EGU22-1045
https://doi.org/10.5194/egusphere-egu22-1045
EGU General Assembly 2022

Contrasting ocean-atmosphere response to the north Indian Ocean cyclones during the pre-monsoon and the post-monsoon seasons

Vineet Kumar Singh[1,2], Roxy Mathew Koll[1], and Medha Deshpande[1]
[1]Indian Institute of Tropical Meteorology, Ministry of Earth Sciences, Pune, India (vineetsingh.jrf@tropmet.res.in)
[2]Department of Atmospheric and Space Sciences, Savitribai Phule Pune University, Pune, India

Tropical cyclones in the north Indian Ocean evolve differently in response to the SST changes during the pre-monsoon (April-June) and post-monsoon (October-December) cyclone season. We analyzed the north Indian Ocean cyclones for the period 1982–2019 and observed that there is a contrasting ocean-atmosphere response to cyclones in the north Indian Ocean during the two cyclone seasons. During the pre-monsoon season, anomalous large SSTs along with high near-surface moisture disequilibrium and higher winds enhance the latent heat flux exchange from the ocean to the atmosphere. This increase in the latent heat flux exchange enhances the convection during the cyclone which in turn releases a large amount of latent heat of condensation in the atmosphere resulting in anomalous warming of 3-4°C at the upper levels (300-400 hPa) of the atmosphere. However, during the post-monsoon season, the upper-level anomalous warming is only about ~1°C. Suppressed cyclone-induced upper-level warming is mainly attributed to the weaker ocean-cyclone interaction in this season. As a result, the latent heat flux exchange between the ocean and atmosphere is weak resulting in weaker convection leading to less upper-level warming as compared to the pre-monsoon season. Also, in the lower levels of the atmosphere, there is anomalous large cooling in the pre-monsoon season as compared to the post-monsoon season. This difference in the low-level anomalous cooling is attributed to the difference in the evaporative cooling due to the difference in the low-level moisture profiles in the atmosphere in the two seasons. Through this study, we highlight that both the oceanic and atmospheric response to the north Indian Ocean cyclones is significantly different during the two cyclone seasons. Also, this is for the first time that the mean cyclone-induced atmospheric heating is reported for the north Indian Ocean. The cyclone-induced atmospheric heating can significantly modulate the atmospheric circulation, thus our study will help in better understanding the atmospheric response to cyclones and its other implications.