Determination of Absorption Lengths using PWP Model in the Bay of Bengal

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In this study, we model the upper layers of the Bay of Bengal, which is rather a unique water body in terms of its dynamics which is controlled by the advection of large fresh water from the adjoining rivers as well monsoonal precipitation thus changing the turbulent mixing in the upper layers. The fresh water influx from rivers and precipitation, leads to low saline water overlying hypersaline water, creates a strong stratification due to which turbulent mixing is inhibited. The resulting halocline inhibits the wind driven mixing of the upper layers thus changing or affecting the optical characteristics of the water body. With the exception of shortwave insolation, the air – sea heat exchange occurs at the sea surface and is vertically redistributed by mixing and advection. The present study focuses on generating these optical or absorption lengths (e-folding depths) at different locations in the Bay of Bengal as a function of time itself, showing absorption length changes with both the space and the time, using the PWP – 1D model for which data is obtained from RAMA Buoys located along 90°E in the Bay of Bengal. The shortwave and longwave absorption length is directly related to heating up of the upper layers of the ocean and thus change its state and dynamics. Heating of the upper oceanic layers are also related to increase in SST as well as the Ocean Heat content of the ocean leading to changes in various systems like monsoon, cyclones, fluxes, etc. These absorption lengths are related to the Mixed layer heat budget directly but it may also be related to the salt budget of the Bay too. The model results highlight that the absorption length affects the SST as well as the temperature of the upper layers and also that the absorption length changes from one season to another season done using the data of - RAMA Buoy located at 90°E and 15°N (northern Bay of Bengal) and 90°E and 12°N as well as data from INCOIS tropflux. The study encourages to use the generated results for the Mixed layer heat budget analysis, or for the modelling purpose, etc.

Keywords - Bay of Bengal, Mixing in the upper layers, Absorption lengths, extinction lengths, Penetration depths, E-folding depth, RAMA buoy, Solar insolation, Water type and quality, Sea surface temperature, PWP – 1D model, Seasonality.