Moored Current Meter Data from Hudson Strait, 1982

K.F. Drinkwater

Marine Ecology Laboratory
Ocean Science and Surveys, Atlantic
Department of Fisheries and Oceans

Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
B2Y 4A2

February 1983

Canadian Data Report of Fisheries and Aquatic Sciences No. 381

Government of Canada
Fisheries and Oceans

Gouvernement du Canada
Pêches et Océans

Canadian Data Report of Fisheries and Aquatic Sciences

These reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of Data Reports reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Data Reports. The current series name was changed with report number 161.

Data Reports are not intended for general distribution and the contents must not be referred to in other publications without prior written clearance from the issuing establishment. The correct citation appears above the abstract of each report.

Rapport statistique canadien des sciences halieutiques et aquatiques

Ces rapports servent de base à la compilation des données de classement et d'archives pour lesquelles il y a peu ou point d'analyse. Cette compilation aura d'ordinaire été préparée pour appuyer d'autres publications ou rapports. Les sujets des Rapports statistiques reflètent la vaste gamme des intérêts et politiques du Ministère des Pêches et des Océans, notamment gestion des pêches, techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

Les Rapports statistiques ne sont pas préparés pour une vaste distribution et leur contenu ne doit pas être mentionné dans une publication sans autorisation écrite préalable de l'établissement auteur. Le titre exact paraît au haut du résumé de chaque rapport.

Canadian Data Report of

Fisheries and Aquatic Sciences 381

February 1983

MOORED CURRENT METER DATA FROM HUDSON STRAIT, 1982

by

K.F. Drinkwater

Marine Ecology Laboratory
Ocean Science and Surveys, Atlantic
Department of Fisheries and Oceans

Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
B2Y 4A2

This is the 14th Data Report from the
Marine Ecology Laboratory

Minister of Supply and Services Canada 1983

Cat. No. Fs 97-13/381 ISSN 0706-6465

Correct citation for this publication:

Drinkwater, K.F. 1983. Moored current meter data from Hudson Strait, 1982. Can. Data Rept. Fish. Aquat. Sci. 381: iv + 46 p.

CONTENTS

ABSTRACT

Drinkwater, K.F. 1983. Moored current meter data from Hudson Strait, 1982. Can. Data Rept. Fish. Aquat. Sci. 381: iv + 46 p.

A current meter array was moored in Hudson Strait from August to October 1982. Current rates and directions together with the temperature and salinity data are presented in graphical form. The mean currents as well as the amplitudes and phase lags for the M_2 tidal constituents are also given.

RESUME

Drinkwater, K.F. 1983. Moored current meter data from Hudson Strait, 1982. Can. Data. Rept. Fish. Aquat. Sci. 381: iv + 46 p.

Du mois d'août au mois d'octobre 1982 on a amarré un ensemble de courantomètres dans le détroit d'Hudson. Les données sur la vitesse et la direction du courant ainsi que sur la température et la salinité sont présentées sous forme de graphiques. On présente également les courants moyens ainsi que les amplitudes et les décalages de phase pour les composantes tidales M_2.

Introduction

Sutcliffe et al. (1983) identified nutrient-rich surface layer outflow from Hudson Strait as an important nutrient source for the Labrador Shelf. In 1982 the Marine Ecology Laboratory of the Bedford Institute of Oceanography (BIO) undertook a field investigation into the physical oceanography and primary production of the Labrador Shelf-Hudson Strait region. As part of that program a current meter array was moored in Hudson Strait in mid-August from CSS Hudson during cruise 82-027 and recovered in mid-October during cruise 82-034. This report presents the current meter data.

Mooring Information

The current meter array was located immediately west of Ungava Bay and consisted of four stations (HS1-HS4) along a transect running approximately northeast from the Quebec shore to Baffin Island and one station (HS5) 90 km further to the east in the center of the Strait (see Fig. 1). Vertical profiles of the moorings are shown in Fig. 2a,b and the mooring information is listed in Table 1. The mooring numbers in the table refer to the BIO consecutive lay numbers. A thermistor-conductivity chain was also moored at station HS2 (see Fig. 2a) but the data are not presented herein.

All current meters were Anderaa instruments equipped with temperature and conductivity sensors. Each mooring consisted of three railway wheels as an anchor, an AMF acoustic release, a Braincon (type 568) float for the main buoyancy and plastic spheres for back-up buoyancy. The Braincon floats were at approximately 25 m depth during the moorings and were equipped with a radio beacon and a flashing light to add in recovery.

The current meter data, as well as the temperature and salinity data were generally of good quality at all stations and at all depths. The only exceptions were the 30 m temperatures and salinities at HS5 which were intermittent due to instrument malfunction and thus these data are not presented.

Data

Measurements of current rate and direction plus temperature and salinity were recorded every 15 minutes. The raw data were editted to remove isolated spikes, then filtered using a 5-weight running mean and decimated to hourly values. These hourly values are plotted for each station and depth (see Appendix 1). The days are given in Julian days (day 233 is August 21). The data were then run through the tidal analysis program at the Bedford Institute which calculates amplitudes and phase lags for standard tidal constituents using a least squares fit of the data. Tidal current ellipses for each constituent were computed. The tidal ellipses for the major constituent, M_2, are listed in Table 2 and plotted in Fig. 3. Residual currents were then calculated by subtracting the tidal currents from the observed values. These hourly residuals were further filtered using a Cartwright filter of 129 weights and a cutoff frequency of 0.74 d^{-1} (period of 1.35d) and decimated to one value every six hours. They were then plotted in progressive vector and stick plot diagrams (see Appendix A). A progressive vector diagram is a vectorial addition of the current data and represents the path a particle would take if always under the influence of the measured current. The arrow in the upper right corner of the progressive vector diagrams point north. The abscissa represents flow along the Strait, positive being 125°T or seaward, while the ordinate represents flow across the Strait, positive being 35°T. Crosses denote position every five days and the dates are given in Julian days. The sticks in the stickplots represent the magnitude and direction of the current. The arrow in the upper right corner again points north, hence, seaward flow along the axis of the Strait (125°T) is represented by a positive vertical line. The Cartwright filtered data were further decimated to one value per day then vector-averged to determine a mean residual current. The means and standard deviations for the

along-Strait (+125°T) and across-Strait (+35°T) components together with the mean rate and directions are listed in Table 3 and the mean currents are plotted in Fig. 4.

ACKNOWLEDGEMENTS

I would like to thank those people who helped in the deployment and recovery of the current meters, especially G. Taylor, T. Foote, P. d'Entremont, M. Scotney, J. Galliott, L. Bellefontaine and P. Girouard. Also thanks are due to R. W. Trites, B. MacLean, P. Keenan, B. Hartling and R. Pingree for their various contributions. Finally I wish to thank Captain Mauger and the crew of the C.S.S. Hudson for their cooperation and helpful assistance.

REFERENCES

Sutcliffe, W.H. Jr., R.H. Loucks, K.F. Drinkwater and A.R. Coote. 1983. Nutrient flux onto the Labrador Shelf from Hudson Strait and its biological consequences. Accepted for publication in Can. J. Fish. Aquat. Sci.

TABLE 1

Mooring Information

Station #	Mooring #	Lat.	Long.	Water Depth (m)	Instrument Depth (m)	Start Time (UT)	Duration Days
HS1	493	61° 09'	69° 29'	254	30	22:15 Aug 22	51.9
					50	22:15 Aug 22	51.9
					100	22:15 Aug 22	51.9
					200	22:15 Aug 22	51.9
HS2	494	61° 19'	69° 09'	320	30	17:45 Aug 22	53.1
HS3	495	61° 37'	68° 50'	300	30	12:00 Aug 22	54.0
					200	12:00 Aug 22	54.0
HS4	496	62° 01'	68° 09'	183	30	18:30 Aug 21	54.9
					100	18:30 Aug 21	54.9
HS5	497	61° 13'	67° 22'	407	30	12:00 Aug 21	54.0
					200	12:00 Aug 21	54.0

TABLE 2

The Amplitudes and Phase Lags for the M_2 Tidal Constituent

Station	Depth	Major Axis			Minor Axis		
		Amp. (ms^{-1})	Phase	Direction	Amp (ms^{-1})	Phase	Rotation
HS1	30	.297	189°	107°	.055	279°	C
	50	.289	189°	103°	.051	279°	C
	100	.295	186°	113°	.070	276°	C
	200	.235	180°	116°	.008	270°	C
HS2	30	.206	182°	119°	.046	271°	C
HS3	30	.257	167°	117°	.027	257°	C
	200	.275	172°	112°	.056	262°	C
HS4	30	.464	170°	110°	.046	260°	C
	100	.411	164°	116°	.003	254°	C
HS5	30	.389	109°	111°	.134	200°	C
	200	.291	127°	92°	.046	217°	C

TABLE 3

Mean Currents and their Standard Deviations (sd) in ms^{-1}.

Station	Depth (m)	Along-Strait Mean	Along-Strait sd	Across-Strait Mean	Across-Strait sd	Mean Rate	Mean Direction
HS1	30	.292	.145	.079	.056	.302	110°
	50	.235	.139	.094	.066	.253	103°
	100	.122	.125	.034	.049	.127	109°
	200	.034	.120	.009	.048	.035	110°
HS2	30	.071	.078	-.011	.052	.073	138°
HS3	30	-.028	.056	-.025	.054	.038	262°
	200	-.018	.029	-.014	.028	.023	265°
HS4	30	-.093	.057	.013	.037	.094	313°
	100	-.048	.052	-.014	.027	.050	289°
HS5	30	-.010	.092	-.094	.059	.095	221°
	200	-.020	.075	-.060	.058	.063	233°

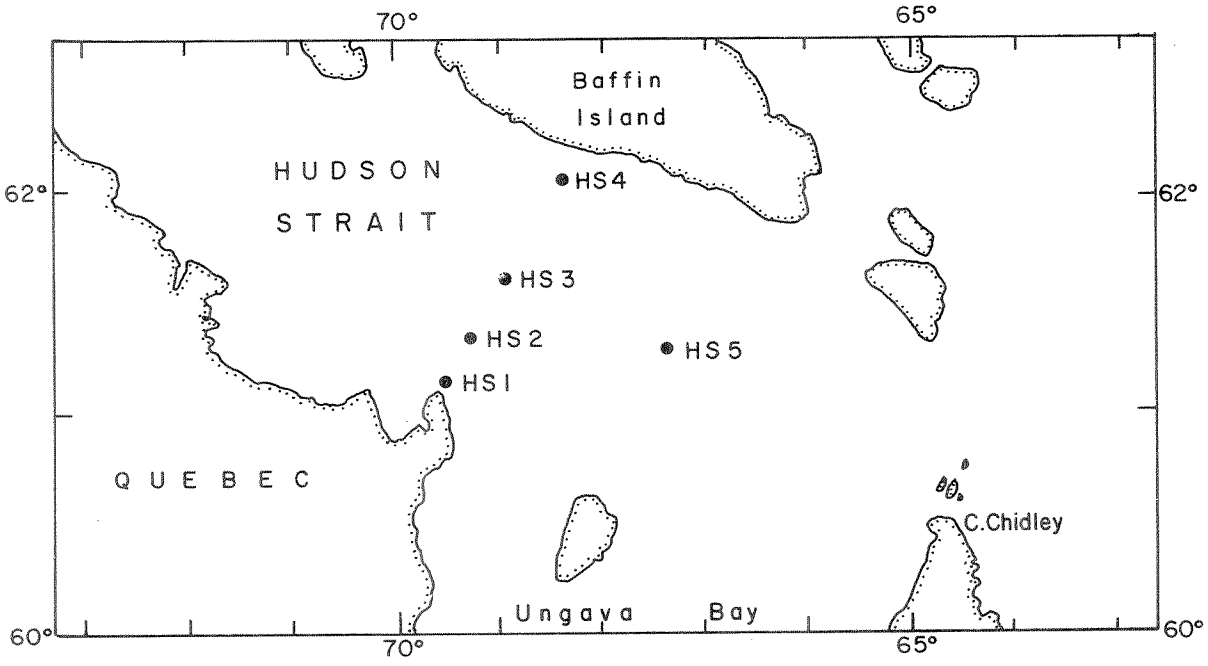


Fig. 1 Hudson Strait showing mooring locations.

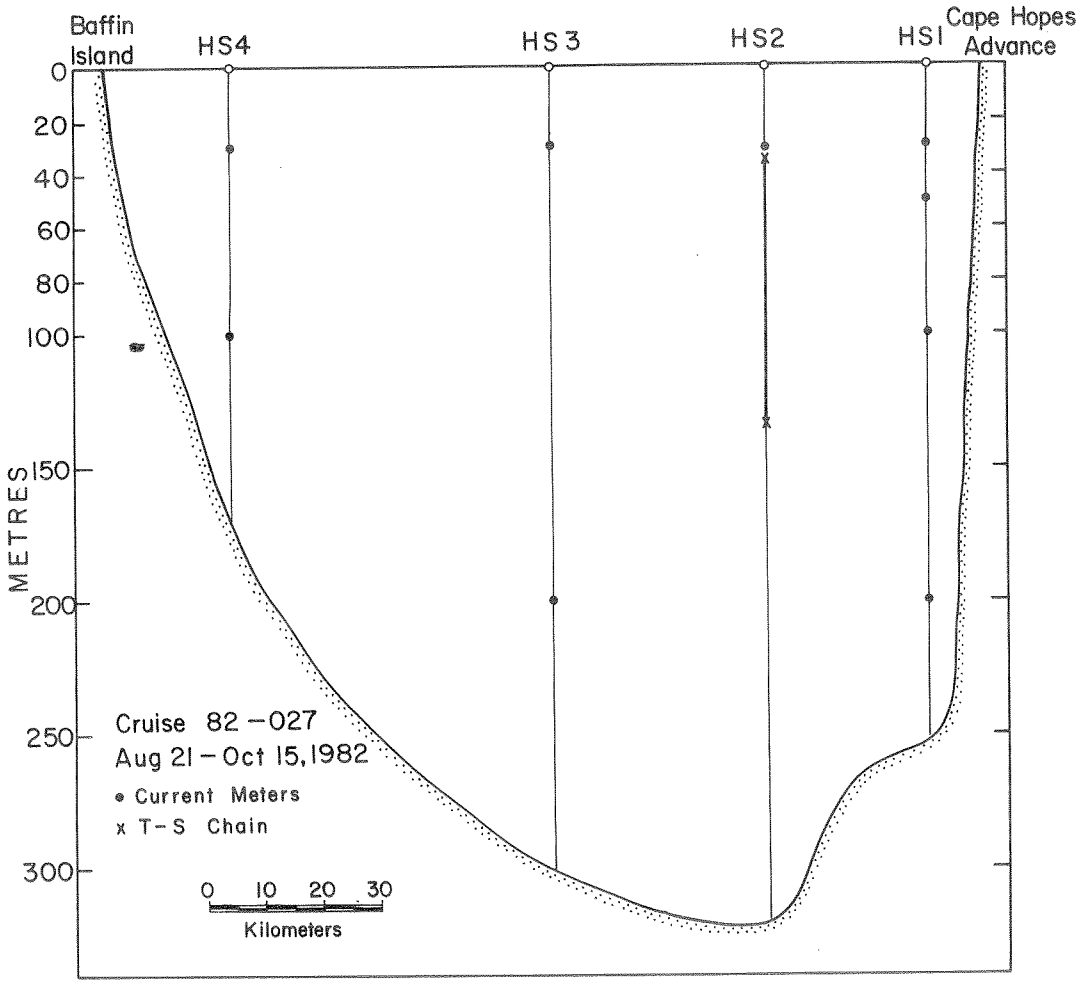


Fig. 2a Vertical profile of moorings HS1-HS4.

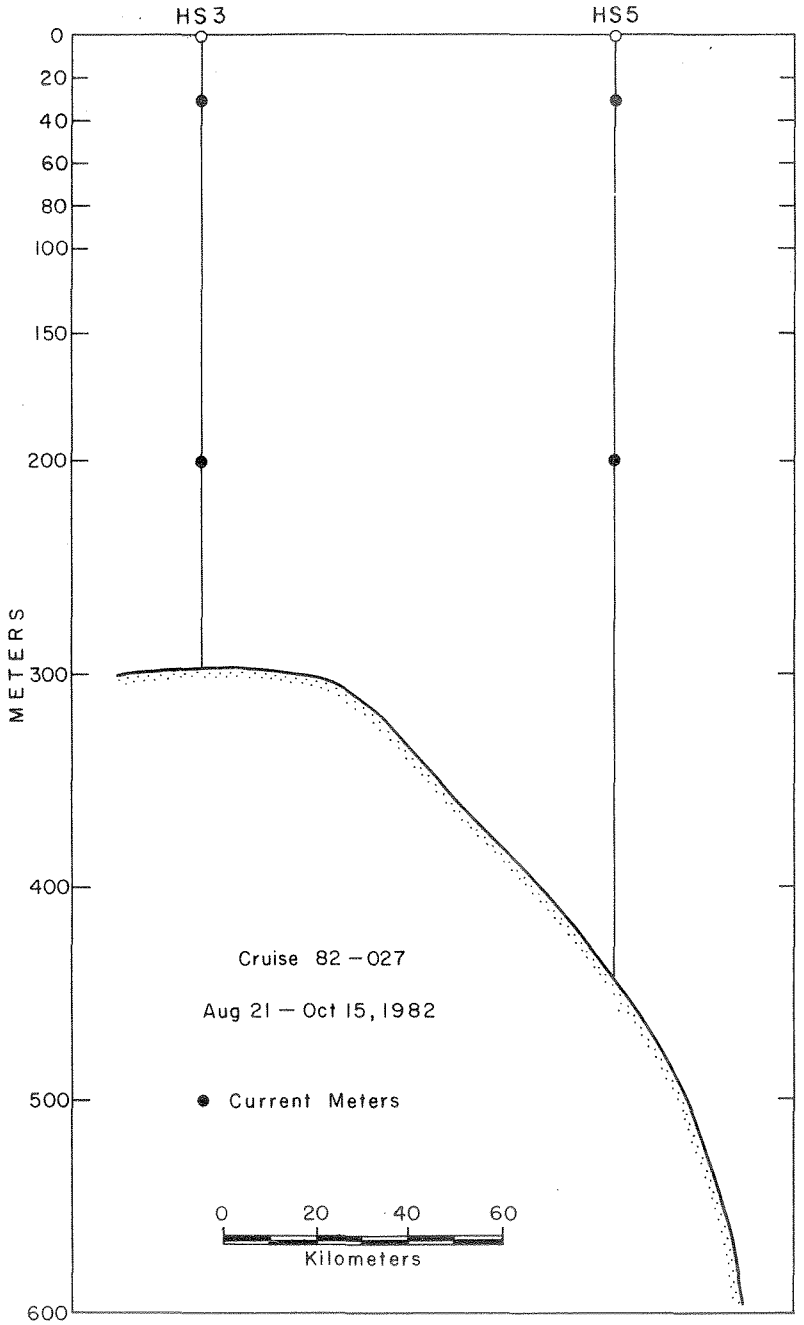


Fig. 2b Vertical profile of moorings HS3 and HS5

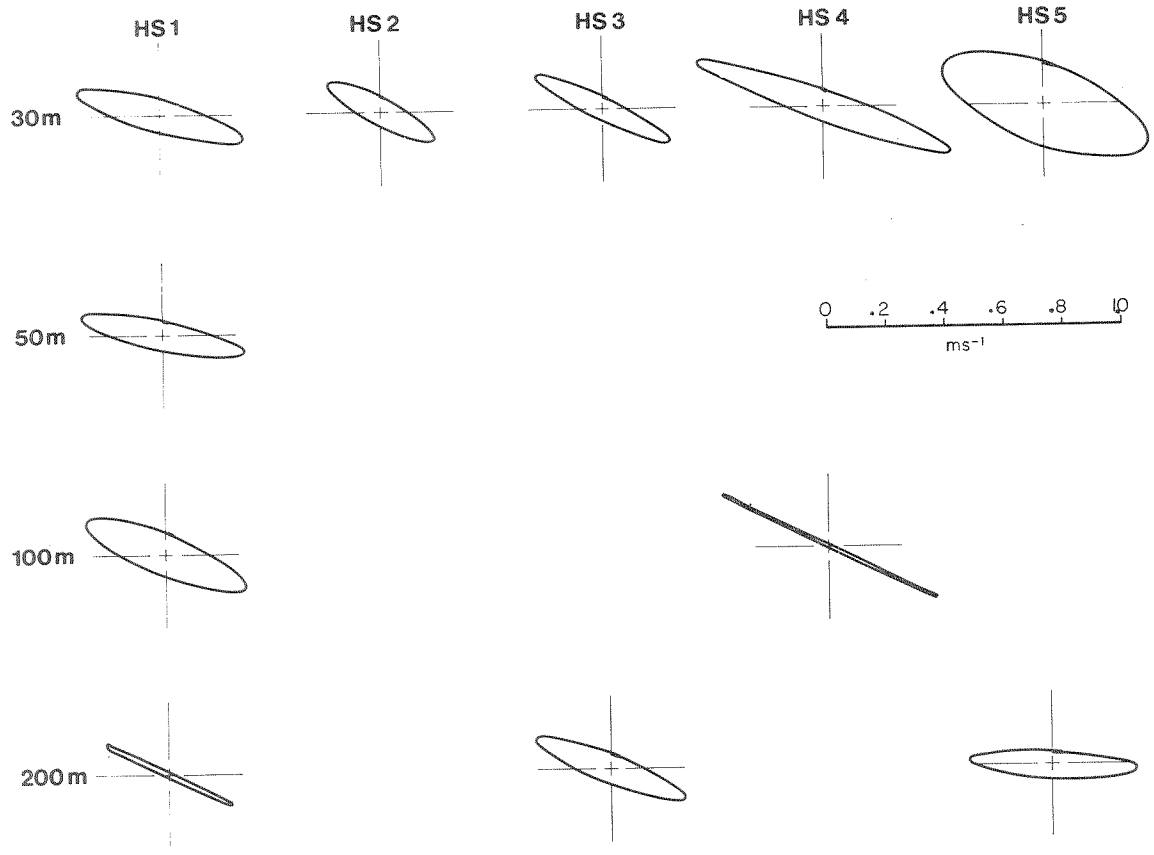


Fig. 3 Tidal ellipses

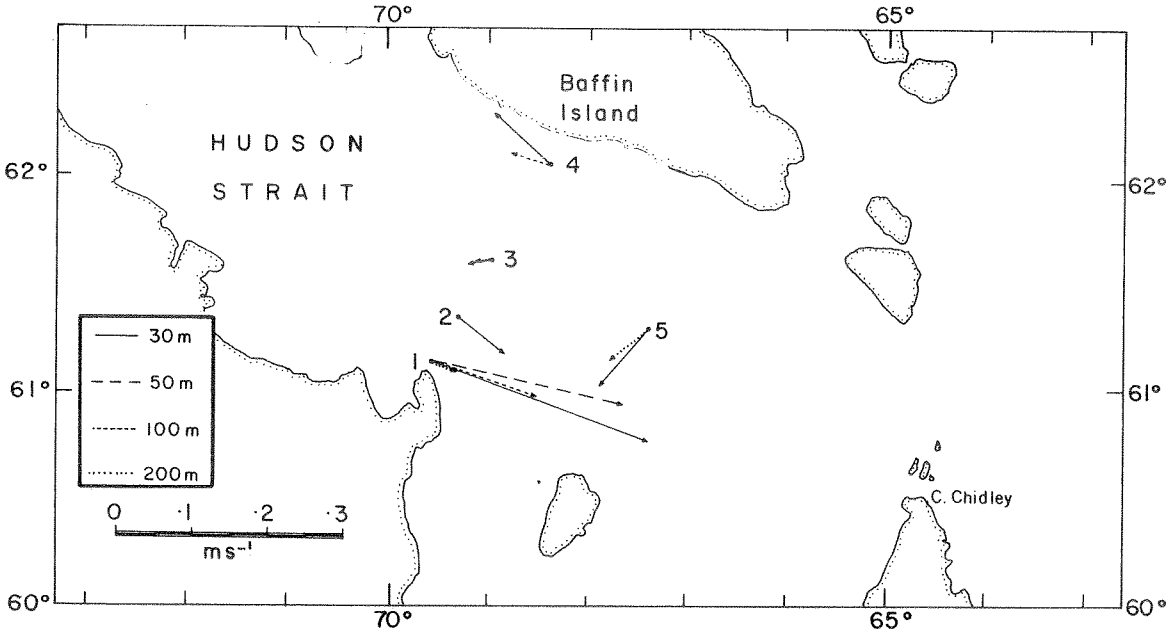
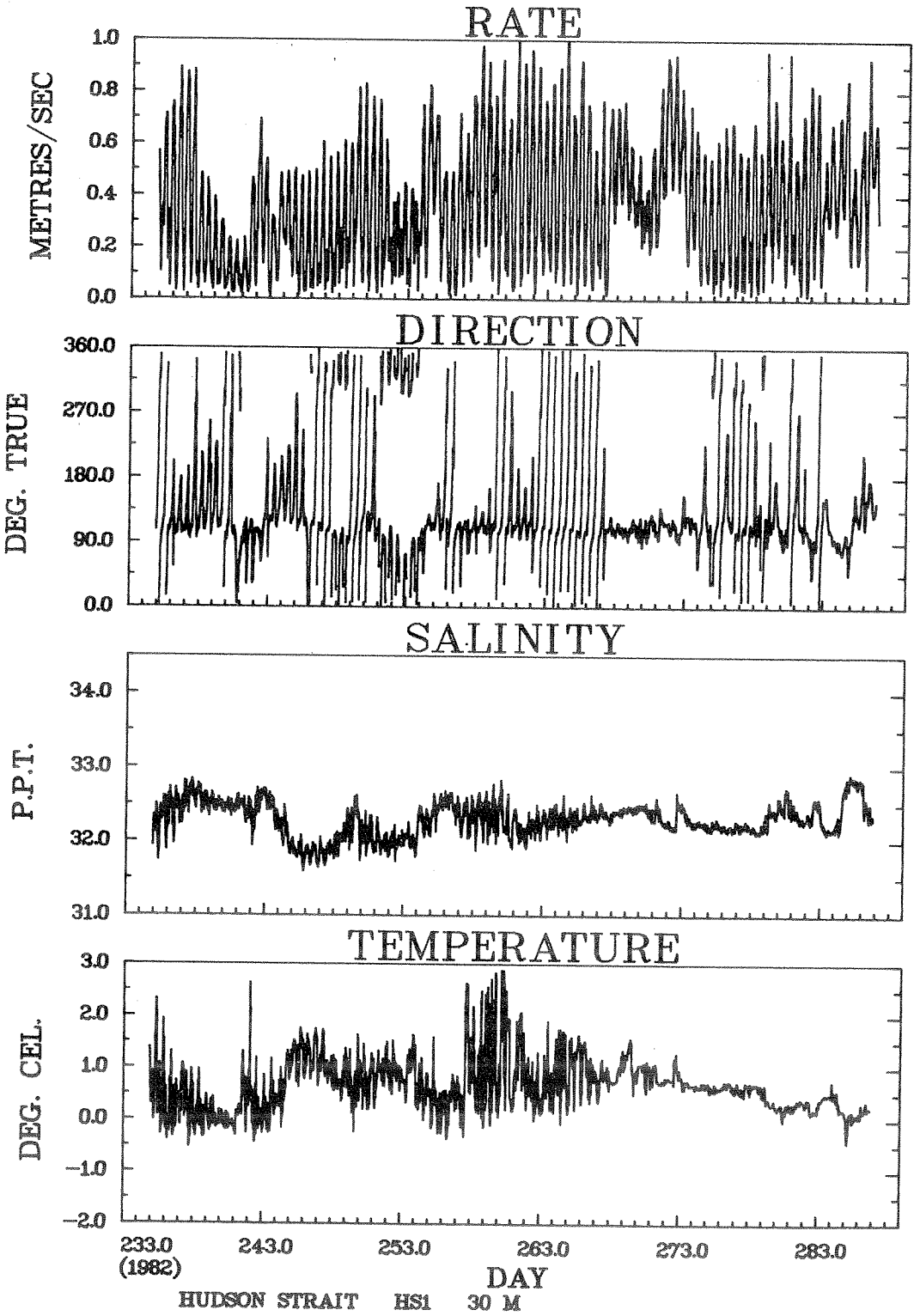
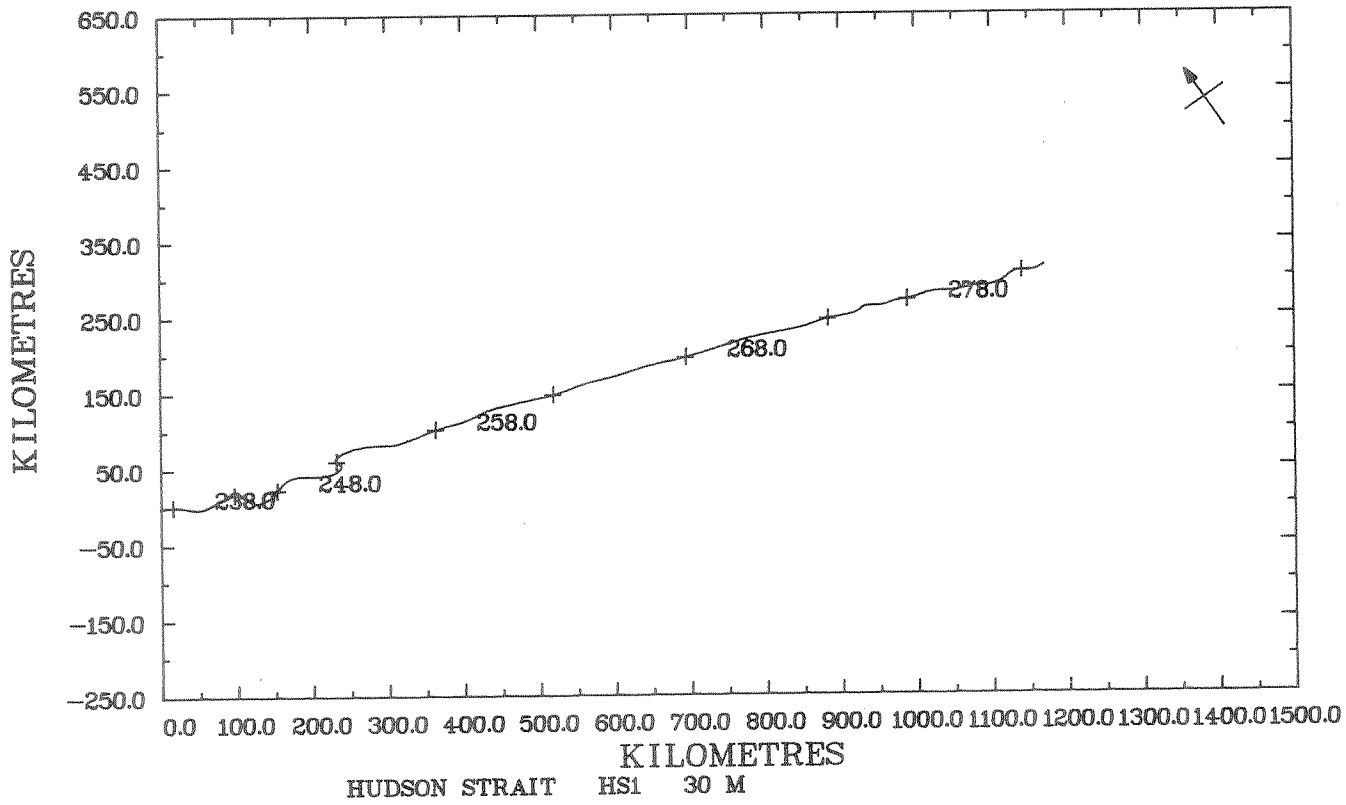


Fig. 4 Mean currents

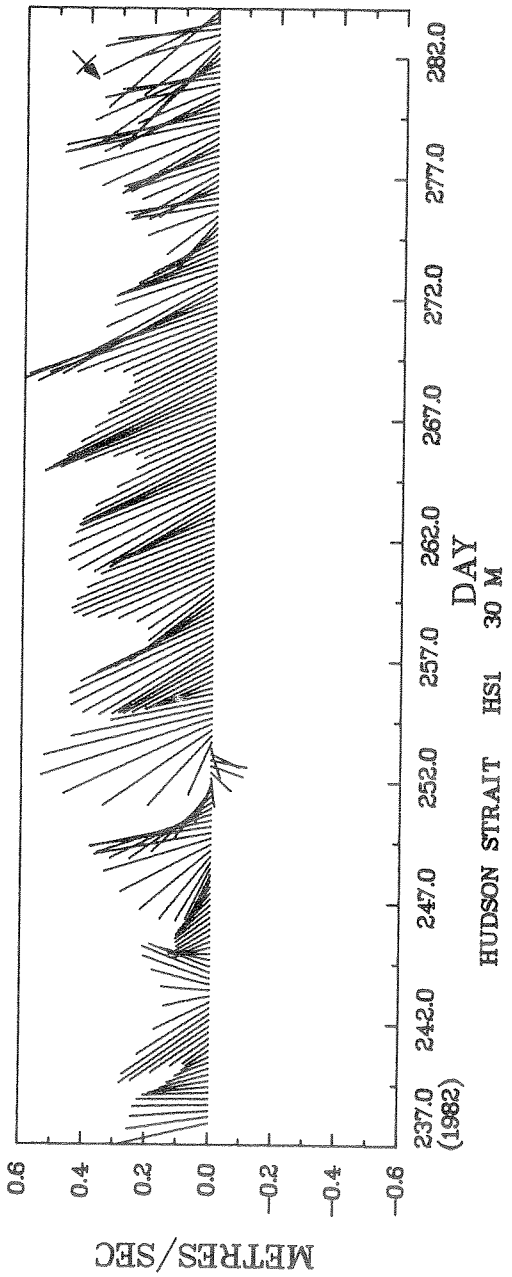
APPENDIX 1

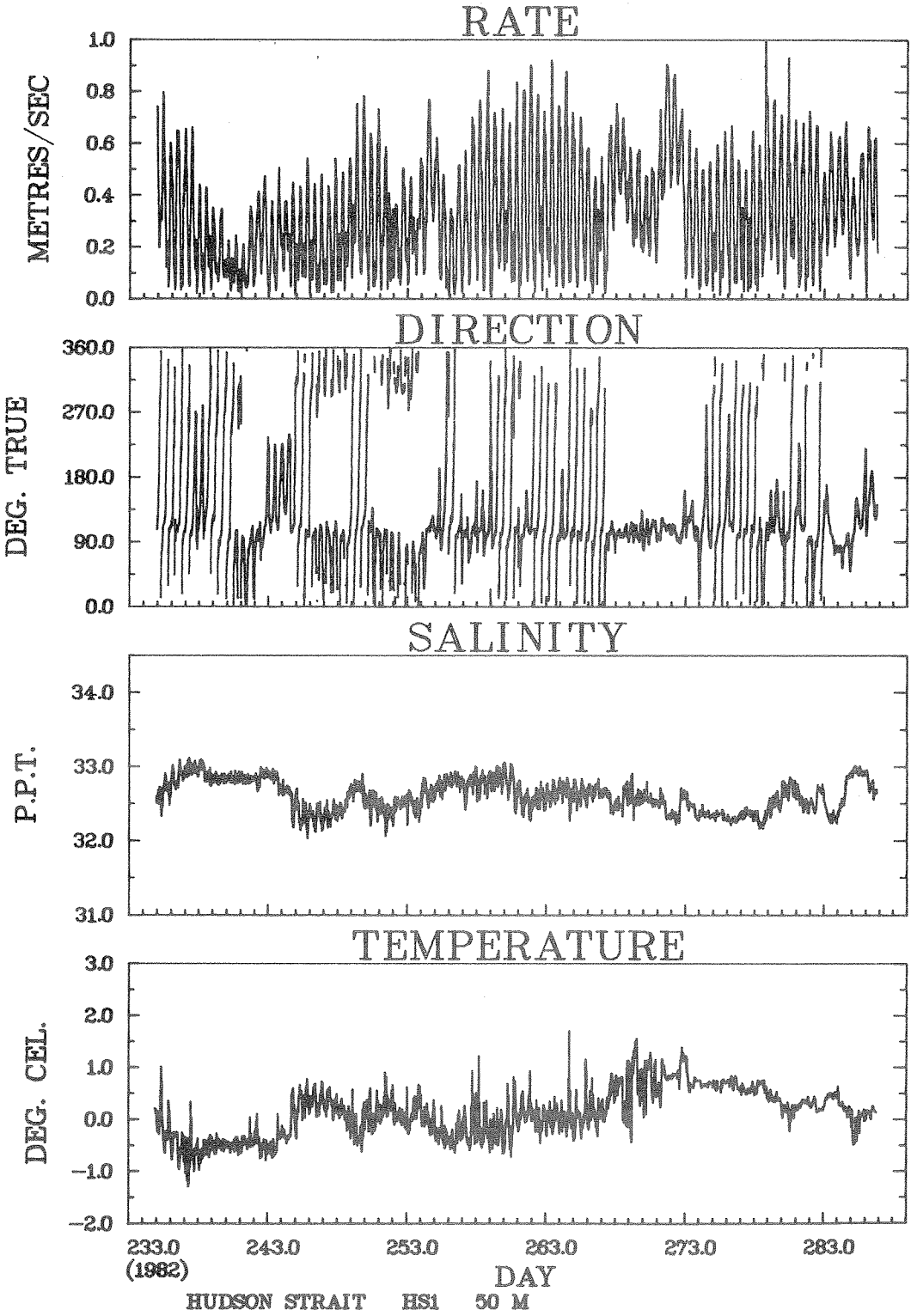
Time series plots of current rates and directions, temperatures and salinities, plus progressive vector diagrams and stickplots for Hudson Strait moorings.

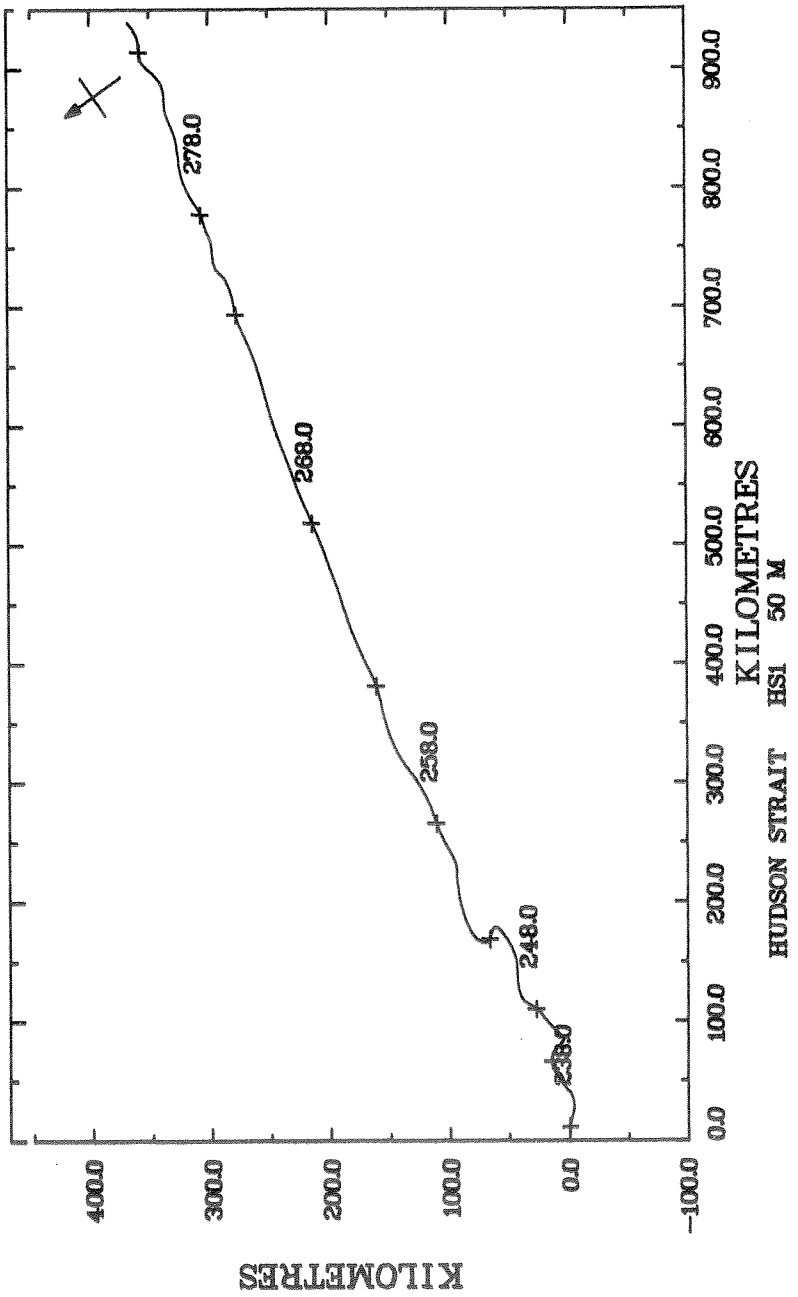

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
−1.0
−2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS1 30 M

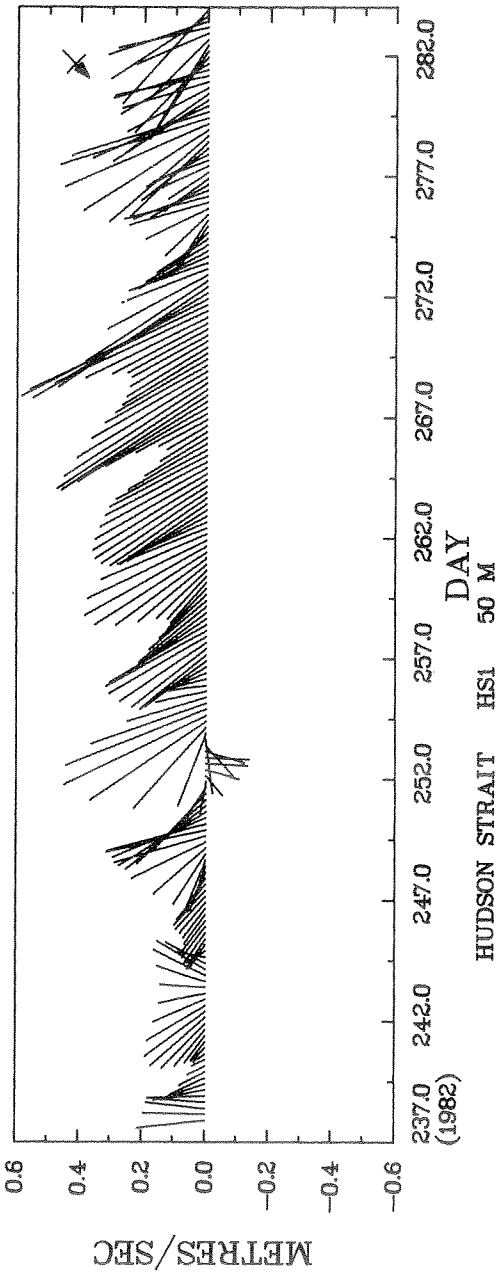


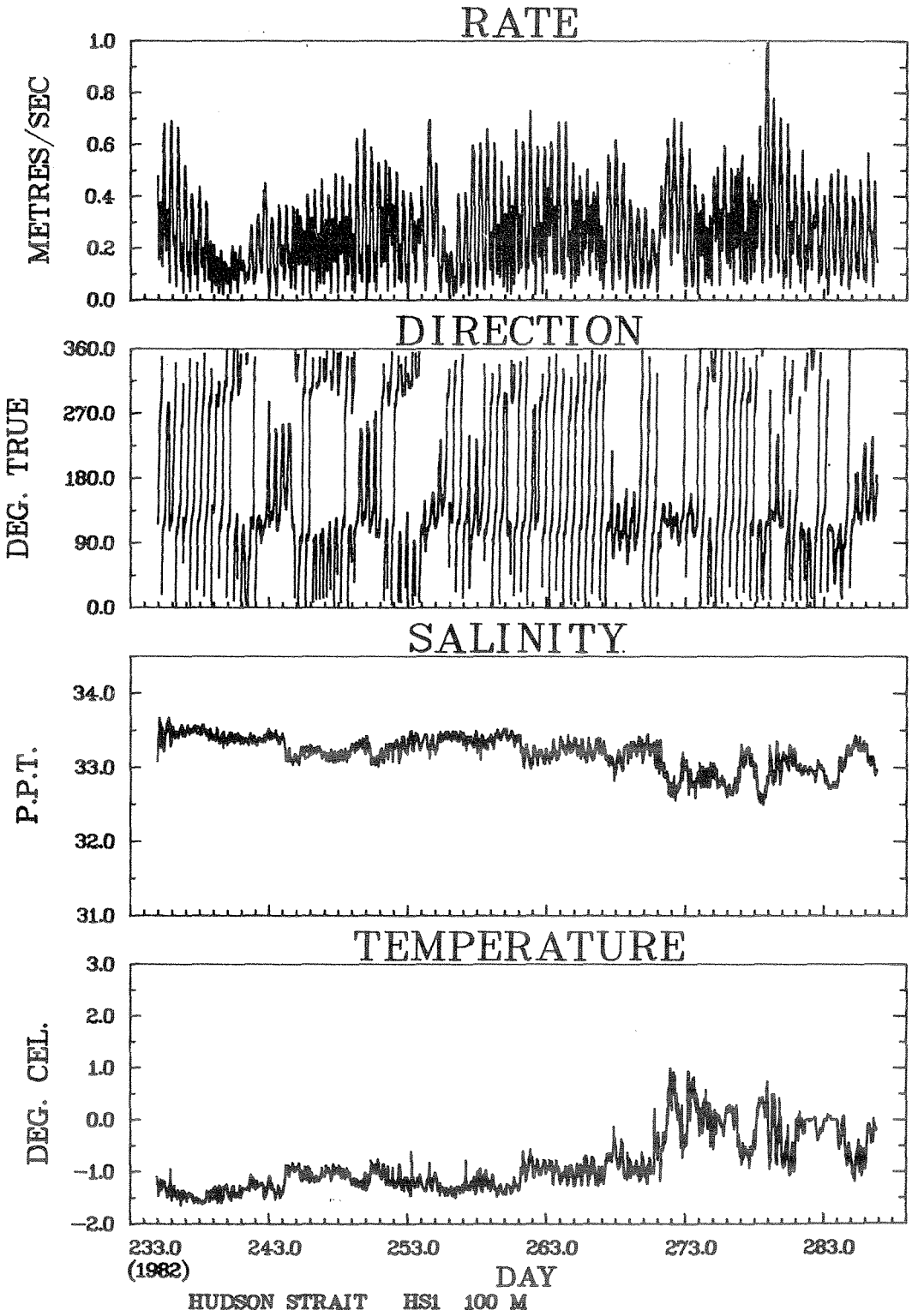
HUDSON STRAIT HS1 30 M

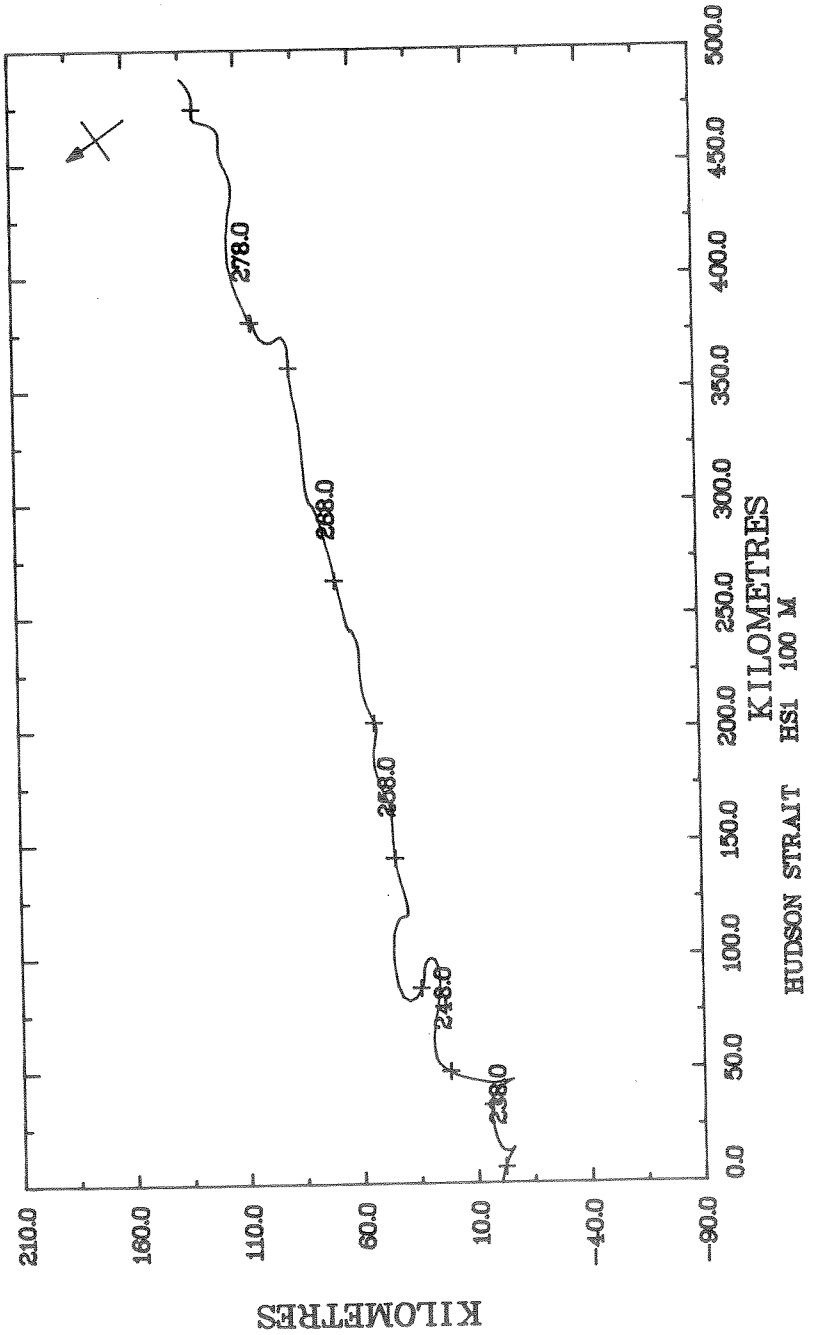

METRES/SEC
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
237.0
(1982)
242.0
247.0
252.0
257.0
262.0
267.0
272.0
277.0
282.0
DAY
HUDSON STRAIT HS1 30 M

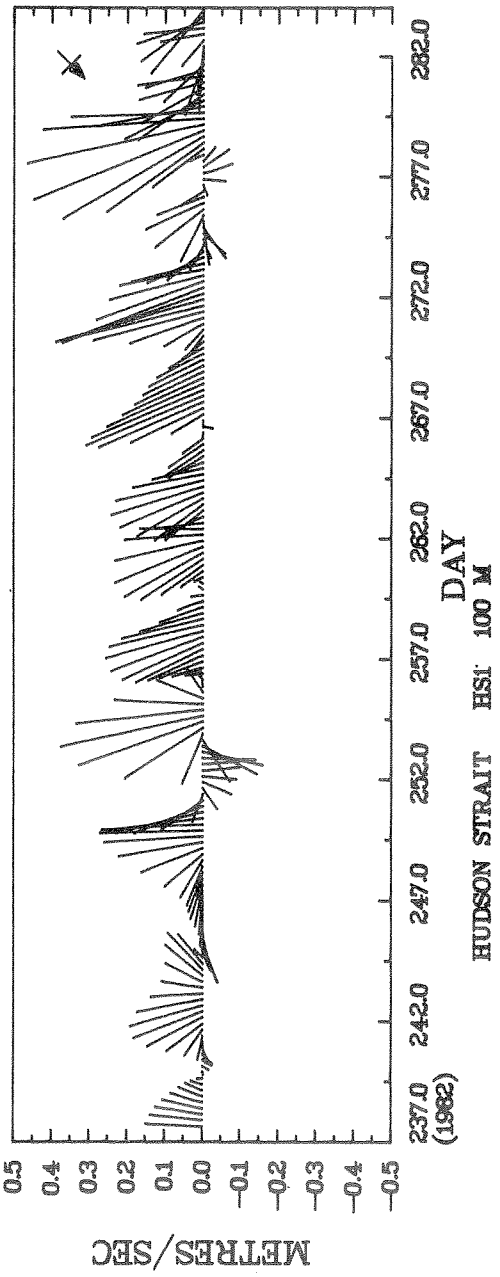

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
−1.0
−2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS1 50 M

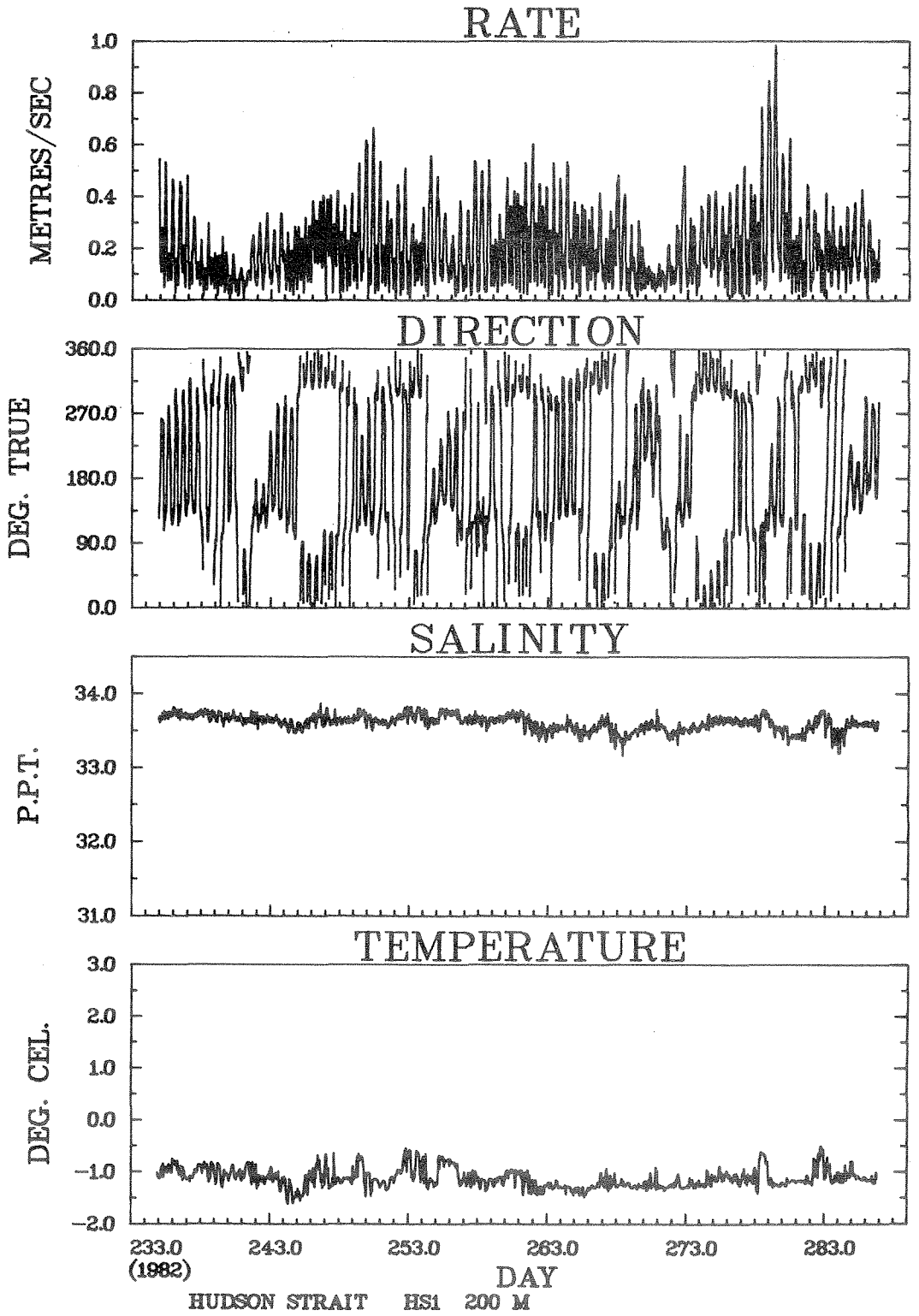

400.0
300.0
200.0
100.0
0.0
-100.0
KILOMETRES
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
KILOMETRES
238.0
248.0
258.0
268.0
278.0
HUDSON STRAIT HS1 50 M

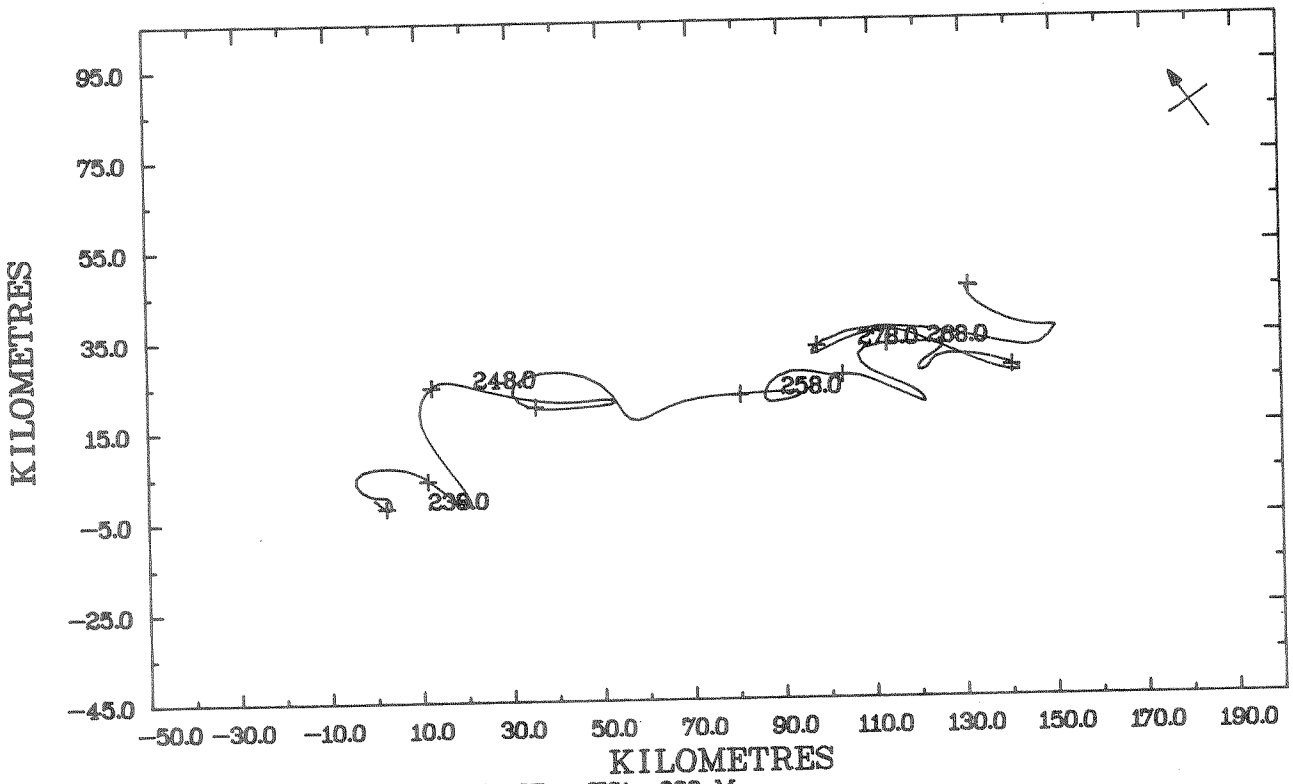

METRES/SEC
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
237.0
(1982)
242.0
247.0
252.0
257.0
262.0
267.0
272.0
277.0
282.0
DAY
HUDSON STRAIT HS1 50 M


RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
-1.0
-2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS1 100 M

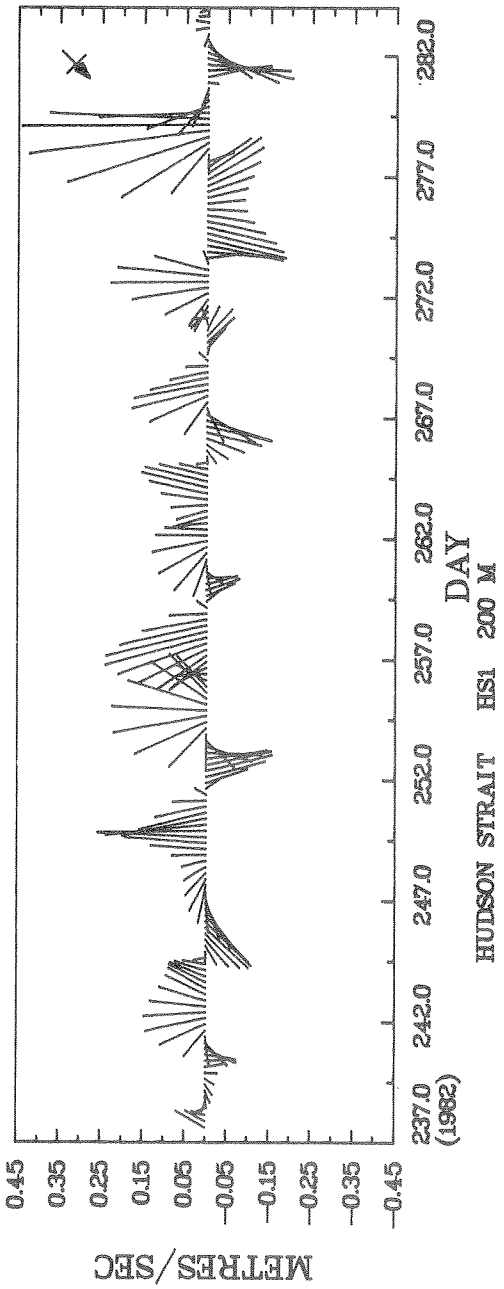

210.0
160.0
110.0
60.0
10.0
-40.0
-90.0
KILOMETRES
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
KILOMETRES
HUDSON STRAIT HSI 100 M
238.0
248.0
258.0
268.0
278.0

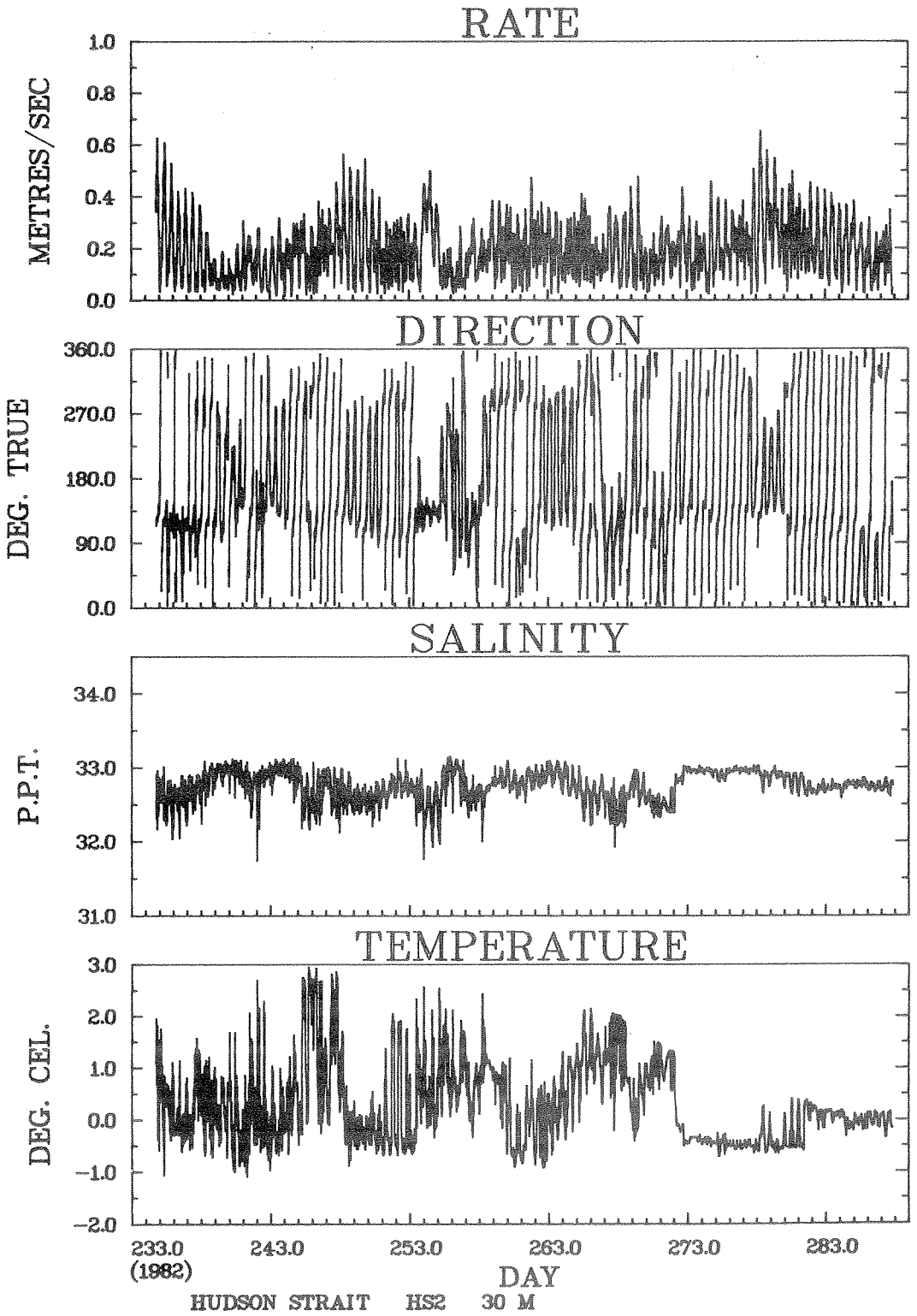

METRES/SEC
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
237.0
(1982)
242.0
247.0
252.0
257.0
262.0
267.0
272.0
277.0
282.0
DAY
HUDSON STRAIT HS1 100 M

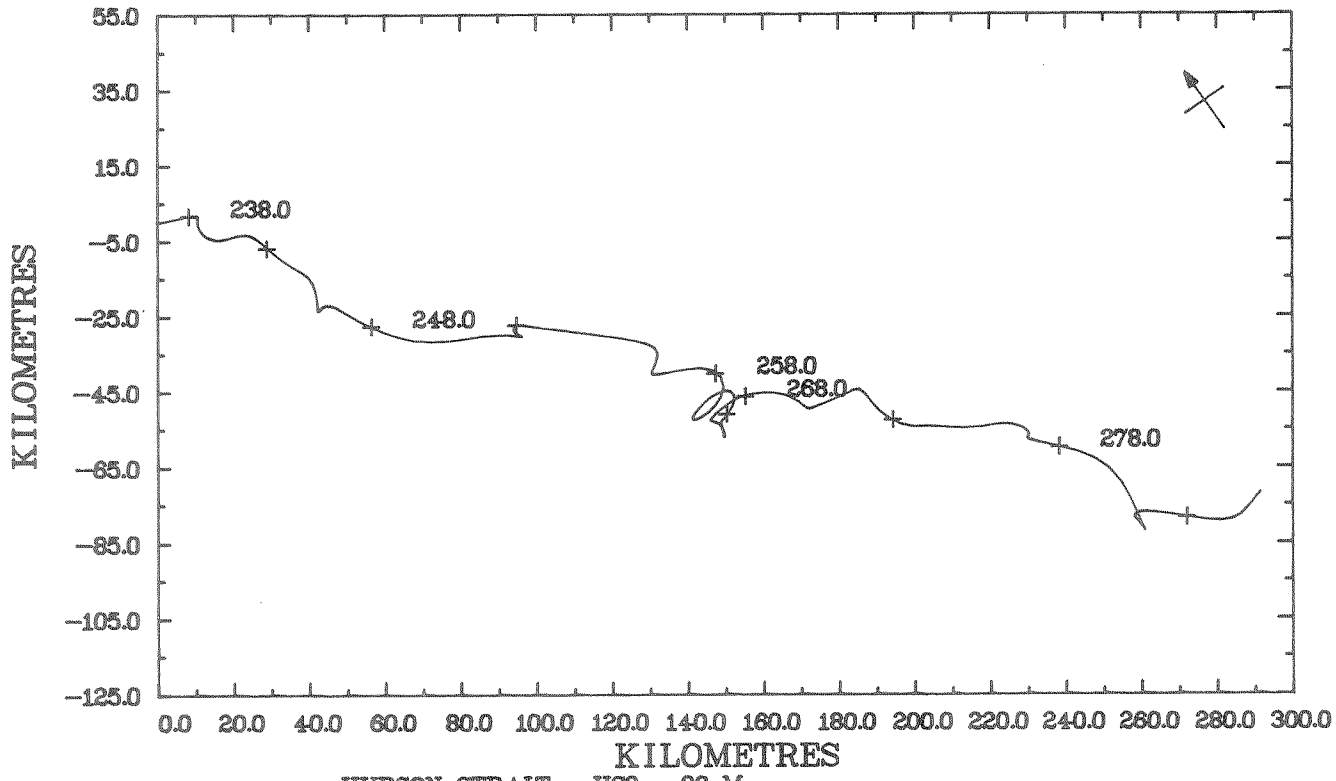

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
-1.0
-2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS1 200 M



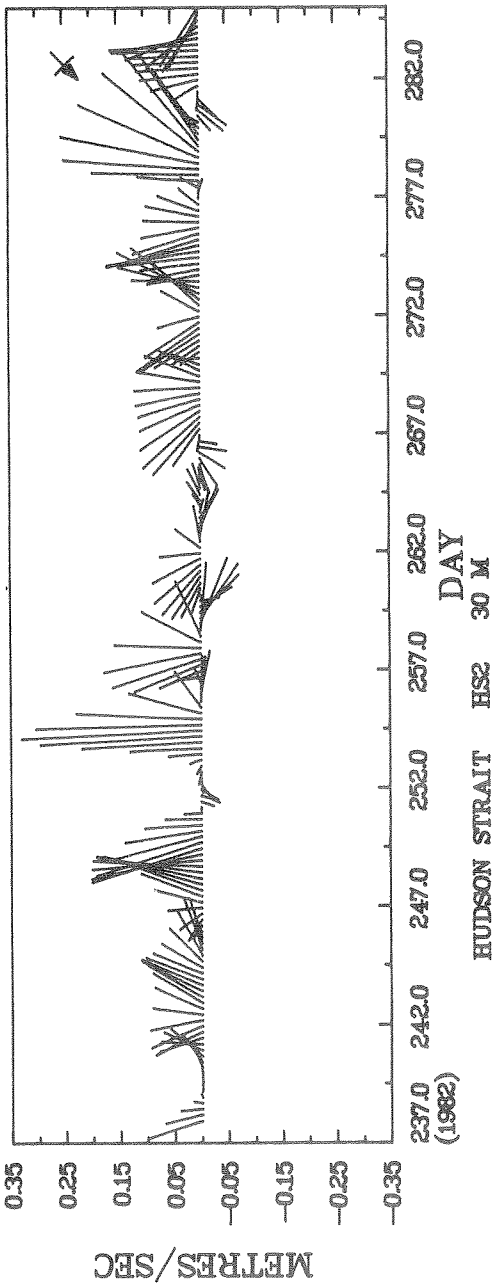
HUDSON STRAIT HS1 200 M

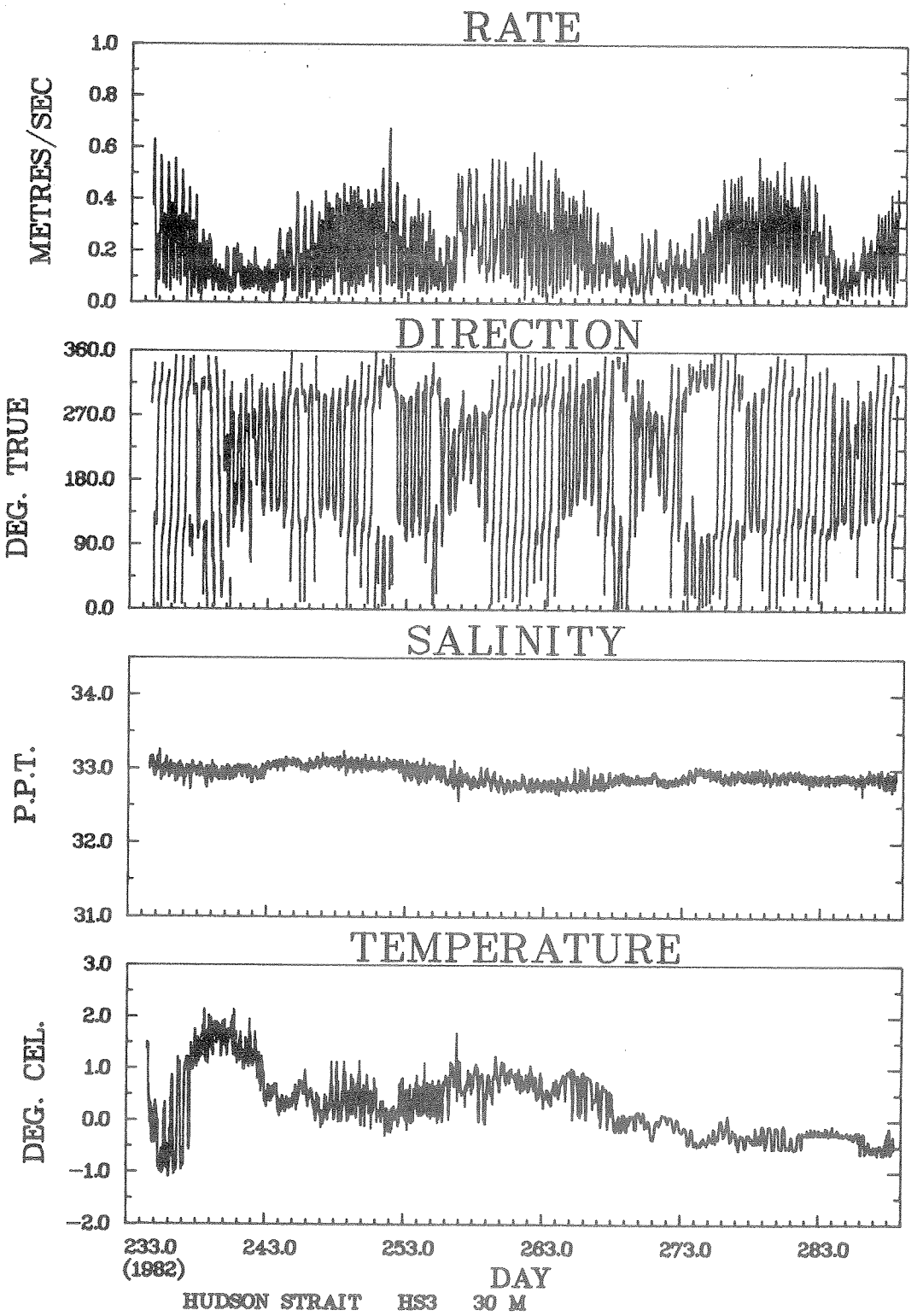

METRES/SEC
0.45
0.35
0.25
0.15
0.05
-0.05
-0.15
-0.25
-0.35
-0.45
237.0
(1982)
242.0
247.0
252.0
257.0
262.0
267.0
272.0
277.0
282.0
DAY
HUDSON STRAIT HS1 200 M

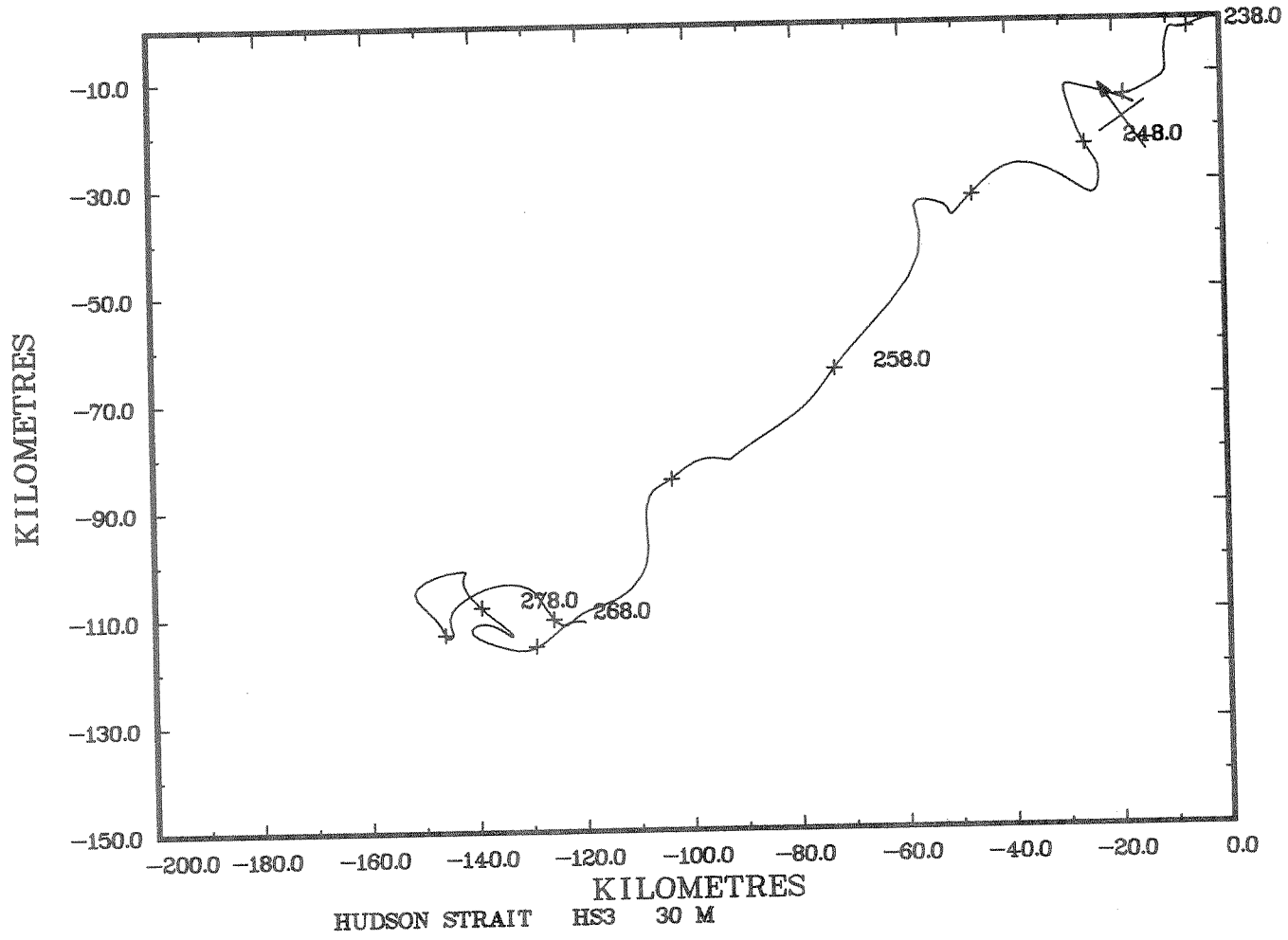

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
−1.0
−2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS2 30 M

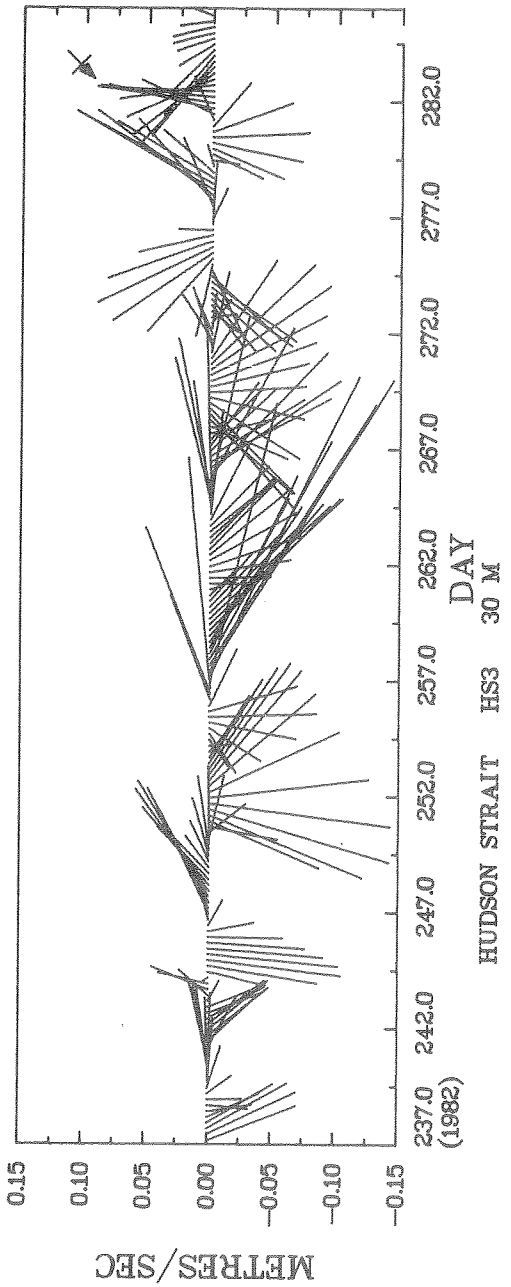


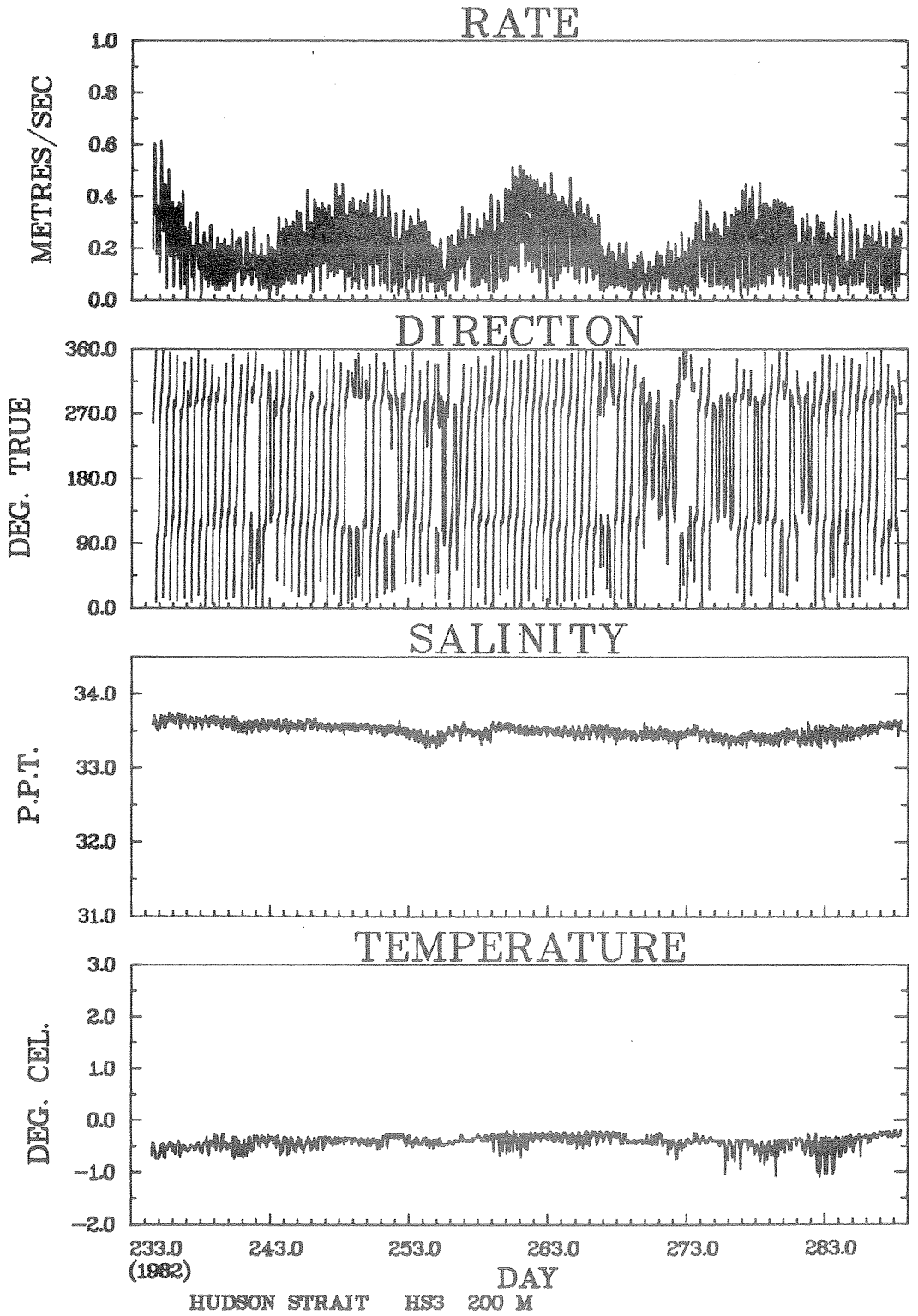
HUDSON STRAIT HS2 30 M

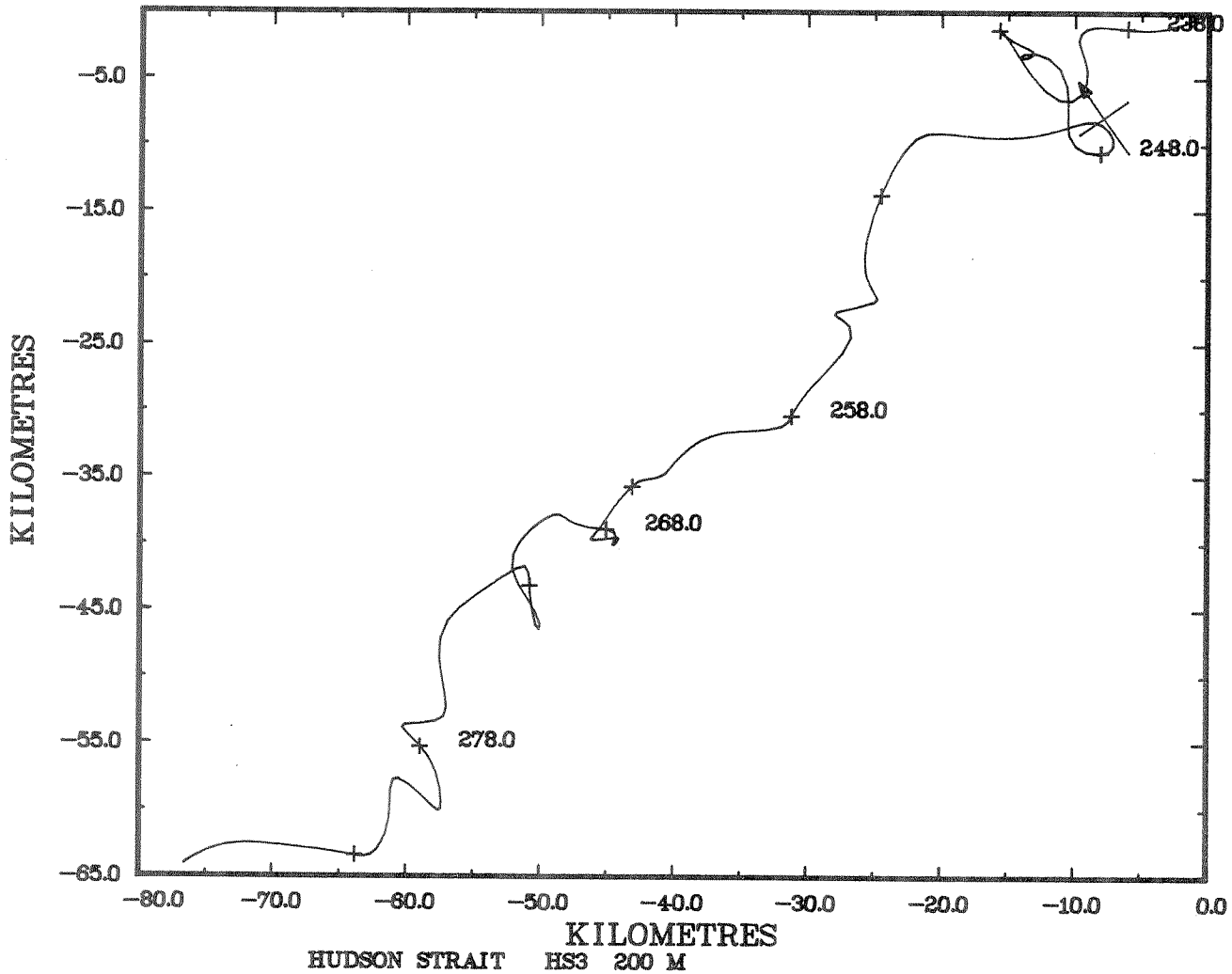

METRES/SEC
0.35
0.25
0.15
0.05
-0.05
-0.15
-0.25
-0.35
237.0
(1982)
242.0
247.0
252.0
257.0
262.0
267.0
272.0
277.0
282.0
DAY
HUDSON STRAIT HS2 30 M


RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
−1.0
−2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS3 30 M

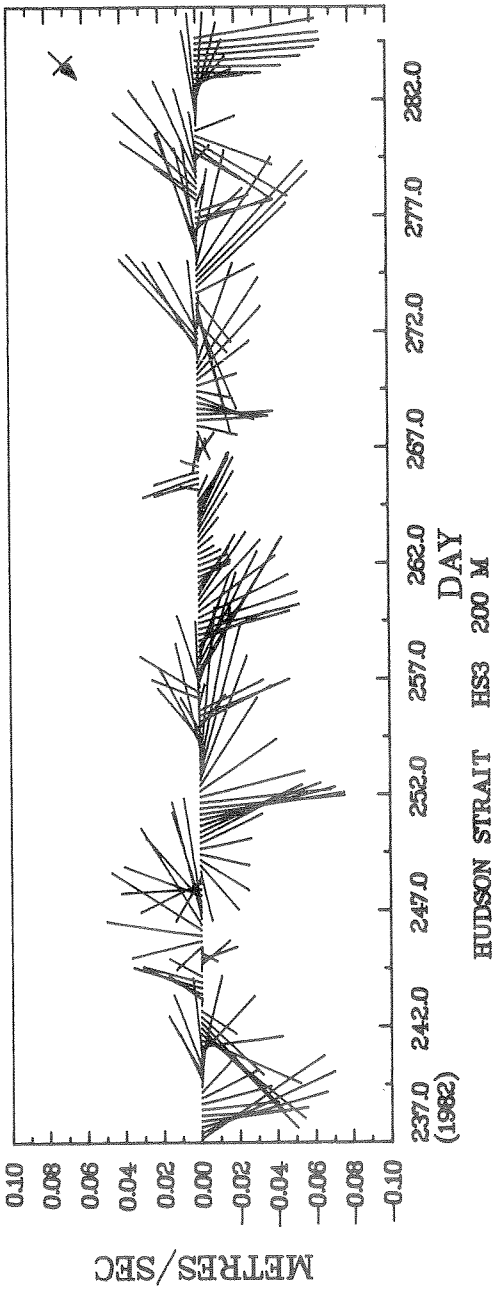

238.0
248.0
258.0
268.0
278.0
-10.0
-30.0
-50.0
-70.0
-90.0
-110.0
-130.0
-150.0
KILOMETRES
-200.0
-180.0
-160.0
-140.0
-120.0
-100.0
-80.0
-60.0
-40.0
-20.0
0.0
KILOMETRES
HUDSON STRAIT HS3 30 M

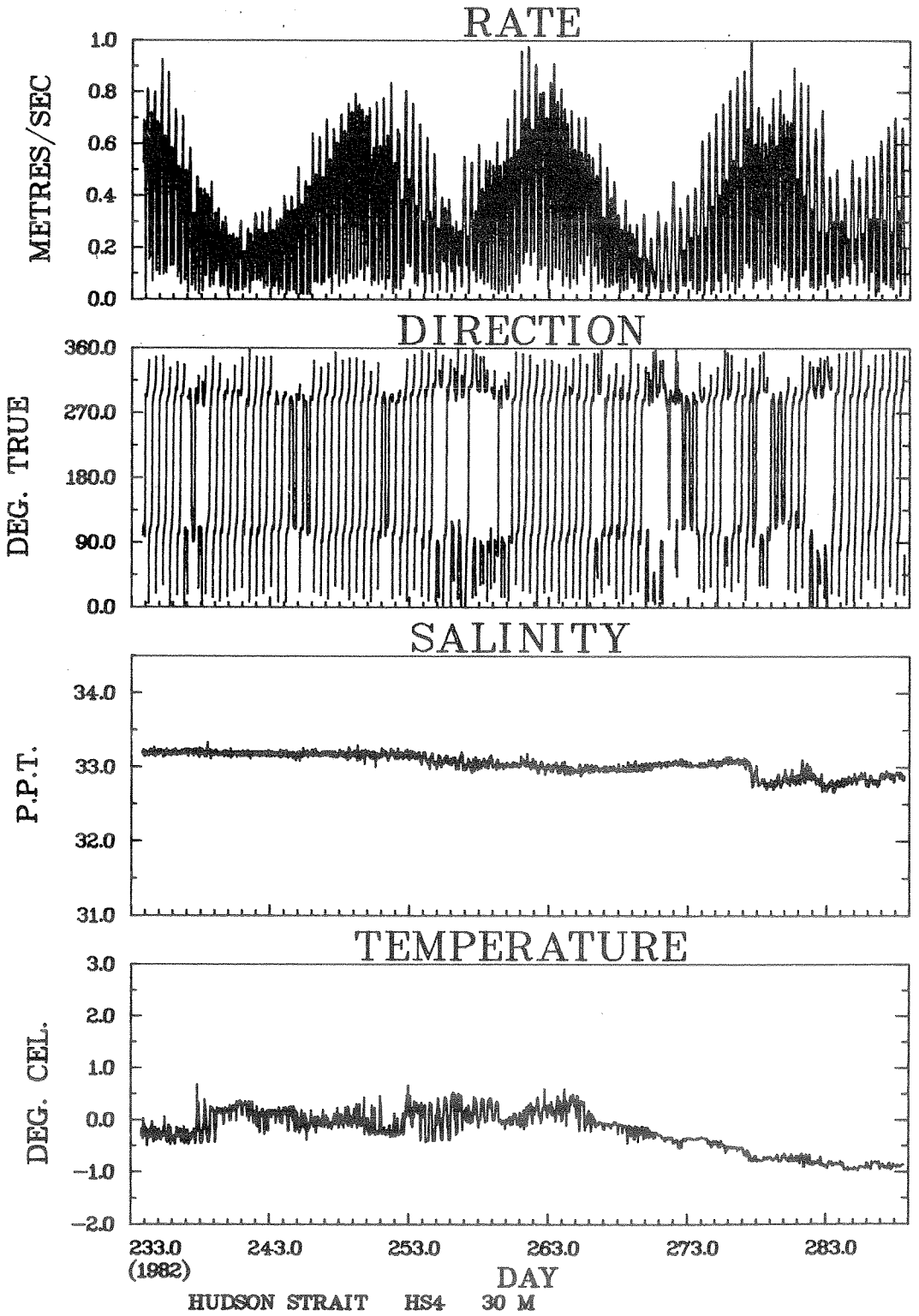

METRES/SEC
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
237.0
(1982)
242.0
247.0
252.0
257.0
262.0
267.0
272.0
277.0
282.0
DAY
HUDSON STRAIT HS3 30 M

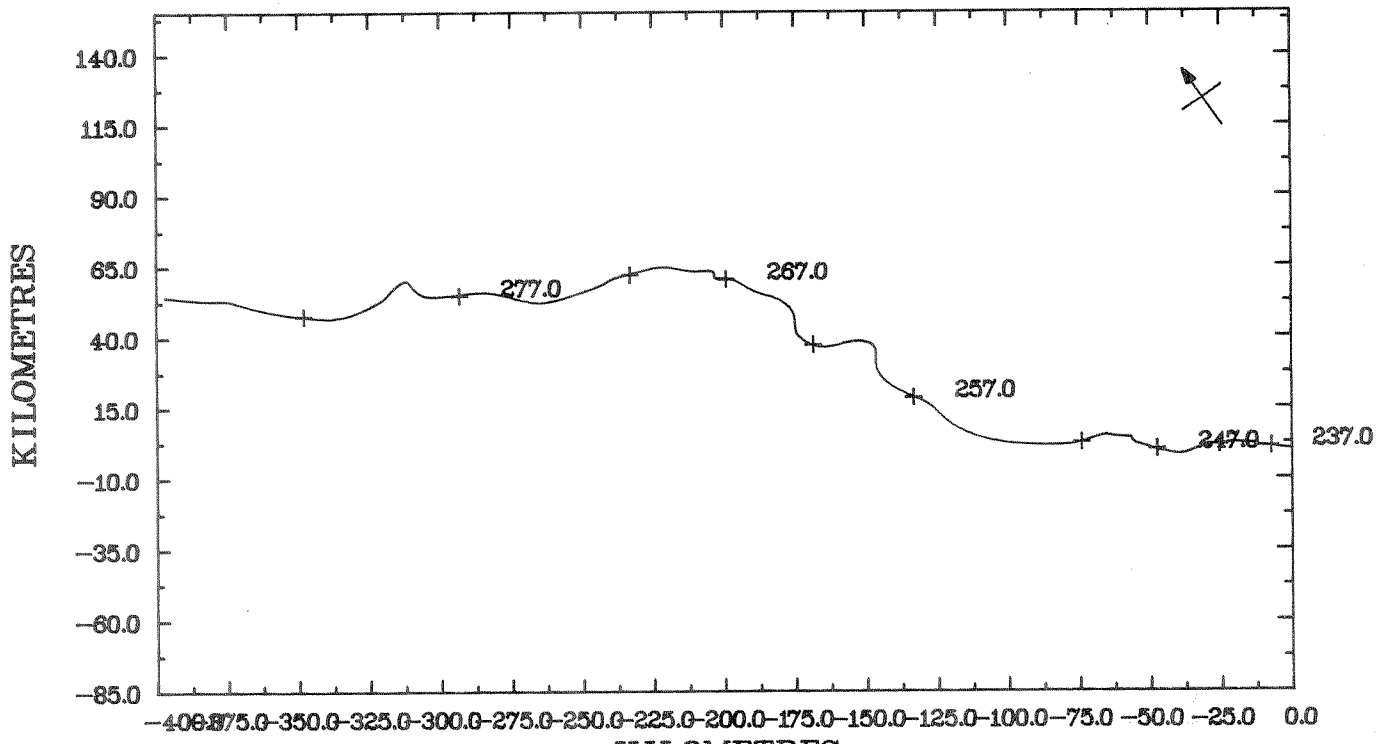

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
−1.0
−2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS3 200 M



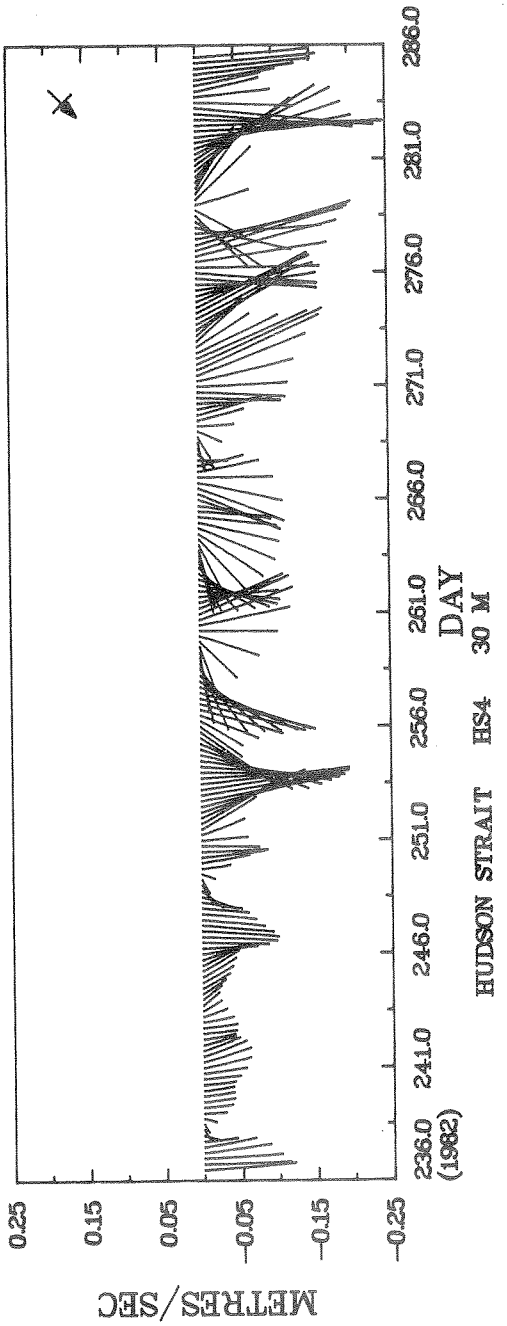
HUDSON STRAIT HS3 200 M

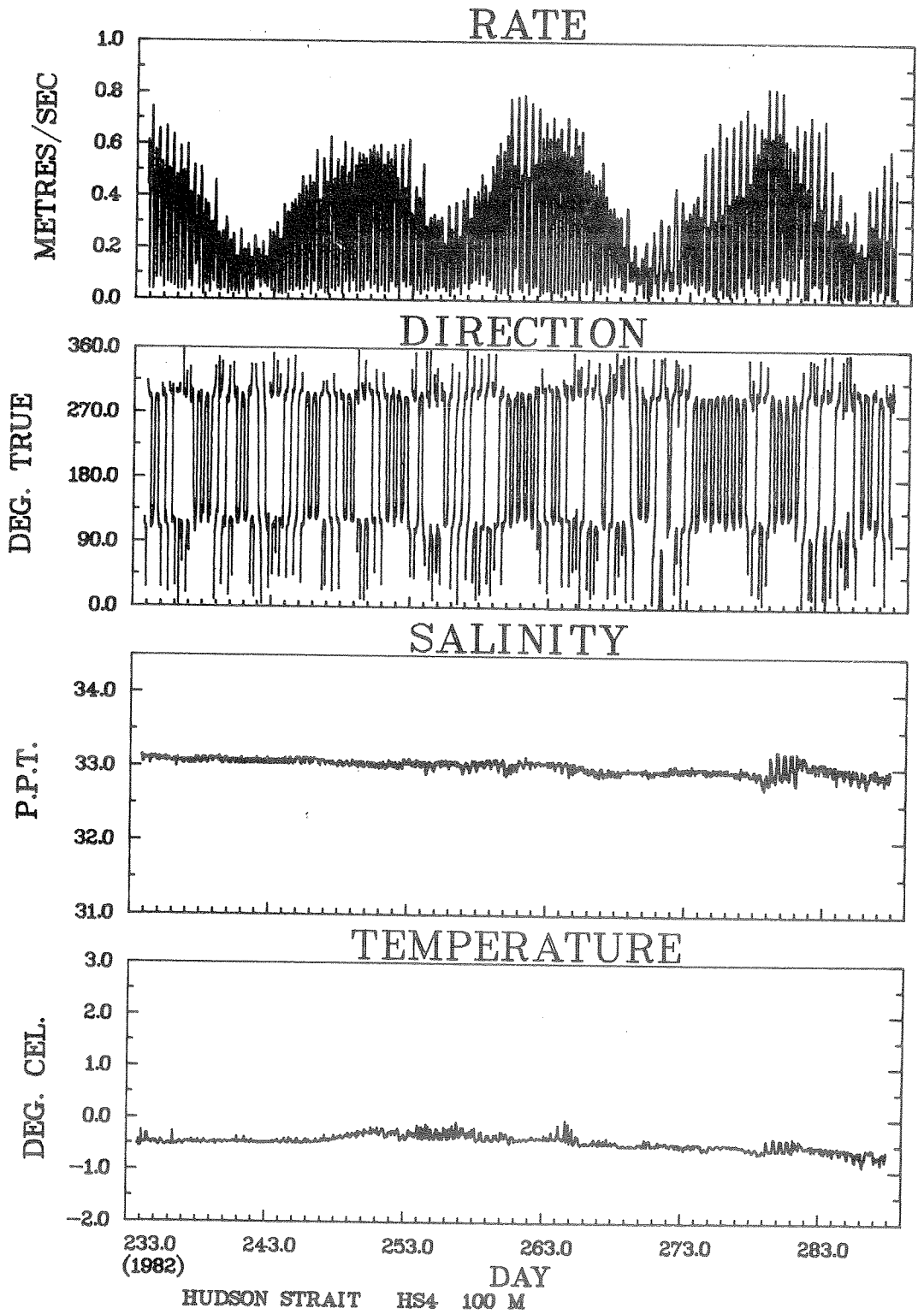

METRES/SEC
0.10
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
237.0
(1982)
242.0
247.0
252.0
257.0
262.0
267.0
272.0
277.0
282.0
DAY
HUDSON STRAIT HS3 200 M

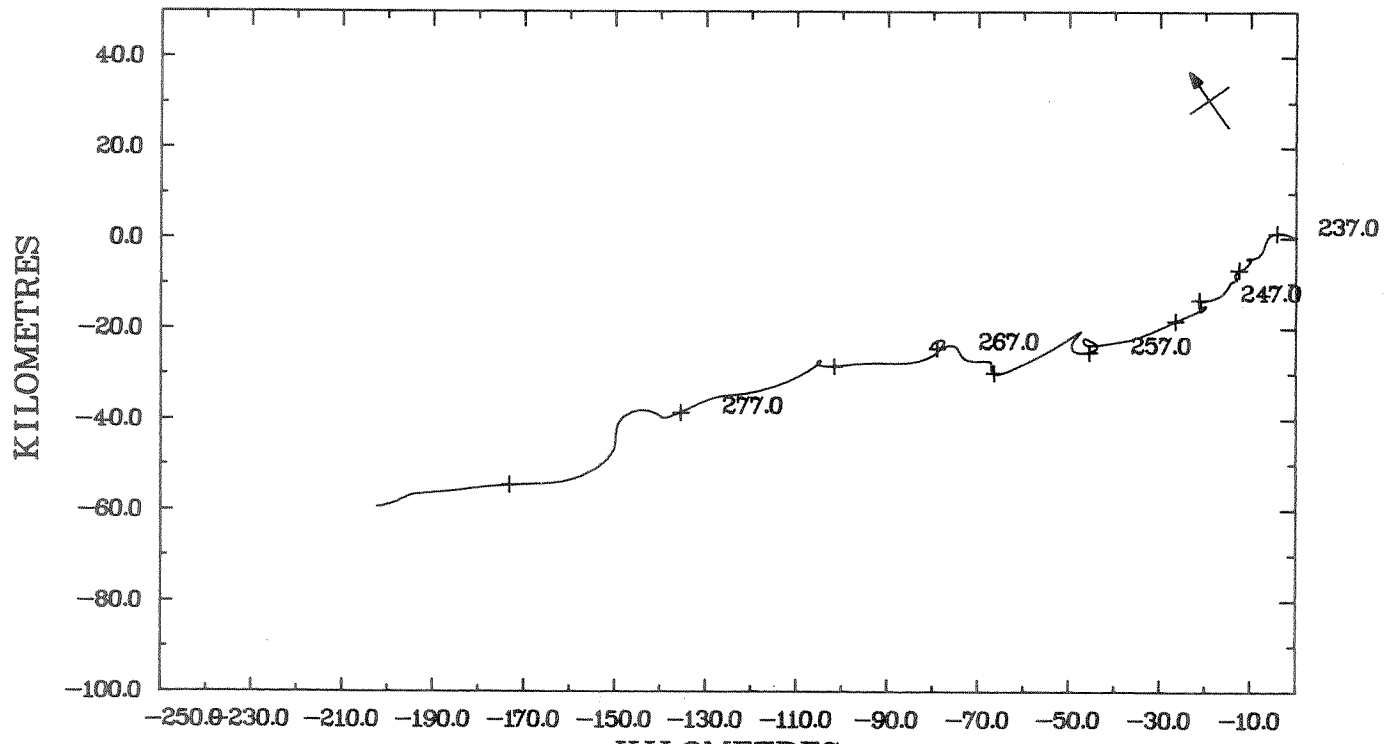

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
−1.0
−2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS4 30 M



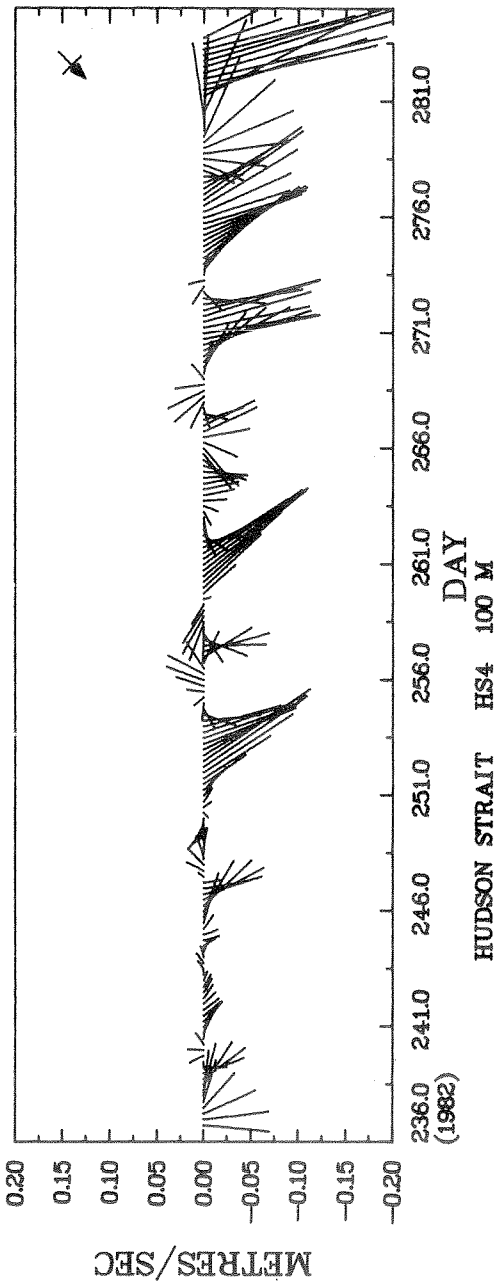
HUDSON STRAIT HS4 30 M

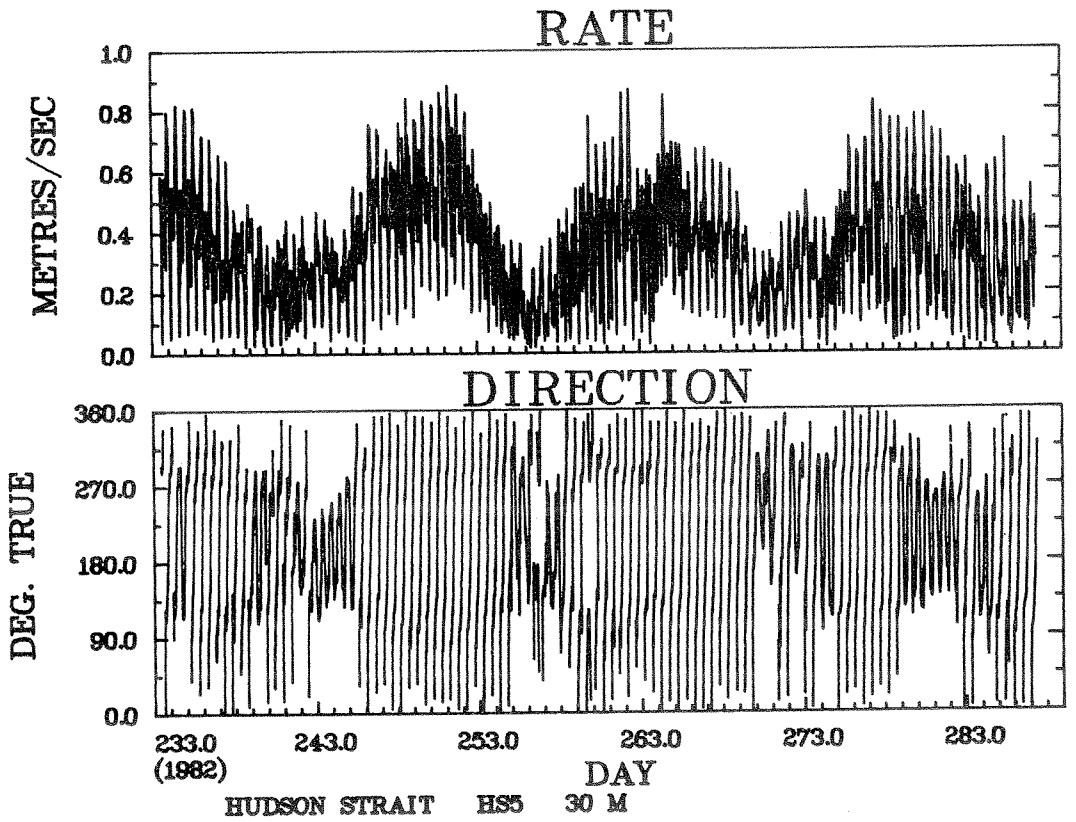

0.25
0.15
0.05
-0.05
-0.15
-0.25
METRES/SEC
236.0
(1982)
241.0
246.0
251.0
256.0
261.0
266.0
271.0
276.0
281.0
286.0
DAY
HUDSON STRAIT HS4 30 M

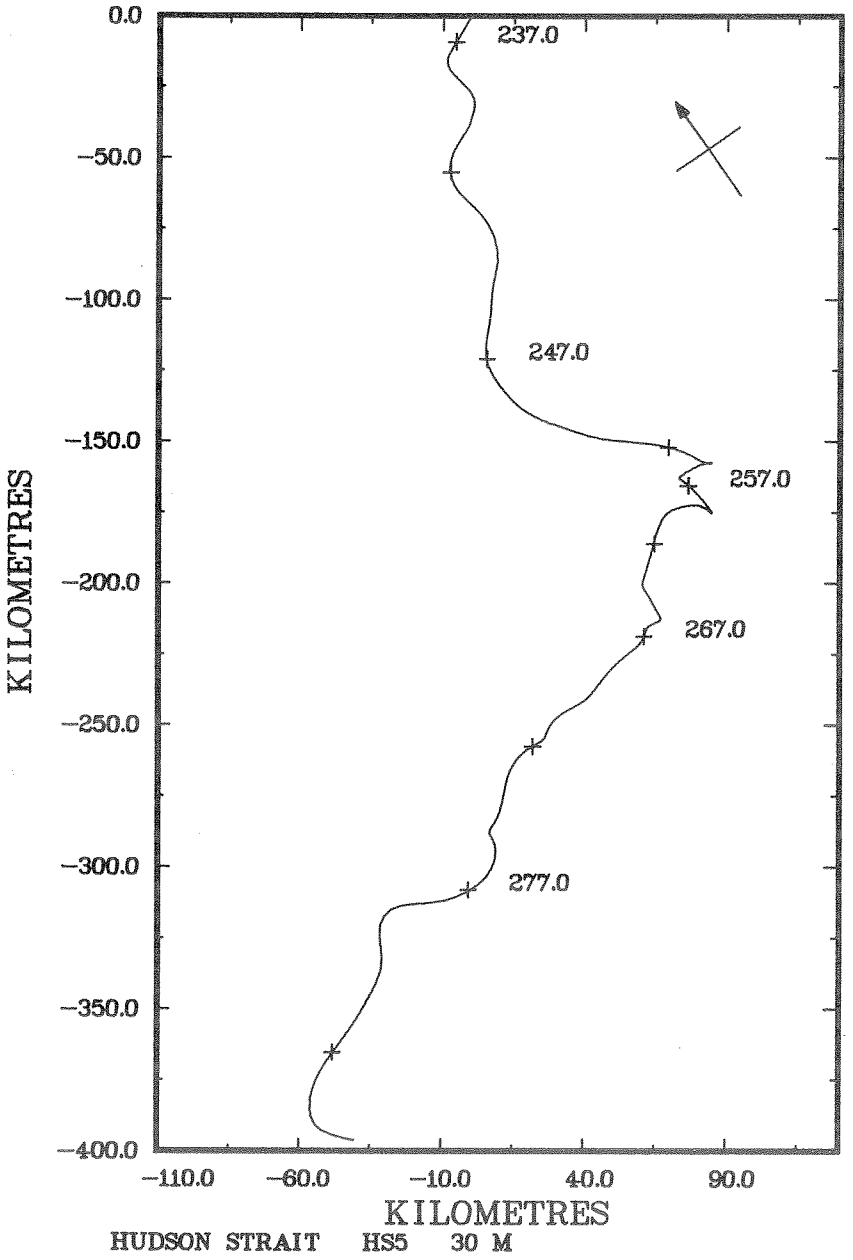

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
−1.0
−2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS4 100 M



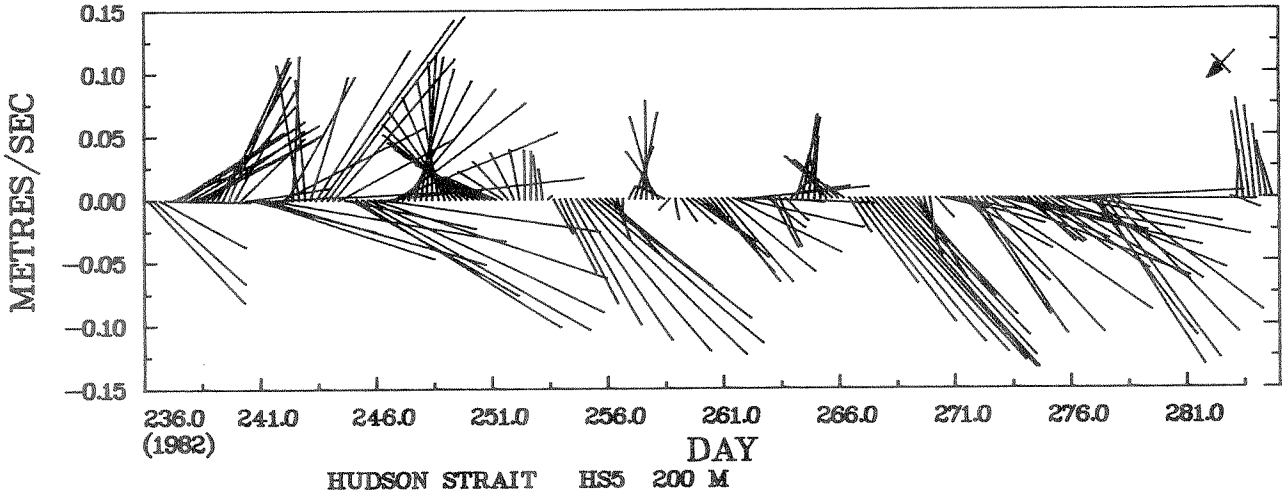
HUDSON STRAIT HS4 100 M

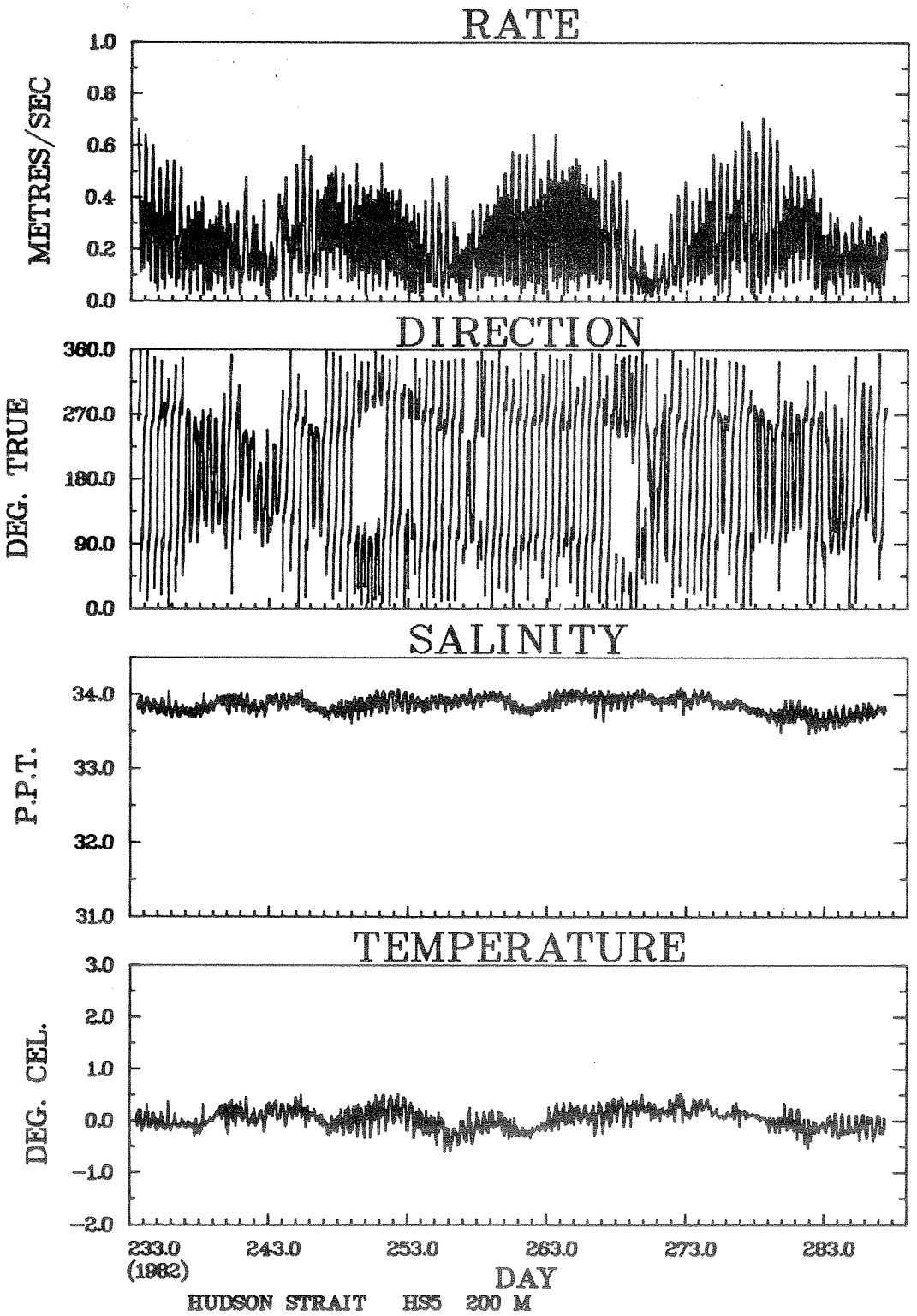

METRES/SEC
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
236.0
(1982)
241.0
246.0
251.0
256.0
261.0
266.0
271.0
276.0
281.0
DAY
HUDSON STRAIT HS4 100 M

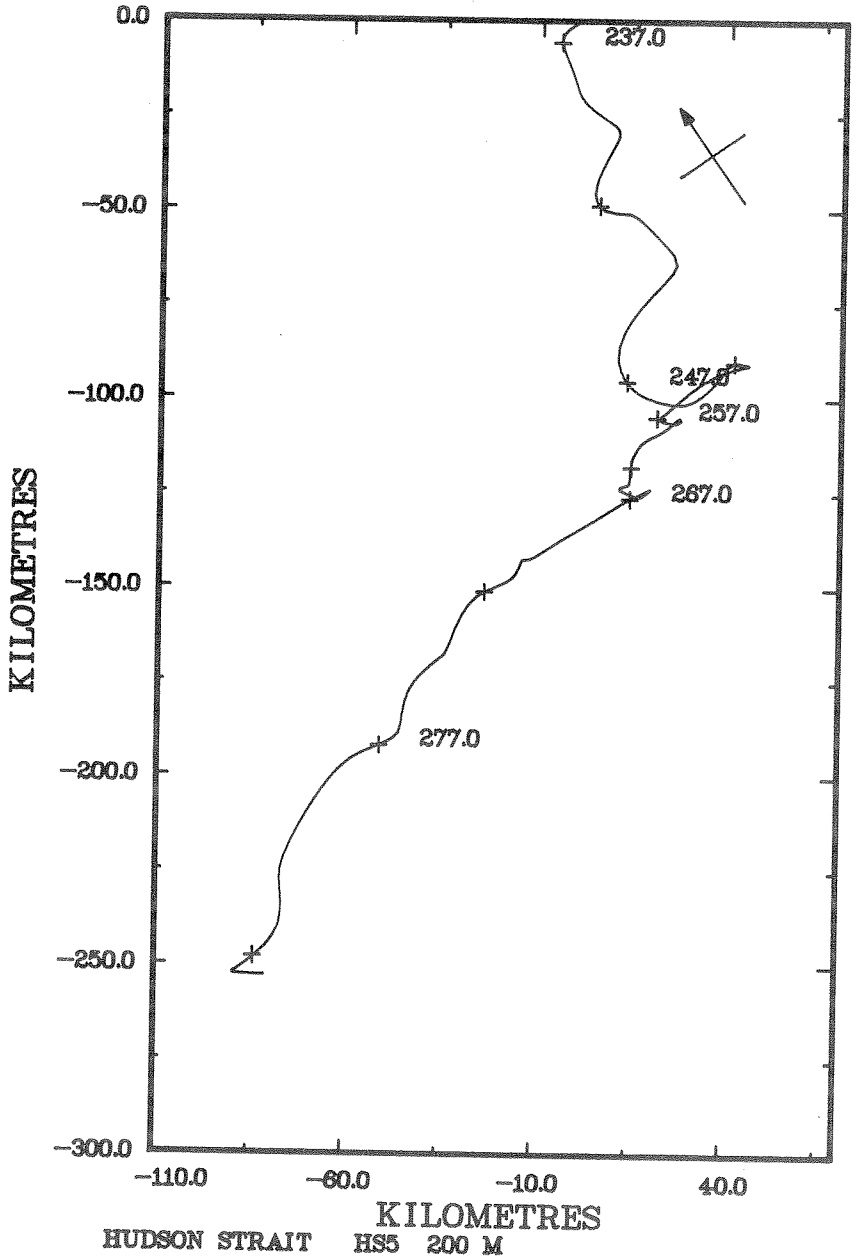

RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS5 30 M

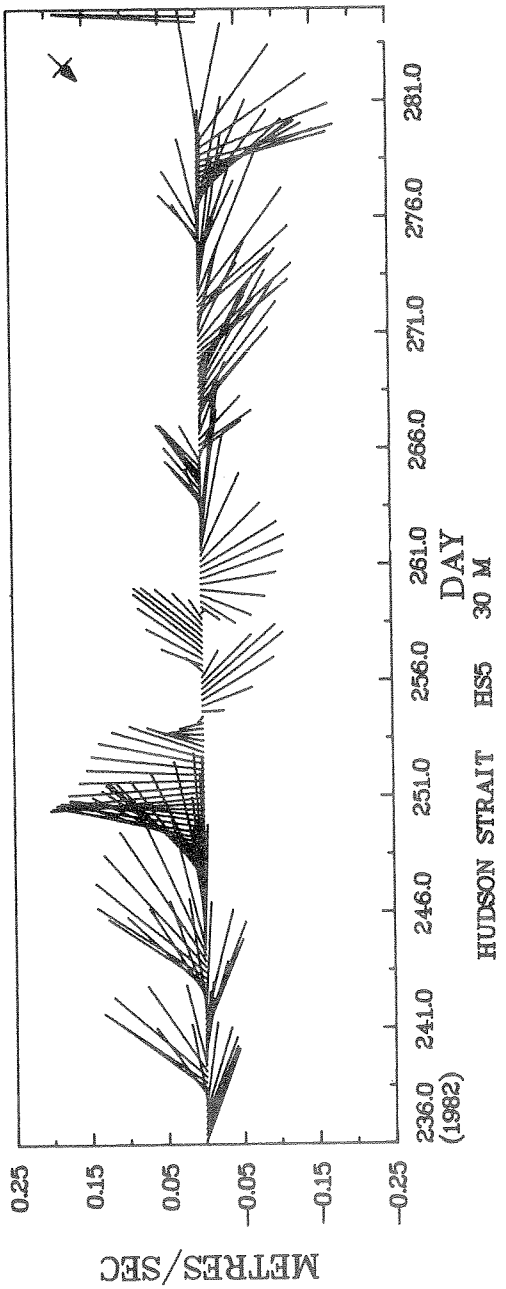


HUDSON STRAIT HS5 30 M


METRES/SEC
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
236.0
(1982)
241.0
246.0
251.0
256.0
261.0
266.0
271.0
276.0
281.0
DAY
HUDSON STRAIT HS5 200 M


RATE
METRES/SEC
1.0
0.8
0.6
0.4
0.2
0.0
DIRECTION
DEG. TRUE
360.0
270.0
180.0
90.0
0.0
SALINITY
P.P.T.
34.0
33.0
32.0
31.0
TEMPERATURE
DEG. CEL.
3.0
2.0
1.0
0.0
-1.0
-2.0
233.0
(1982)
243.0
253.0
263.0
273.0
283.0
DAY
HUDSON STRAIT HS5 200 M


0.0
-50.0
-100.0
-150.0
-200.0
-250.0
-300.0
KILOMETRES
237.0
247.0
257.0
267.0
277.0
-110.0
-60.0
-10.0
40.0
KILOMETRES
HUDSON STRAIT HS5 200 M


0.25
0.15
0.05
−0.05
−0.15
−0.25
METRES/SEC
236.0
(1982)
241.0
246.0
251.0
256.0
261.0
266.0
271.0
276.0
281.0
DAY
HUDSON STRAIT HS5 30 M