

M.S.36. NARENDRAN NAIR, R. – Circulation in the Indian Ocean In Relation to the Monsoon Circulation of the Atmosphere – 1983 – Dr. G.S. Sharma

The forcing function of the wind driven ocean circulation is the curl of the wind stress (vorticity). Since all the parameters related to wind at the surface of the Indian Ocean show considerable time dependance than in other oceans, it is important to study their spatial and temporal variations. This study presents monthly charts of the zonal and meridional components of wind stress, wind stress curl and circulation pattern of surface waters. Monthly charts of the surface currents and winds of the atlas entitled 'Indian Ocean Oceanographic and Meteorological Charts' publishd by the Royal Netherlands Meteorological Institute in 1952 forms the basis of the relevant data used for this study. An area of the Indian Ocean between 36° E and 116° E and from 20° S to its northern land boundary is covered for mapping. Certain salient features observed in the study are given below.

During the southwest monsoon, the curl of the wind stress in the northern hemisphere is positive off the coasts of Somali and Arabia and east coast of India which drives a northerly flow off these coasts. The negative curl off the west coasts of India, Burma and Malayasia drives a southerly flow. During this period, as magnitude of the wind stress curl increases northwards, the strength of the Somali Current increases in the same direction. When the wind stress curl is positive, the circulation off the Somali Coast is northerly and it is southerly when the wind stress curl is negative. In general, cyclonic flow is observed in

regions of positive wind stress curl and anticyclonic flow prevails in regions of negative wind stress curl.

The maximum current strength in the Arabian Sea occurs when the intensity of the curl is maximum (May-July). The major anticyclonic circulation comprising of the Monsoon Current, the South Equatorial Current and the Somali Current is most predominant in July and August when the intensity of the negative wind stress curl is maximum. During the northeast monsoon, almost entire northern parts of the Indian Ocean exhibit positive curl field. The zone of negative curl lies approximately south of the equator, and as a result, the major anticyclonic eddy of the southwest monsoon is replaced by a cyclonic eddy in the north and an anticyclonic eddy in the south.

Both zonal and meridional components of the wind stress in the northern hemisphere change from negative to positive during March-April indicating the transition period between the northeast and southwest monsoons. Positive values of the wind stress continue to prevail till August beyond which the transition from southwest to northeast monsoon takes place during September-October. Negative values are predominant during the period November to February indicating conditions of the northeast monsoon.

The main features of the global surface vorticity are anticyclonic vorticity in the middle and subtropical latitudes and cyclonic vorticity in the tropics. But, the vorticity in the Indian Ocean during summer shows considerable variations from the normal pattern. Areas of anticyclonic vorticity cover almost the entire Indian Ocean during the southwest monsoon. These observations demonstrate that the Indian Ocean displays an impressive anomaly of the vorticity distribution and has stronger seasonal changes than any other area of the world ocean.