Geophysical Research Abstracts
Vol. 20, EGU2018-711-1, 2018
EGU General Assembly 2018

Characterising the Synoptic Expression of the Angola Low

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The Angola Low has been proven to have an important modulating role on tropical and subtropical southern African precipitation. However, the Angola Low is not a well understood feature of southern African climate. The exact mechanism with which it forms and evolves during the summer months - over which it ebbs and wanes frequently - is unknown. The Angola low exhibits a marked transition in December where it shifts from dry to moist convection.

This work aims to characterise the synoptic expression of the Angola Low. We diagnose the mechanism of these systems by considering the relative vorticity budgets of reanalysis datasets and atmospheric models on a daily timescale.

We find that the synoptic expression of the Angola Low is a combination of dry heat lows and moist tropical low-pressure systems. The implications that the distinction between dry and moist events has for the interannual relationship between the Angola Low, precipitation and ENSO are examined. Heat low phase and tropical low phase composites are contrasted against similar lows observed in other continental tropical regions and found to be broadly comparable.

However, the tropical lows exhibit unusual semi-stationary behaviour by lingering in the Angola region rather than travelling offshore. This behaviour is proposed to be caused by a diurnal mountain-sea breeze circulation which enhances (inhibits) cyclonic vorticity stretching and convection inland (near the coast). The combined effect of the heat lows and the anchored tropical lows creates the Angola Low in the climatological average. By elucidating the mechanisms of the Angola Low, this research improves the foundation of process based evaluation of Southern African present and future climate in CMIP and AMIP models.