

# ENSO control on Arabian Sea tropical cyclones in a changing climate

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Tropical cyclones rarely occur in the Arabian Sea during the pre-monsoon month of May. However, our analysis reveals that there has been a significant increase in the number of cyclones in this region during the recent years. While the first half of the satellite era (1979-1996) saw a single cyclone, the second half (1997-2014) witnessed an increase of up to six cyclones. We investigate the mechanism and largescale conditions regulating the changes in cyclonic activity, and explore if this increase in the frequency of cyclones will continue into the future. Our analysis using observations and CMIP5 model simulations suggest an ENSO control on the pre-monsoon tropical cyclones in the Arabian Sea. We find that La Niña-like conditions during the recent years have resulted in an anomalous cyclonic circulation and reduced vertical wind shear in the Arabian Sea via a modification of the Walker circulation, thereby providing favorable conditions for cyclone genesis and development. This anomalous cyclonic circulation associated with the La Niña conditions are observed throughout the middle troposphere (700-400 hPa). Nevertheless, CMIP5 model projections suggest a 50% reduction in the number of tropical cyclones in the future (2051-2100), as compared to the recent decades (1951-2000). Our analysis shows that this decrease in cyclones is a response to the positive skewness towards El Niño like conditions in the future, which results in an anomalous anticyclonic circulation in the Arabian Sea along with increase in wind shear and decrease in relative humidity inhibiting the formation of cyclones in the region.

Keywords: Pre-monsoon cyclones, ENSO, climate change