Abstract

Two thermodynamic energy budgets, one for the equivalent enthalpy and one for the latent energy were computed in this study. A convective signal was singled out by a diagnostic model applied to tropical FGGE-data as detailed in the paper. Within the framework, the convective signal is basic for the calculation of subgrid-scale fluxes of enthalpy, latent energy and condensed water. With these fluxes at hand, the thermodynamic and dynamical structures of the Intertropical Convergence Zone (ITCZ) over Africa for May and June 1979 were studied. The relation between subgrid-scale fluxes and Easterly Waves was scrutinized by use of two case studies; for Easterly Waves as westward propagating wavy grid-scale disturbances over North Africa are supposed to trigger convective activity in this region. Finally an updated general sketch of the tropical circulation over North Africa is presented.

One of the most important results of this study is the fact that the position of the ITCZ is not in coincidence with the position of maximum mass-convergence near the surface, as being positioned in the latitude belt of minimum specific humidity and maximum temperatures at the ground (15°N). However the ITCZ is embedded in a region of permanent high humidity and persistent westerly winds at the lowest levels (5-10°N). This region is south of the African Easterly Jet (AEJ) which has its maximum in 600-700 hPa. The most reliable parameter for defining the ITCZ is the subgrid-scale flux of latent energy.

Baroclinic easterly waves north of the AEJ are in coincidence with dry convection near the trough, and accordingly with intense upward fluxes of enthalpy. Barotropic easterly waves south of the AEJ trigger moist convection near the trough, which is indicated by intense upward fluxes of latent energy.