

On triggering mechanisms of the Indian Ocean subtropical dipole

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Based on experiments using a coupled general circulation model, triggering mechanisms on the Indian Ocean subtropical dipole (IOSD) are investigated. The IOSD is characterized by a dipole pattern of sea surface temperature (SST) anomalies in the northeastern and southwestern parts of the southern Indian Ocean, and generated by the variations in the Mascarene High during austral summer. In the experiment, where the SST outside the southern Indian Ocean is nudged toward the monthly climatology of the simulated SST, two types of the IOSDs occur owing to the anomalous Mascarene High. One type is associated with the zonal wavenumber four pattern of equivalently barotropic geopotential height anomalies in the midlatitudes, suggesting a potential link with the Antarctic Circumpolar Wave. Another type occurs when the geopotential height anomalies have opposite signs in the midlatitudes and the Antarctica, suggesting a possible relation with the Antarctic Oscillation. These results indicate that even without atmospheric teleconnections from air-sea coupled modes outside the southern Indian Ocean, the IOSD may develop owing to the variations in the Mascarene High. However, the IOSD occurs less frequently in this case. This suggests that atmospheric teleconnections from air-sea coupled modes such as El Nino/Southern Oscillation and Indian Ocean Dipole may also play a role in generating the IOSD.

Keywords: Indian Ocean subtropical dipole, Mascarene High, Antarctic Circumpolar wave, Antarctic Oscillation