

Seasonality in the formation mechanisms for the Mascarene High

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A subtropical high is an integral part of the climate system, influencing not only weather conditions in the surrounding regions but also the underlying oceanic state. Over the South Indian Ocean, the subtropical Mascarene High exhibits a distinct seasonality from its counterpart over the other subtropical basins. In summer the High resides over the eastern portion of the basin, and low-level heating-cooling contrast between the Australian Continent and southeastern Indian Ocean has been shown to be important in forcing the High. In winter, the High strengthens and shifts westward into the vicinity of the core region of the Southern Hemisphere stormtrack that forms along the oceanic frontal zone between the warm Agulhas Return Current and the cool Antarctic Circumpolar Current. The stormtrack activity is enhanced in winter, acting to reinforce the High, especially near the surface, via eddy feedback forcing. A linear baroclinic model (LBM) experiment in which diabatic heating and transient eddy feedback forcing, both evaluated from atmospheric reanalysis data, are used as forcing confirms the critical importance of the afore-mentioned summer/winter forcing mechanisms. The LBM experiment also suggests that the wintertime reinforcement of the surface High can also arise from radiative cooling by marine low-level clouds broadly distributed toward the east across the basin under the southeasterly Trades. This local feedback system may be invoked under the subsidence as a remote influence from the Asian summer monsoon.

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