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SPEED OVERLAYS FOR UC2 AND SB6 GOES SATELLITE PICTURES

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INTRODUCTION

The Pacific Weather Centre uses GOES satellite pictures to track cloud systems and cloud elements over North America and the North Pacific. Since the satellite is positioned over the equator at 135W longitude, the scale of the picture becomes more compressed as the distance from 0°N 135W increases. The scale changes not only for every point on the picture but also for every direction from any single point. The infinitely variable scale of satellite pictures complicates the calculation of speeds of cloud features.

PRESENT METHODS OF DETERMINING SPEEDS

There are four methods in operational use for determining speeds on GOES satellite pictures at the Pacific Weather Centre.

The first method simply involves identifying the latitudes and longitudes of start and end points of features of interest and transferring the information to a polar stereographic map projection. Speeds are then calculated by the standard method using one degree of latitude equal to 60 nautical miles.

The second method is similar to the first. Once the latitude and longitude of start and end points have been identified, a computer program is called to calculate the speeds.

The third method may be of most interest to field offices receiving GOES pictures retransmitted by the Pacific Weather Centre. The procedure is quite general and can be applied to any map projection of any scale. Carroll (3) describes the method in detail in a recent Technical Note. The north-south component of the feature of interest is calculated in degrees of latitude per hour. Similarly, the east-west component is calculated in degrees of longitude per hour. Using figure 1, these displacement rates are converted separately to a velocity in knots. Since the north-south component requires no correction, the velocity is read along the 0° latitude diagonal line. The east-west component must be corrected for latitude using the appropriate diagonal line in the figure. The final step involves finding the resultant of the two component velocities using graph paper.

The methods described above are somewhat cumbersome requiring a number of separate steps. For everyday operational use a more direct procedure is desirable. In response to this requirement, Brown (1) developed an overlay for the UC2 sector large scale GOES satellite pictures. The curved line in figure 2 is aligned with the horizon on the satellite picture with the squared grid over the area of concern. Each square of the grid represents an area 60nm by 60nm. For 6 hour motions, speeds can be read directly by counting the appropriate distance for each square. A graph is also provided for calculating speeds for other than for six hourly time intervals.

NEW OVERLAYS

The overlay described above is a major improvement over the previous procedures for calculating speeds on GOES satellite pictures. However, unless the particular track of concern parallels either one of the overlay grid axes, the speed of a feature along the track can only be estimated.

To overcome this problem new overlays (figures 3 and 4) have been prepared for the UC2 and SB6 sectors of the large scale GOES pictures. Average scales for areas of 10X10 degrees or 10X20 degrees for each sector have been plotted for sixteen points of the compass. Each mark (dot) on both overlays represents 60 nautical miles. For six hourly motions each mark is equivalent to 10 knots. By choosing the correct scale every cloud feature motion on the GOES satellite pictures can be measured directly and accurately using the appropriate overlay.

Unfortunately, the overlays are dependent on picture size and are not suitable for GOES imagery which originates from the PWC. However, these overlays could be adapted to the smaller size pictures by an appropriate reduction factor.

REFERENCES

1. Brown, Bob - "Overlay for Computation of Distances on the UC2 GOES Satellite Picture"
 Pacific Region Technical Note 79-024,
 August 2, 1979.
2. Johnson, H.M. - "A Quick Way to Determine Cloud Feature Speeds
 Using Gridded Satellite Pictures"
 NWS/NESS Satellite Applications Information Note 3/77.
3. Carroll, Pat - "Nomogram for Calculating Feature Speeds on GOES
 Satellite Pictures"
 Pacific Region Technical Note 80-017,
 June 16, 1980.

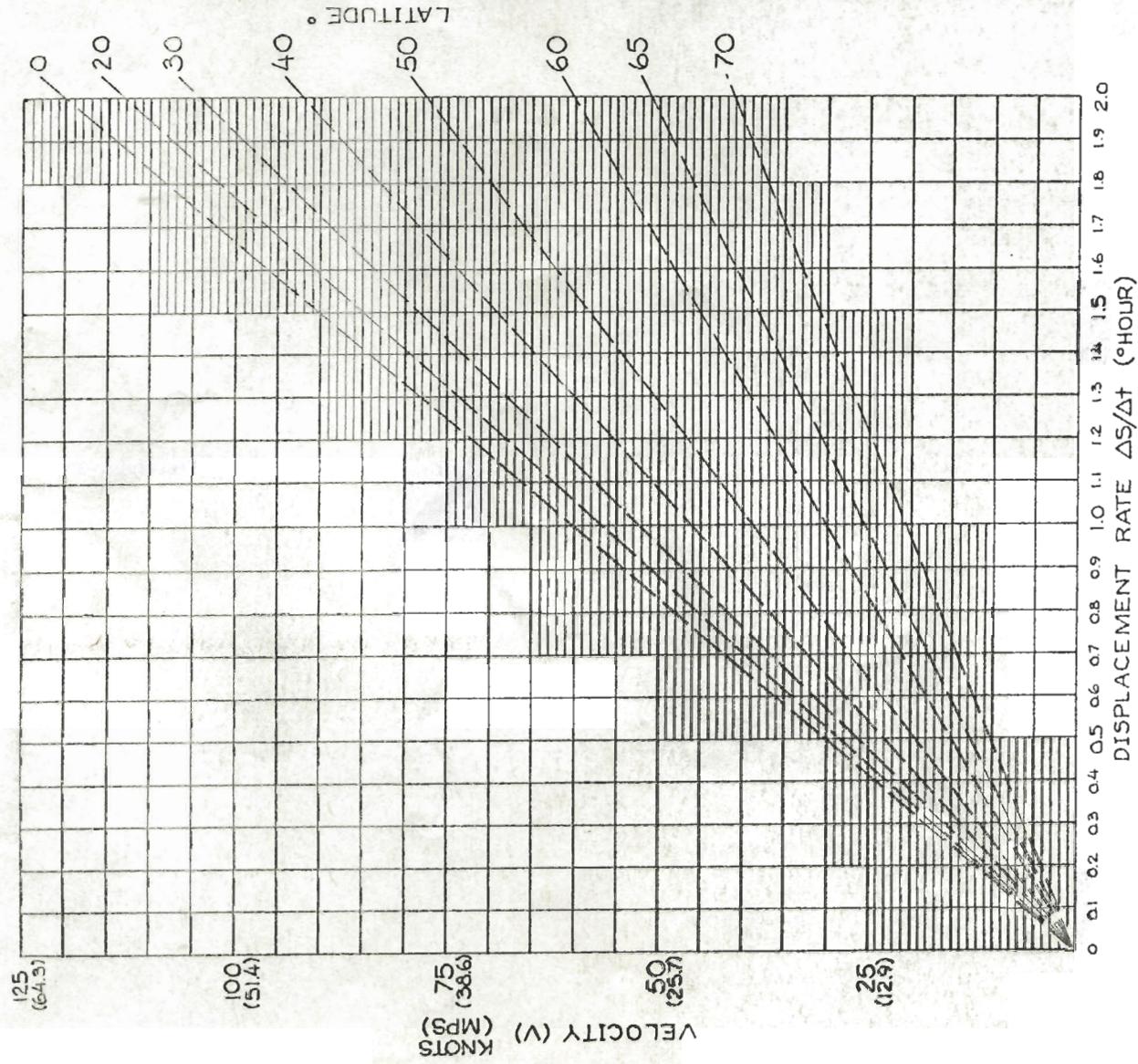


Fig. 1

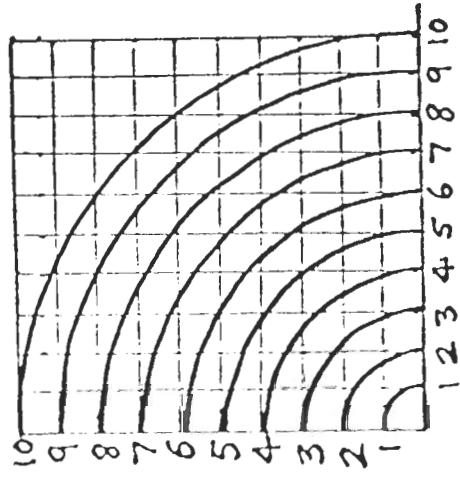
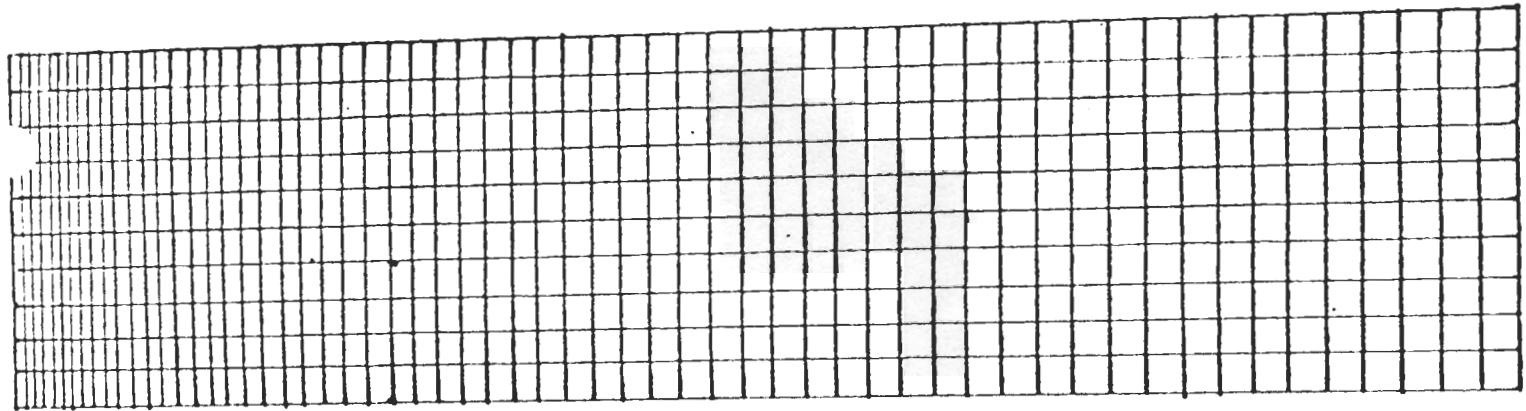
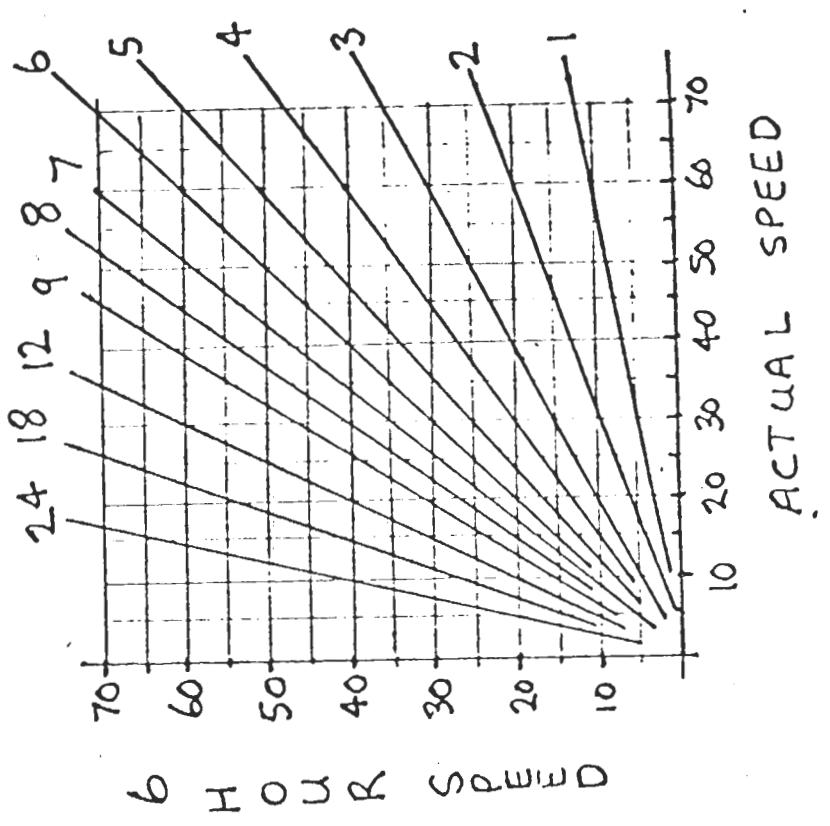


Fig. 2

SATELLITE IMAGERY SPEEDS UC2

	145-165W	105-125W	125-145W	125-145W		
	N/S	N/S	N/S	N/S		
	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW		
	NW/SE	NE/SW	NW/SE	NE/SW		
	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW		
	E/W	E/W	E/W	E/W		
	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE		
	NE/SW	NW/SE	NE/SW	NW/SE		
	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE		
60-70N						
	165-185W	85-105W	145-165W	105-125W	125-145W	125-145W
	N/S	N/S	N/S	N/S	N/S	N/S
	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW
	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW
	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW
	E/W	E/W	E/W	E/W	E/W	E/W
	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE
	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE
	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE
50-60N					50-60N	
	165-185W	85-105W	145-165W	105-125W	125-145W	125-145W
	N/S	N/S	N/S	N/S	N/S	N/S
	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW
	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW
	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW
	E/W	E/W	E/W	E/W	E/W	E/W
	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE
	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE
	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE
40-50N					40-50N	
	165-185W	85-105W	145-165W	105-125W	125-145W	125-145W
	N/S	N/S	N/S	N/S	N/S	N/S
	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW
	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW
	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW
	E/W	E/W	E/W	E/W	E/W	E/W
	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE
	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE
	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE
30-40N					30-40N	
	165-185W	85-105W	145-165W	105-125W	125-145W	125-145W
	N/S	N/S	N/S	N/S	N/S	N/S
	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW
	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW
	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW
	E/W	E/W	E/W	E/W	E/W	E/W
	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE	ENE/WSW	WNW/ESE
	NE/SW	NW/SE	NE/SW	NW/SE	NE/SW	NW/SE
	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE	NNE/SSW	NNW/SSE

Fig. 3

SATELLITE IMAGERY SPEEDS SB6

	130-140W	120-130W	110-120W	
60-70N	N/S	N/S	N/S	60-70N
50-60N	NW/SE	NW/SE	E/W	50-60N
40-50N	E/W	E/W	NW/SE	40-50N
30-40N	NE/SW	NE/SW	N/S	30-40N
	N/S	N/S	N/S	
	NW/SE	NW/SE	E/W	
	E/W	E/W	NE/SW	
	NE/SW	NE/SW	N/S	

Fig. 4