

Variability of upper ocean characteristics and tropical cyclones in the South West Indian Ocean

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Track and intensity are key aspects of tropical cyclone behaviour. Intensity may be impacted by the upper ocean heat content integrated over a variable mixing length (known as T_{dy}) and barrier layer thickness (BLT). Here, the variability of T_{dy} and BLT in the South West Indian Ocean and their relationships with tropical cyclones are investigated. It is shown that rapid cyclone intensification is influenced by large T_{dy} values, thick barrier layers and the presence of anticyclonic eddies. For TC generation in the South West Indian Ocean, the parameter T_{dy} was found to be important.

Large BLT overlay with large T_{dy} values during summer ($r = 0.47$, November-April) and are modulated by Rossby waves propagation. T_{dy} and BLT are strongly correlated with ENSO. The 1997-1998 El Niño shows a strong signal in T_{dy} , SST and BLT over the South West Indian Ocean. Thereafter, an increasing trend in T_{dy} occurred over most of the basin which may be associated with changes in atmospheric circulation. Increasing SST, Power Dissipation Index and frequency of Category-5 tropical cyclones also occurred from 1980 to 2010.

To further examine the links between tropical cyclones, T_{dy} and BLT, an analysis of the ocean response to Category 5 Tropical Cyclone Bansi that developed near Madagascar during January 2015 is performed. Its unusual track was found to be linked with the strengthening of the monsoonal north westerlies while its rapid intensification from Category-2 to Category-4 was linked to a high- T_{dy} region, associated with a warm core eddy and large BLT.