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Swell observations on Soviet research vessels during Monsoon Experiment (MONEX) 1977-Part II : Arabian Sea

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ABSTRACT. The results of the analysis of swell observations by Russian ships in Arabian Sea are presented here. The broad conclusions are :

(1) The height of swell steadily increases when we move from equator to Lat. 12°N during both June and July.

(2) There is no significant variation in the height of swells in time scale between Lat. 10 °N and 15° N once the monsoon sets in.

(3) No diurnal variation was observed in the height of swells.

1. Introduction

In an earlier contribution the authors presented the analysis of swell observations taken on board Soviet research ships during monsoon experiment 1977 over the equatorial region. In the present paper, the analysis of swell observations by three ships over Arabian Sea is presented. As described earlier the experiment were conducted in three phases. For the first and second phases, intense studies were conducted over Arabian Sea. The first phase was designed to study the onset of monsoon over Arabian Sea in June 1977 while the second phase was to gather data when monsoon was well set. This phase was towards end of June and most part of July. Swell observations of both the phases are analysed here.

In a paper by Mukherjee & Sivaramakrishnan (1978) it has been shown that the 'Bombay High' area is not so calm during monsoon and that waves (both swells and seas) gradually become higher with the progress of monsoon. It is, therefore, of interest to see how the swells increase in height from equator northwards and also how the height increases with the progress of monsoon. For this the swell observations during the journey of ships form equator to stationary polygon position *i. e.*, between 2 to 7 June and again in July when they travelled towards equator were considered.

2. Data

2.1. *Ships position*

The four ships Academician Shirshov, Okean, Priliv and Priboy moved from equator northwards on 2 June 1977 and reached the stationary polygon position on 7th. They remained so during 7 to 19 June and then sailed towards Bombay. The ship Okean was away from the position from 1800 GMT of 10 June to 1800 GMT of 13 June. The ships again came to stationary position on 29 June and remained so till 16 July. They then moved to a predetermined position for intercomparison and later moved southwards to equator.

2.2. *Synoptic situation*

When the ships were moving northwards from equator the monsoon has just arrived in Arabian Sea. The ships moved enough north where monsoon was yet to arrive. When they reached the stationary polygon position, a severe cyclonic storm was forming nearby under the influence of the storm. The monsoon moved northwards and the polygon area came under its influence. Fig. 1 gives the track of the storm.

3. Results and discussion

3.1. *Meridional profile*

Heights of swells were plotted against latitude

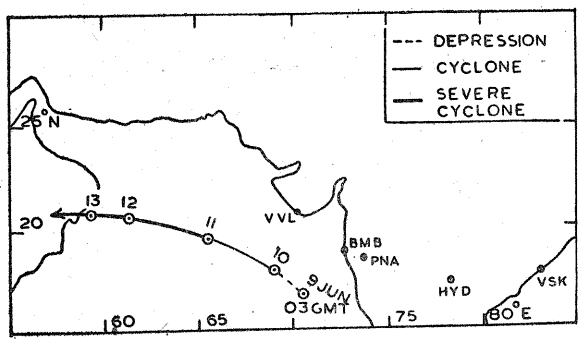

Fig. 1. Track of the storm (all positions are at 03 GMT of dates)

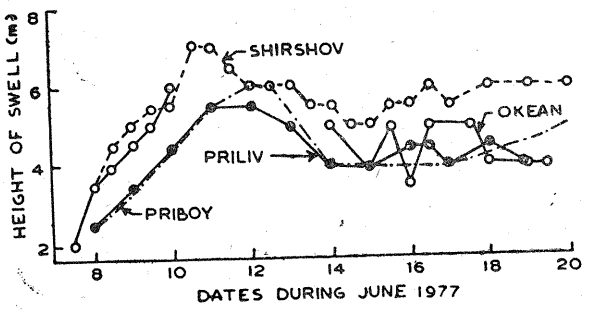

Fig. 3. Development of swells over Arabian sea during onset of monsoon

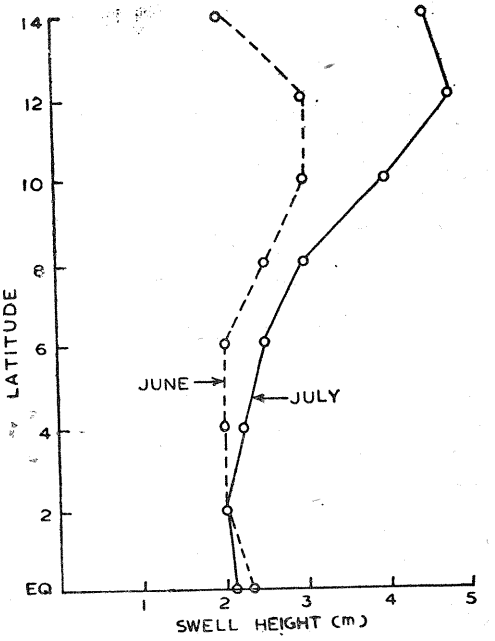

Fig. 2. Meridional profile of swell height

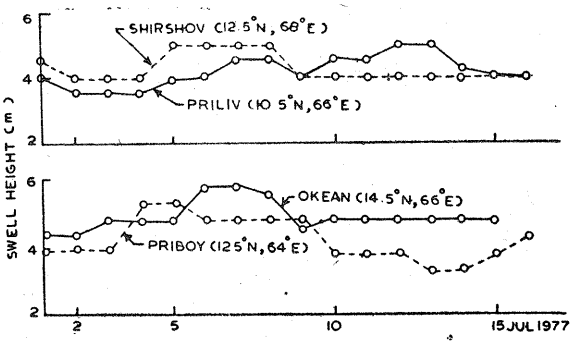

Fig. 4.

to get a north south profile. Since the variation of longitude was within only 5°, it was assumed that the variation along longitude can be neglected. Fig. 2 gives the profile. It is seen that the swell height steadily increases from equator to Lat. 12°N both in June and July. The height in July is always more than that for June to the north of Lat. 2°N. There is a decreasing trend to the north of Lat. 12°N. But as there was no swell observations taken the north of Lat. 14°N., this trend can not be clearly investigated.

The observations when the ships were at stationary position are interesting. The positions of the ships were Okean (14.5°N/66°E) Shirshov (12.5°N/68°E) Priboy (12.5°N/64°E) and Priliv (10.5°N/66°E). The swell height during the first voyage is shown in Fig. 3. The increased heights between 10th to 13th in all the observations, are obviously due to the presence of cyclonic storm in Arabian Sea. There is no significant variation of height on time scale in any observations apart from the one due to cyclones. The values are mostly 4 to 5.5 metres.

Fig. 4 gives the plot of swell heights during 1 to 15 July 1977. These curves again confirm that there is not much variation in height on time scale. However the values observed by Okean have gone down to 3.5 metres on two days. Except that the variation is 1.5 metres only. Okean was at 14.5°N which is well in Central Arabian Sea. The strong monsoon activity in July might have caused the swell height vary much.

Since six hourly observations were available for each day, the presence of diurnal variation, if any, was investigated. No diurnal variation was observed.

References

Mukherjee, A. K., & Sivaramakrishnan, T. R., 1978, Proceedings of EMPIO, symposium, NPOL Cochin.