

A study on the seasonal variability of upwelling and its effects on physical parameters in Arabian Sea

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The upwelling in Arabian Sea is an important phenomenon, mainly occurring along the southwest coast of India during summer monsoon, which increases the biological productivity in the region. The south west coast of Arabian sea region accounts for about 53% of fish yield of the total fish production in Arabian Sea, thus it is imperative to study and understand the process of upwelling in this region. To study the upwelling features in southwest coast of India, monthly Ekman mass transport is estimated using analyzed wind and derived products from Oceansat-II scatterometer data. Seasonal variability of Ekman mass transport has been analyzed to study the occurrences of coastal upwelling in this region. Results show prominent region of upwelling along southwest coast of India is between 7° and 15° N. Transport estimate demonstrate that the strong offshore Ekman mass transport, as high as -2000 kg/m/s, was observed during summer monsoon months due to favorable wind conditions. Very weak offshore transport, as low as -200 kg/m/s, was observed during pre-monsoon months as winds were weak and spatially variable. Moderate offshore transport, up to -750 kg/m/s, was observed during winter monsoon months. The upwelling associated ocean surface features such as Sea-surface temperature (SST, from AVHRR), chlorophyll concentration (AQUA-MODIS), wind stress curl derived from Oceansat-II and sea surface salinity (SSS, from Aquarius) were examined to demonstrate the spatial and temporal evolution of upwelling in this region. With the advancement of the summer monsoon and upwelling, the monthly mean SST range reaches up to $26-27^{\circ}\text{C}$ (August – September) from about $29-30^{\circ}\text{C}$ (April - May). The monthly mean Chlorophyll concentration reaches up to $25-30$ mg/m³ (August-September) from $0.1-0.2$ mg/m³ (January-February). The monthly SSS which was observed to be about 34 psu (December 2102- January 2013) reaches to 36.5 psu (August-September). Analysis of SST from different sources suggests that the occurrence of a mini-cold pool (MCP) off the southern tip of India (STI) is a persistent phenomenon which occurs during both the summer and the winter monsoon seasons. The dynamics which governs the occurrence of MCP during the summer monsoon season is mainly due to upwelling, advection of the cold upwelled water from the western Arabian Sea and the southwest coast of India. Since, Somalia upwelling is an established fact, hence, we estimate upwelling only on southwest coast of India to understand the genesis of MCP. Results show that the genesis of MCP off STI starts by June and peaks in August and the SST attains a value as low as 26.0°C , essentially due to upwelling and advection of upwelled water from the Somalia region along with upwelled water from southwest coast of India.