551·515·2

SATELLITE TRACKING OF CYCLONIC STORM

Sadler (1962) determined the track of the Arabian Sea cyclonic storm from the cloud photographs recorded by TIROS-I Meteorological Satellite while in its orbit over the Arabian Sea on 13, 14, 16, 17, 18 and 19 May. He considers that though moderate number of ships' observations were available from the cyclone area they have been inadequate to permit a correct positioning and tracking of the storm as also for an evaluation of the strength of the storm. It occurred to the present writer to re-examine all the available ships' observations in order to see their consistency with the storm track determined from the Satellite photographs.

The track determined from TIROS-I photographs was carefully extracted from Fig. 20 of Sadler's paper and is given in Fig. 1 together with the track published by the Indian Meteorological Service. Relevant ships' observations from the storm field extracted from the original logs are given in Table 1. They are also represented in Fig. 1.

The track TT determined by surface reports agrees within a degree with the track SS till 17 May when a fair number of ships' reports from the storm field was available. Nevertheless the points of difference are also worth noting. The SS track shows a marked shift of the disturbance to the south by nearly a degree on 14 May and a similar shift later northward. The position and wind records of ships are normally correct. From position A near the centre of the disturbance the observation of S.S. *Kampala* indicates that the centre was to its east, *viz.*, A. This ship which was travelling southsouthwestwards reported a westerly wind and a marked pressure rise at position B indicating that it was moving away from the centre of the disturbance. The correctness of the centre fixed by the Satellite at 0915 Z on 14 May is, therefore, doubtful. The A position report of S.S. *Kampala* at 06 Z on 14 May also leads one to believe that the disturbance lay considerably to the southeast of the position fixed by the Satellite at 09 Z on 13 May.

The disturbance appears to have intensified into a severe storm by 15 May. From 09 Z of 16 May to 12 Z of 17 May the two tracks agree remarkably well in latitude. The interpolated centre D′ on the SS track at 18 Z on 16 May, however, appears to be slightly north of the actual centre in view of the observation of S. S. *Mohammedi* made at the same time from position D. Similarly the 12 Z report of S.S. *Indian Tradition* from position E suggests that the centre of the storm was a degree to the east of position E′ shown on the SS track.

After 12 Z of 17 May, the ships' reports from the storm field are very inadequate to enable the tracking of the storm by the usual method and the Satellite centre fixes are of immense importance in showing that the storm did not die off while over the sea but actually crossed over into Arabia. A ship S. S. *Exchequer* recorded having experienced very heavy weather and high seas at 0530 Z on 18 May while just off the Arabia coast at position F. Here again the wind report makes one to believe that the corresponding centre of the disturbance was about a degree to the east of the interpolated position F on the SS track.

Though these ships' observations do not define the exact centre of the disturbance they do indicate strongly that the accuracy of tracking of this storm by Satellite photography has also been very limited. This is understandable from Sadler's statement that the storm centre could not be fixed by observing the eye in the Satellite photographs as the eye in many cases would not be detectable due to an overlying thick cirrus shield and/or cloud debris within the eye. In such cases the centre fix was obtained by utilising the curvature of the low level cloud spirals outside the main cloud mass and the storm centre fixes were, therefore, correct within one degree only. The relatively larger deviation of the SS track from the actual noted prior

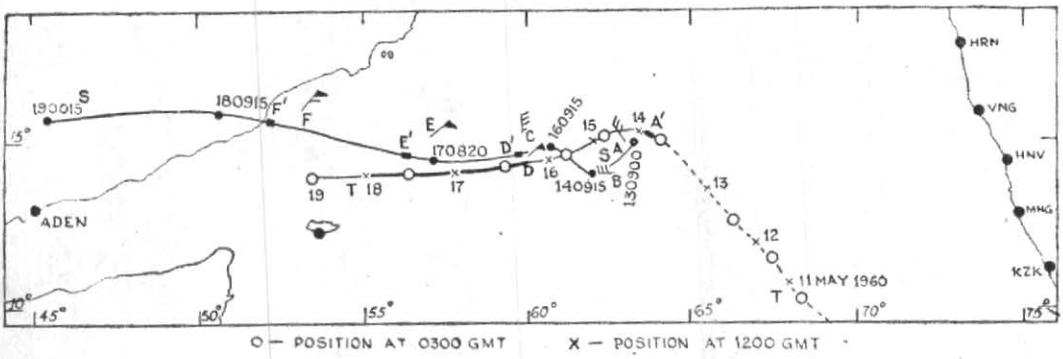

Fig. 1. Track of Arabian Sea Cyclonic Storm, May 1960

SS—Track determined from Satellite photographs. The first two of the six figures groups shown against the centres give the date and the rest, time in GMT

TT—Track determined by conventional method published by the Indian Meteorological Service. The figures marked along side give the dates

O indicates position of the centre at 03Z and X position at 12 Z

TABLE 1

Ref. in Fig. 1	Name of ship	Position		Date	Time (GMT)	Wind		Pressure (mb)
		Lat. (°N)	Long. (°E)			Direction	Speed (knots)	
A	S. S. *Kampala*	14·8	63·0	14	06	NNW	30	996·2
B	S. S. *Kampala*	14·0	62·6	14	09	W	30	1001·2
C	S. S. *Mohammedi*	15·2	59·9	16	12	N	37	995·2
D	S. S. *Mohammedi*	14·5	60·0	16	18	NE	50	982·8
E	S. S. *Indian Tradition*	15·2	57·2	17	12	NE	50	995·2
F	S. S. *Exchequer*	15·8	53·3	18	0530	NNE	55	..

to 15 May probably arose because the disturbance had not then developed sufficiently and the cloud spirals were not so well defined and persistent.

Sadler's conclusion that "the storm centre fixes by the Satellite can be superior to those by conventional means even over regions containing a large number of ships and land reports", therefore, merits reconsideration. When there are adequate ships' observations from the field, the centre at sea level can be better fixed by them than by Satellite photographs. The great advantage of Satellite

photography is the facility it affords for tracking storms over seas from where ships' reports are not available. Still greater is the insight it gives about the developments in the storm field by way of the changes in the eye and the evolution of the cloud structure aloft, factors which cannot be studied from the surface but which are so very important to the forecaster.

T. M. K. NEDUNGADI

Meteorological Office,
Poona
June 28, 1962

REFERENCE

James, C. Sadler 1962 *Indian J. Met. Geophys.*, **13**, 1, p. 29.