

COASTAL AND NEARSHORE CIRCULATION OFF MANGALORE

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ABSTRACT

Studies on currents off Mangalore (west coast of India) showed a strong tidal influence very near the shore which decreased with increasing distance from the shore. At 2 km and further offshore, the onshore component of the current was mostly absent and the currents showed some seasonal variation. The implications of these findings in relation to the disposal of any industrial effluent discharged in the area, have been discussed.

INTRODUCTION

Mangalore (12°51'N, 74°50'E) is located in the central part of the west coast of India. The shoreline in this region is generally straight, running in a N10°W-S10°E direction and is low-lying and sandy. This paper presents the results of investigations on the nearshore currents off Mangalore. The area of study has a fairly smooth bottom topography. The bottom contours are roughly parallel to the shore and the bottom is characterised by a fairly gentle slope and absence of rocks. Two rivers, the Gurpur and Netravathi join the sea about 11 km south of the New Mangalore port.

Studies on currents in the area were undertaken to ascertain the dispersal characteristics of the sea so that treated and innocuous effluents could be discharged into the sea without any adverse effect to the environment.

The importance of circulation in problems relating to discharge of effluents is obvious. Tidal currents in the nearshore region tend to bring the discharged waste back on to the shoreline and could pollute the beach and nearshore areas and could cause a lot of damage to marine fauna and flora in the tidal region of the beaches and also affect the benthic organisms.

Along the central west coast of India, observations on currents in the nearshore and inshore waters have been mostly limited to spot measurements (Murty and Varadachari, 1966; Srivastava, Varma, Pylee and Kurup, 1972; Rao, Cherian, Varma and Varadachari, 1974; Cherian, Rao and Varma, 1975; Varma, Rao and Cherian, 1975). Observations on currents over tidal cycles, using current meters, have been made by Nair and Bhattathiri (1968) in the Angria Bank region, Nair, Neralla and Ganguly (1968) off Mormugao, Nair and Bhattathiri (1969) in the Bombay Harbour Bay and by Kurup, Joseph and Varadachari (1976) off Velsao, Goa. Some studies on coastal currents off Mangalore have been carried out using floats and theodolites (Reddy, Hariharan and Kurian, 1978).

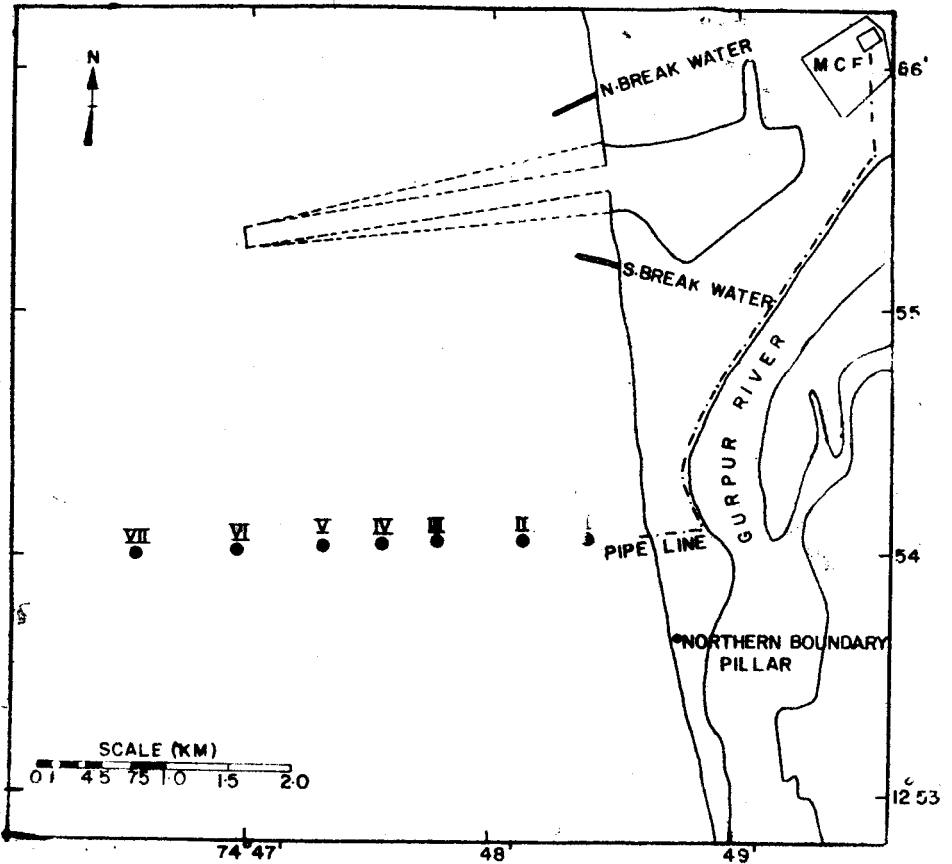


Fig. 1. Map showing the positions of stations off Mangalore.

MATERIAL AND METHODS

Seven observation stations were fixed off Mangalore (Fig. 1, Table I). Current measurements were made at 3 levels (1 m below the surface, mid-depth and 1 m above the bottom) using a direct reading current meter from an anchored boat. The observations were divided into two parts:-

- (a) Studies on currents over tidal cycles, at stations I-IV.
- (b) Seasonal current at stations IV-VII.

Studies on tidal currents were carried out on December 1, 1975 and April 20 and September 27, 1976. These months represent fair weather, premonsoon and postmonsoon seasons respectively.

Table I. Details of hydrographic stations off Mangalore.

Stn. Nos.	I	II	III	IV	V	VI	VII
Depth (m)	6.0	7.0	8.0	5.0	10.0	11.0	12.0
Distance from shore (km)	0.48	1.00	1.60	2.08	2.56	3.20	4.00

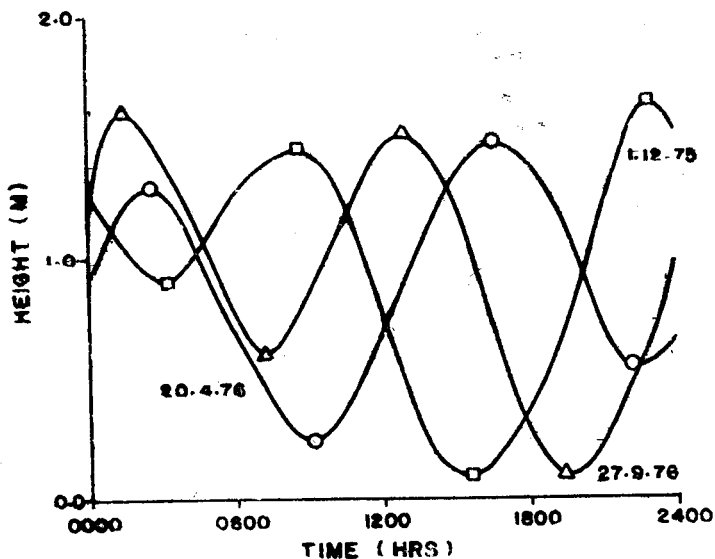


Fig. 2. Tidal range at Mangalore on 1.12.75, 20.4.76 and 27.9.76.

Studies on seasonal currents were carried out at monthly intervals for all the months of the year except the monsoon months. Current measurements at stations IV and VII were made every 2 hours over a tidal cycle since it was noticed that the tidal influence was almost negligible beyond station IV. The vector average of the currents over a tidal cycle has been taken to be the representative of the seasonal current.

RESULTS AND DISCUSSION

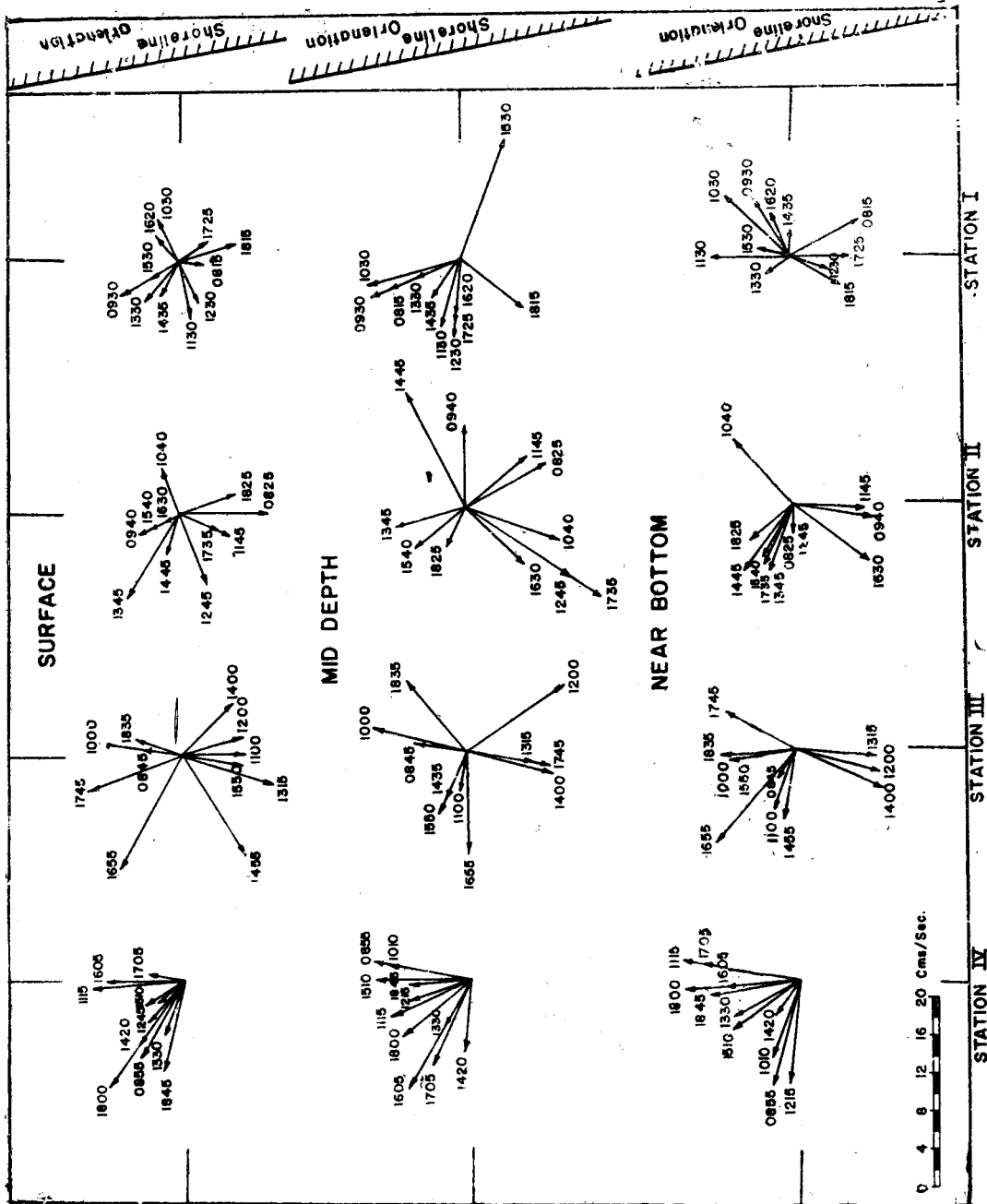
Tide levels at Mangalore on the days of tidal observations are given in Fig. 2. The tidal currents encountered in the region are of a rotary type. However, as can be seen from Figs. 3, 4 and 5, the rotary nature of the tidal currents is not very regular which may be due to the effect of winds, waves etc.

It is observed that the tidal influence on the currents decreases in the offshore direction and at station IV it becomes almost negligible. At station IV, the currents are parallel to or away from the shore at all depths. The maximum tidal current speed encountered was about 28 cm/sec.

The seasonal currents (Fig. 6) show an increase in speed in the offshore direction. The currents were weakest in December (about 5 cm/sec). During May to October they were strong and maximum speed was around 50 cm/sec. The currents were in general southerly from April to October and northerly from November to February. The currents showed a tendency to change from northerly to southerly during the transition months of February and March.

From these observations it can be concluded that the site for disposal of treated effluents should be anywhere beyond station IV. This will result in a wide dispersal of treated effluents and will also ensure that no appreciable amount of discharged waste will return to shallow areas or onto the shore.

Fig. 3. Variation in currents with the tide at stations I-IV during December.



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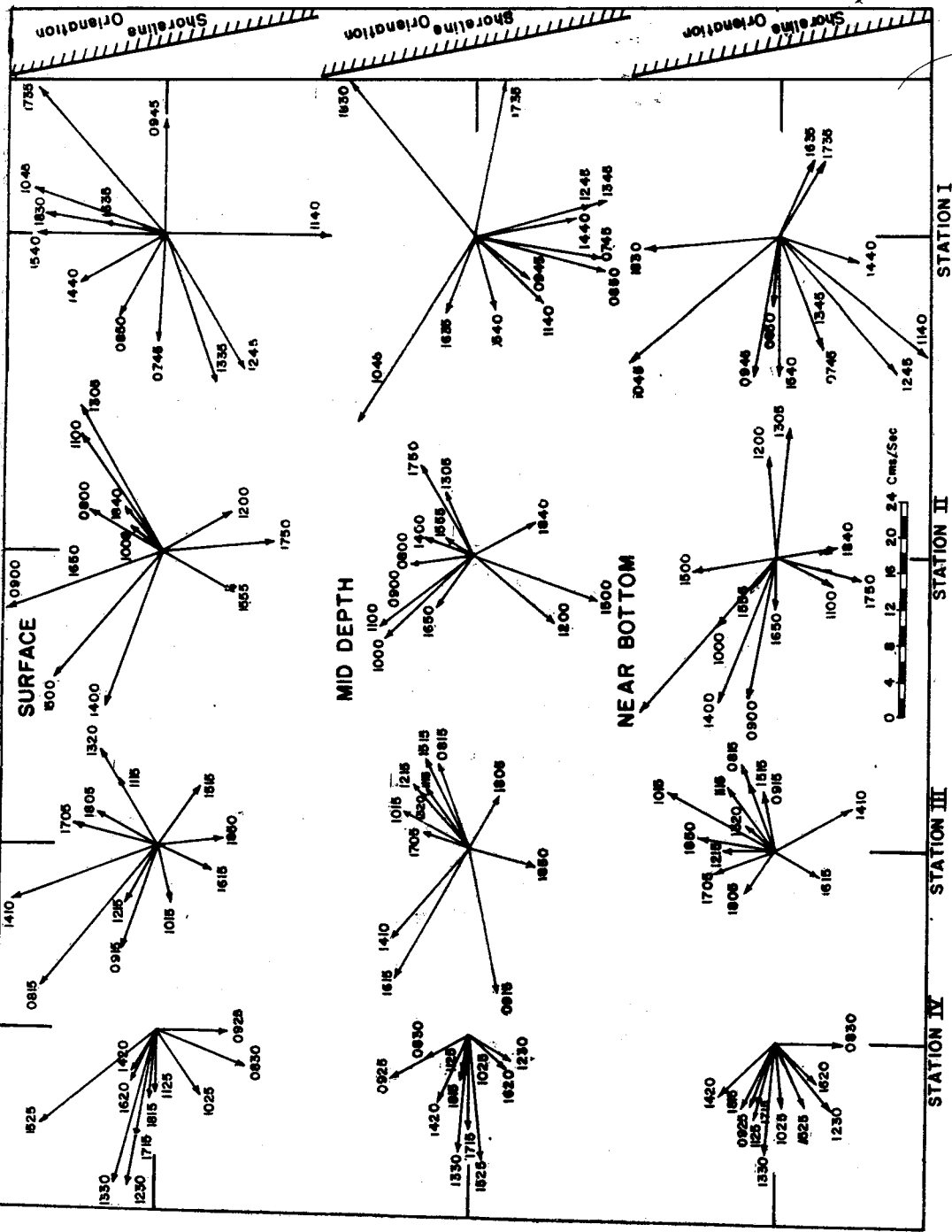


Fig. 4. Variation in currents with the tide at stations I-IV during April.

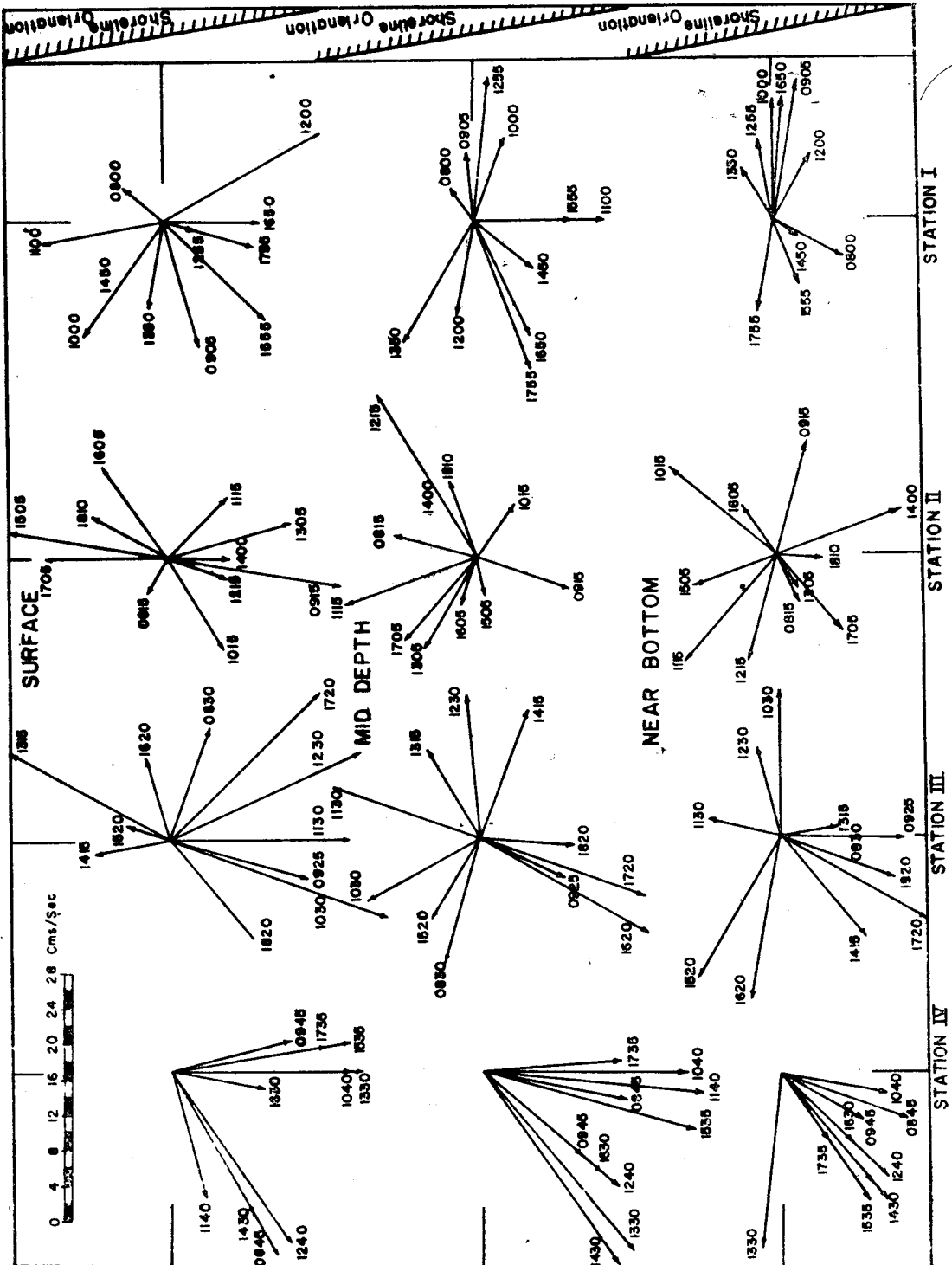


Fig. 5. Variation in currents with the tide at stations I-IV during September.

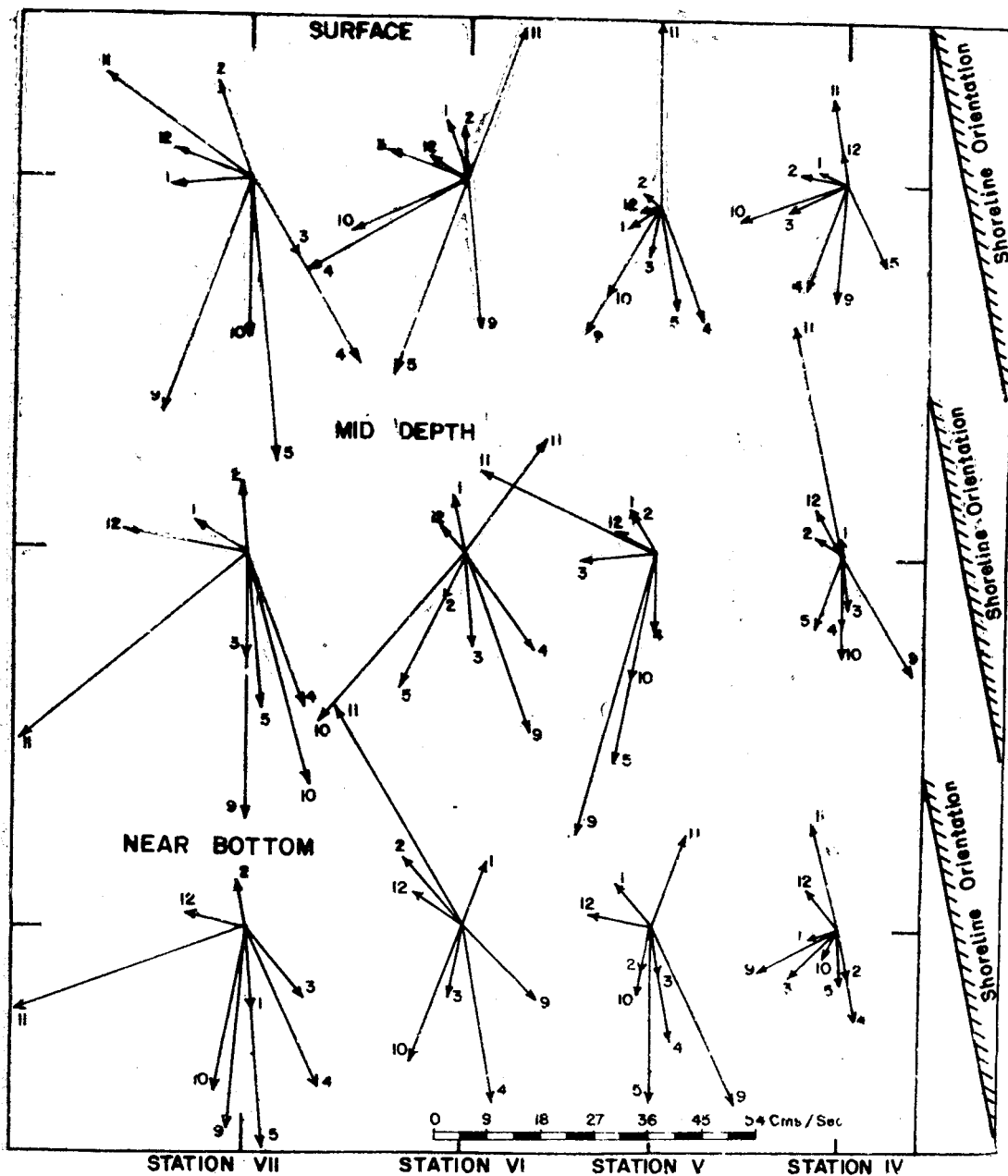


Fig. 6. Variation in currents with seasons at stations IV-VII (1-12 represent the calendar months January to December).

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