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Thermodynamics of the Local Hadley Circulation Over Central Africa

Authors : Landry Tchambou Tchouongsi, Appolinaire Derbetini Vondou

Abstract : This study describes the local Hadley circulation (HC) during the December-February (DJF) and June-August (JJA) seasons, respectively, in Central Africa (CA) from the divergent component of the mean meridional wind and also from a new method called the variation of the ψ vector. Historical data from the ERA5 reanalysis for the period 1983 to 2013 were used. The results show that the maximum of the upward branch of the local Hadley circulation in the DJF and JJA seasons is located under the Congo Basin (CB). However, seasonal and horizontal variations in the mean temperature gradient and thermodynamic properties are largely associated with the distribution of convection and large-scale upward motion. Thus, temperatures beneath the CB show a slight variation between the DJF and JJA seasons. Moreover, energy transport of the moist static energy (MSE) adequately captures the mean flow component of the HC over the tropics. By the way, the divergence under the CB is enhanced by the presence of the low pressure of western Cameroon and the contribution of the warm and dry air currents coming from the Sahara.

Keywords : Circulation, reanalysis, thermodynamic, local Hadley.
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