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Influence of Long-Term Variability in Atmospheric Parameters on Ocean State over the Head Bay of Bengal

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Abstract : The atmosphere-ocean is a dynamically linked system that influences the exchange of energy, mass, and gas at the air-sea interface. The exchange of energy takes place in the form of sensible heat, latent heat, and momentum commonly referred to as fluxes along the atmosphere-ocean boundary. The large scale features such as El Nino and Southern Oscillation (ENSO) is a classic example on the interaction mechanism that occurs along the air-sea interface that deals with the inter-annual variability of the Earth's Climate System. Most importantly the ocean and atmosphere as a coupled system acts in tandem thereby maintaining the energy balance of the climate system, a manifestation of the coupled air-sea interaction process. The present work is an attempt to understand the long-term variability in atmospheric parameters (from surface to upper levels) and investigate their role in influencing the surface ocean variables. More specifically the influence of atmospheric circulation and its variability influencing the mean Sea Level Pressure (SLP) has been explored. The study reports on a critical examination of both ocean-atmosphere parameters during a monsoon season over the head Bay of Bengal region. A trend analysis has been carried out for several atmospheric parameters such as the air temperature, geo-potential height, and omega (vertical velocity) for different vertical levels in the atmosphere (from surface to the troposphere) covering a period from 1992 to 2012. The Reanalysis 2 dataset from the National Centers for Environmental Prediction-Department of Energy (NCEP-DOE) was used in this study. The study signifies that the variability in air temperature and omega corroborates with the variation noticed in geo-potential height. Further, the study advocates that for the lower atmosphere the geo-potential heights depict a typical east-west contrast exhibiting a zonal dipole behavior over the study domain. In addition, the study clearly brings to light that the variations over different levels in the atmosphere plays a pivotal role in supporting the observed dipole pattern as clearly evidenced from the trends in SLP, associated surface wind speed and significant wave height over the study domain.

Keywords : air temperature, geopotential height, head Bay of Bengal, long-term variability, NCEP reanalysis 2, omega, wind-waves
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