3 18 1982")
      CALL COMPRS
C
      AIRDEN=1.3
      PI=3.141592
C     READ DATA CARDS
100   READ (3,1001) (NAME(J),J=1,4),XMIN,XMAX,YMIN,YMAX,NTRACKS,IDEVN,
     *KDEVN
1001  FORMAT(4A10,3F10.3,F9.3,I1,2I3)
C
      IF(NTRACKS.LT.1) NTRACKS=1
      IF(XMAX-XMIN.LT.1.) XMAX=20.
      YMAX=YMIN+XMAX-XMIN
      PRINT 1002,(NAME(J),J=1,4),XMIN,XMAX,YMIN,YMAX,NTRACKS
1002  FORMAT(1H0,4A10,8H X RANGE,F9.3,3H TO,F8.3,12H KM  Y RANGE,F9.3,
     1      3H TO,F8.3,3H KM,I4,7H TRACKS)
      PRINT 1010,IDEVN,KDEVN
 1010 FORMAT(1H0,40X,6HIDEVN=,I4,7H KDEVN=,I4)
C     PLOT AXES
      CALL PAGE(11.,11.)
       CALL INTAXS
      LABX=7HEAST KM
        LABY=8HNORTH KM
C     PLOT ICEBERG TRACK
      AXIS=9.
      CALL NOBRDR
      CALL TITLE(NAME,40,LABX,7,LABY,8,AXIS,AXIS)
      CALL GRAF(XMIN,5.,XMAX,YMIN,5.,YMAX)
       CALL RLVEC (XMIN,0.,XMAX,0.,0)
       CALL RLVEC (0.,YMIN,0.,YMAX,0)
C
C     COMPUTE DRIFT TRACK N TIMES
       TOW=0.0
       IDRT=0
C
      DO 800 N=1,NTRACKS
      IND=1
      ERROR=0.
      PCTERR=0.
      RMSERR=0.
      RMS=0.
      REWIND 3
C     READ LABEL AND RANGE OF PLOT
      READ(3,1001) (NAME(J),J=1,4)
C     READ INITIAL PARAMETERS FOR NTH TRACK
      DO 110 I=1,N
 110  READ(3,1003) U,IDRU,W,IDRW,RANGE,IBRG,V,IDR,LAT,IMAX,CA,CW,CS,CX,
     *ISAIL,KEEL,ISURF,SAM,TOW,IDRT
C    TO ADJUST FOR WIND VELOCITY = 0
      IF(N.EQ.2) U=0.
C    TO ADJUST FOR WATER VELOCITY = 0
      IF(N.EQ.3) W=0.
      NN=NTRACKS-N
```

```
      DO 115 I=1,NN
      IF(NN.EQ.0) GO TO 115
      READ(3,1003) FDUMP
  115 CONTINUE
C
C   CHANGE DEGREES TO RADIANS TO FIND THE INITIAL WIND AND WATER DIRECTIONS
C
      DRU=PI*(IDRU+KDEVN+180)/180.
      DRW=PI*(IDRW-IDEVN)/180.
C
 1003 FORMAT(4(F5.2,I4),2I3,4F5.3,3I5,E10.3,F5.1,I5)
C     SET DEFAULT VALUES
      IF(IMAX.EQ.0) IMAX=24
      IF(LAT.EQ.0) LAT=60
      IF(ISAIL.EQ.0.AND.KEEL.EQ.0.AND.ISURF.EQ.0) 120,130
  120 ISAIL=250 $ ISURF=1964 $ SAM=44000.
  130 IF(KEEL.EQ.0) KEEL=4*ISAIL
      PRINT 1004, V,IDR,LAT,IMAX,CA,CW,CS,CX,ISAIL,KEEL,ISURF,SAM
 1004 FORMAT(10H1INITIAL V,F6.3,4H M/S,I4,14H DEG  LATITUDE,I4,4H DEG,I3
     1,6H HOURS,/,4H CA=,F5.3,5H  CW=,F5.3,5H  CS=,F6.4,5H  CX=,F6.4,/,
     1      10H SAIL AREA,I6,11H  KEEL AREA,I6,14H  SURFACE AREA,I6,
     1      11H M**2  MASS,E11.3,12H METRIC TONS)
      DIR=PI*IDR/180.
      VX=V*SIN(DIR)
      VY=V*COS(DIR)
C
C   OBSERVED INITIAL POSITION
C
      DIR=PI*IBRG/180.
      RANGE=RANGE*1.852
      XP(1)=RANGE*SIN(DIR)
      X=XP(1)*1000.
      YP(1)=RANGE*COS(DIR)
      Y=YP(1)*1000.
      L=1
      CALL MARKER(0)
      CALL CURVE(XP(1),YP(1),1,-1)
      XPL(1)=XP(1)
      XXX=XPL(1)
      YPL(1)=YP(1)
      YYY=YPL(1)
C     INITIALIZE DRAG PARAMETERS
      A=ISURF
      AMSS=SAM*1000.
      PRINT 1005
 1005 FORMAT(1H0,"HOUR  POSN EAST KM NORTH VEL EAST M/S NORTH TOTAL"
     *" WIND M/S FROM CURRENT M/S TO  RANGE(KM) AZIM     KM ERROR "
     *"PCT TOWFORCE DIR")
      CA=AIRDEN*(CA*ISAIL*.5 + CS*A)
      CW=1000.*(CW*KEEL*.5 + CX*A)
      B=2.*7.29E-5*SIN(LAT*PI/180.)
      NEWHR=0
      NEWMIN=1
C
C
C   THE NEXT TWO LINES CAN BE USED WHEN TOWING THE ICEBERG - WHERE
C    IDRT EQUALS THE DIRECTION TOWED
C
C      IDRT=IDRT+60
```

```
C       IF(N.EQ.7) IDRT=330
C
C     LOOP FOR IMAX HOURS IN 1 HOUR STEPS
      IMP1=IMAX+1
      DO 700 IHR=1,IMP1
C     LOOP FOR ONE HOUR IN 10 MIN STEPS
      DO 600 MINUTE=1,6
C
       IF((IHR-1).NE.IABS(NEWHR)) GO TO 400
      IF(MINUTE.NE.NEWMIN) GO TO 400
C
C     UPDATE WIND, CURRENT, POSITION, AND TOW FORCE
C
C
      UX=U*SIN(DRU)
      UY=U*COS(DRU)
      WX=W*SIN(DRW)
      WY=W*COS(DRW)
      NEWMIN=(NEWMIN-1)*10
C
      V=(VX**2+VY**2)**.5
C
C     TOWING FORCE
      DIR=PI*IDRT/180.
      YTOW=TOW*9800.
      XTOW=YTOW*SIN(DIR)
       YTOW=YTOW*COS(DIR)
       IF(IND.EQ.1) GO TO 398
C
C     CALCULATE DRIFT ERROR SINCE LAST OBSERVED POSITION
C  COMPUTED POSITION IS STORED IN XPL(L) AND YPL(L)
C   XDRIFT AND YDRIFT IS THE OBSERVED DRIFT SINCE THE LAST OBSERVATION
C   XERR AND YERR IS THE COMPUTED DRIFT SINCE THE LAST OBSERVATION
C
      XDRIFT=XP(IND)-XP(IND-1)
      YDRIFT=YP(IND)-YP(IND-1)
      XERR=XPL(L)-XXX-XDRIFT
      YERR=YPL(L)-YYY-YDRIFT
      ERROR=XERR**2 + YERR**2
      RMSERR=RMSERR+ERROR
      ERROR=ERROR**.5
C
C  STORE LAST COMPUTED POSITION
C
      XXX=XPL(L)
      YYY=YPL(L)
C
C  CALCULATE TOTAL DRIFT ERROR WHERE XP(IND) AND YP(IND)=OBSERVED POSITION
C     AND XPL(L) AND YPL(L)=THE COMPUTED POSITION
C
      XER=XP(IND)-XPL(L)
      YER=YP(IND)-YPL(L)
      ER=XER*XER+YER*YER
      RMS=RMS+ER
C
      IF(XDRIFT.EQ.0..AND.YDRIFT.EQ.0.) GO TO 390
      PCTERR=100.*ERROR/(XDRIFT**2+YDRIFT**2)**.5
       GO TO 398
390    PCTERR=0.
```

```
      398   PRINT 1008,NEWHR,NEWMIN,XPL(L),YPL(L),VX,VY,V,U,IDRU,W,IDRW,
           1RANGE,IBRG,ERROR,PCTERR,TOW,IDRT
      1008 FORMAT(1H ,2I3,4F9.3,F6.3,3(F8.2,I6,2X),F8.3,F8.0,F8.3,I4)
C
C       READ NEXT SET OF WIND, CURRENT, POSITION, TIME, TOW FORCE
C
        IOLDHR=NEWHR
        READ(3,1009)U,IDRU,W,IDRW,RANGE,IBRG,NEWHR,NEWMIN,TOW,IDRT
      1009 FORMAT(3(F5.2,I4),I4,I2,F5.1,I5)
C    TO ADJUST FOR WIND VELOCITY = 0
        IF(N.EQ.2) U=0.
        IF(N.EQ.2) TOW=0.
C    TO ADJUST FOR WATER VELOCITY = 0
        IF(N.EQ.3) W=0.
C
        IF((NEWHR+NEWMIN).EQ.0) GO TO 399
         IF(NEWHR.EQ.4H     ) GO TO 399
C
        NEWMIN=NEWMIN/10+1
C
C
C   THIS SECTION WILL CALCULATE A VELOCITY CHANGE PER 6 SECOND STEP SO THERE
C       WILL BE A GRADUAL, AS OPPOSED TO A SUDDEN CHANGE IN VELOCITY AT THE
C       BEGINNING OF EACH HOUR (WHEN THE DATA IS READ IN).
C
C
C     CHANGE DEGREES TO RADIANS
        DRU=PI*(IDRU+KDEVN+180)/180.
        DRW=PI*(IDRW-IDEVN)/180.
C
C    NUMBER OF 6 SEC STEPS - DEPENDS UPON NUMBER OF HOURS BETWEEN DATA POINTS
C
        STEPS=((IABS(NEWHR)-IHR+1)*6+NEWMIN-MINUTE)*100+1
C    DUX AND DUW = THE X AND Y COORDINATES OF THE WIND CHANGE PER TIME STEP.
C
        DUX=(U*SIN(DRU)-UX)/STEPS
        DUY=(U*COS(DRU)-UY)/STEPS
C
C    DWX AND DWY = THE X AND Y COORDINATES OF THE WATER CURRENT CHANGE PER TIME STEP.
C
        DWX=(W*SIN(DRW)-WX)/STEPS
        DWY=(W*COS(DRW)-WY)/STEPS
C
C
        RANGE=RANGE*1.852
        IF(IND.GE.100) GO TO 400
C
C       OBSERVED POSITION
C
         DIR=PI*IBRG/180.
         IND=IND+1
         XP(IND)=RANGE*SIN(DIR)
         YP(IND)=RANGE*COS(DIR)
         IMARK=0
         IF((NEWHR/12*12).EQ.NEWHR) IMARK=7
         IF(NEWMIN.NE.1) IMARK=5
         CALL MARKER(IMARK)
         CALL CURVE(XP(IND),YP(IND),1,-1)
C
```

```
      GO TO 400
C
 399  DUX=0.
      DUY=0.
      DWX=0.
      DWY=0.
C
C
C   A GROUNDED ICEBERG IS DESIGNATED BY A NEGATIVE HOUR.
C
 400  IF(NEWHR .LT. 0 .AND. IOLDHR .LT. 0) GO TO 501
C
C     LOOP FOR 10 MIN IN 6 SEC (0.1 MIN) STEPS
C
      DO 500 I=1,100
C
C   LINEAR INTERPOLATION OF THE WIND AND CURRENT.
C
      UX=UX+DUX
      UY=UY+DUY
      WX=WX+DWX
      WY=WY+DWY
C
C
      U1=UX-VX
      U2=UY-VY
      W1=WX-VX
      W2=WY-VY
      UREL=(U1*U1+U2*U2)**.5*CA
      WREL=(W1*W1+W2*W2)**.5*CW
C      FORCE BALANCE IN NEWTONS
      F1=UREL*U1+WREL*W1+XTOW
      F2=UREL*U2+WREL*W2+YTOW
      VX=VX+(F1/AMSS-B*W2)*6.
      VY=VY+(F2/AMSS+B*W1)*6.
C
C     INCREMENT POSITION FOR 6 SEC STEP
      X=X+6.*VX
      Y=Y+6.*VY
500   CONTINUE
       GO TO 502
C
C   IF THE ICEBERG IS GROUNDED THEN VELOCITY IN THE X AND Y DIRECTION IS SET TO ZERO.
C
501    VX=0.
       VY=0.
502    IF(L.GE.1000) GO TO 600
      L=L+1
       XPL(L) = X/1000.0
       YPL(L) = Y/1000.0
600   CONTINUE
C     PRINT 1006,IHR,XPL(L),YPL(L),VX,VY
C1006 FORMAT(1H ,I3,3H 00,F9.3,3F11.3)
700   CONTINUE
      CALL MARKER(N)
      CALL CURVE (XPL,YPL,L-6,6)
      CALL MARKER(11)
      L=72*((L-7)/72)-71
      IF(L.GE.1) CALL CURVE (XPL(73),YPL(73),L,-72)
```



```
      FIND=IND-1
      RMSERR=(RMSERR/FIND)**.5
      RMS=(RMS/FIND)**.5
      PRINT 1007,RMSERR,RMS,FIND
1007  FORMAT(1H0,"RMS ERROR IN COMPUTED DRIFT SEGMENTS",F7.4,
     >" KM   RMS ERROR IN POSITION",F7.4," KM",F5.0,"OBS")
800   CONTINUE
C
      CALL CURVE (XP,YP,IND,0)
      CALL ENDPL(0)
      CALL DONEPL
      END
```

APPENDIX 7.

Procedure for Locating Iceberg Drift Data

APPENDIX 7

Procedure for Locating Iceberg Drift Data

Project files in the C.O.G.L.A. offices at B.I.O. which contain iceberg drift data belong to the 8640 series; the 86 indicates the east coast area and the 40 indicates "projects approved under Section 48 of C.O.G.L.A.". Table A7 lists the C.O.G.L.A. file numbers and drawer numbers accessed during the search for raw data. Some of the files were in the 8613 series.

In order to locate raw iceberg data for a certain year and drilling operator the following procedure is required:

1. Locate project number for the given year (Table A7).

2. Search files and locate drawer in which the data are stored. (For example, 1979 iceberg data are located in project file 8640-E2-30, drawer number 27-4 and 28-1 (Table A7).

3. Search through the material and locate for the iceberg drift track data (Fig. 2), wind and current data (Fig. 3) and towing logs (Fig. 4).

4. Copy relevant data and return files to C.O.G.L.A.

TABLE A 7

ICEBERG TRACKS IDENTIFIED AS SUITABLE FOR HINDCAST MODELLING

Iceberg	Year	C.O.G.L.A. Project File	C.O.G.L.A. Drawer No.
BV 34	1974	8640 - B3 - 5E	22 - 3
BV 47	1974	8640 - B3 - 5E	22 - 3
G 43	1974	8640 - E2 - 7E	22 - 3
GI 7	1979	8640 - E2 - 30E	27 - 4
		Vol. 1 & Vol. II	28 - 1
NB 12	1979	8640 - E2 - 30E	28 - 1
NB 19	1979	8640 - E2 - 30E	28 - 1
NB 38	1979	8640 - E2 - 30E	28 - 1
NB 68	1979	8640 - E2 - 30E	28 - 1
RB 22	1979	8640 - E2 - 30E	27 - 4
RB 30	1979	8640 - E2 - 30E	27 - 4
RB 126	1979	8640 - E2 - 30E	27 - 4
F022	1975	8640 - B3 - 6E	24 - 2
		8640 - E2 - 12E	24 - 2
K013	1975	8640 - B3 - 6E	24 - 2
		8640 - E2 - 12E	24 - 2
SN09	1975	8640 - B3 - 6E	24 - 2
		8640 - E2 - 12E	24 - 2
LRI	1973	8640 - E2 - 3E	21 - 2
LX6	1973	8640 - E2 - 3E	21 - 2
RK018	1976	8640 - E2 - 14E	25 - 2
SK024	1978	8613 - E2 - 4 - 1	25 - 2
SK042	1978	8613 - E2 - 4 - 1	25 - 2
SK045	1978	8613 - E2 - 4 - 1	25 - 2

Additional iceberg drift tracks selected without computer assistance:

CA104	1976	8640 - E2 - 14E	25 - 2
HE04	1976	8640 - E2 - 12E	24 - 2
B55	1973	8640 - E2 - 3E	25 - 2
RB04	1980	8640 - P28 - 8E	28 - 3
GI41	1980	8640 - P28 - 8E	28 - 3