Geophysical Research Abstracts
Vol. 20, EGU2018-3496, 2018
EGU General Assembly 2018

Upper Ocean Response to Tropical Cyclone Phailin (2013) over the Freshwater Plume in the Northern Bay of Bengal

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The study of ocean processes forced by the passage of a tropical cyclone (TC) is critical for understanding air-sea interactions that can lead to the intensification of TCs and therefore, for improving models used for its prediction. In this study, a category-5 tropical cyclone, Phailin that crossed over the freshwater plume in northern Bay of Bengal (BOB) during 08-14 October, 2013 is chosen to explore the impact of salinity stratification on the sea surface temperature (SST) during the TC passage. A drastic increase ($>$ 1 PSU) in sea surface salinity (SSS) is revealed in almost the whole plume after the passage of Phailin due to very strong mixing of the shallow mixed layer induced by the TC. The pre-existing strong BL with a thickness of 20-50 m and temperature inversions with an amplitude of 0.6-0.8°C is noticed in the plume along the path of the Phailin cyclone, destruction of which apparently decreases SST cooling in the plume and favored Phailin's development. Such a barrier layer could reduce the entrainment cooling by about 1°C/d during the TC passage, according to a diagnostic mixed layer model. As there is a permanent existence of BL and an abundance of intense TCs in the northern BOB, these results highlight the importance of a systematic and in-depth investigation of the interaction between TCs and salinity-induced BL in the freshwater plume.