The role of Mesoscale Convective Systems in the African Easterly Waves tropical cyclogenesis

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The role of mesoscale convection and associated potential vorticity (PV) generation have shown to be significant in the evolution of African Easterly Waves (AEWs). However, how the evolving AEWs interact with Mesoscale Convective Systems (MCSs) coupled to them and the mechanisms within the boundary layer that lead to tropical cyclogenesis is still unclear. A detailed analysis of an intense AEW that became a tropical cyclone and another intense wave that did not undergo genesis are done through a PV budget analysis to evaluate the role of diabatic PV resulting from the MCSs in tropical cyclogenesis. Diabatic PV can result in an expansion of the isentropes in the region of the trough promoting the stretching of the AEW’s vortex and thus produce a localized potential vorticity tendency due to diabatic heating. This process together with favorable boundary layer conditions—such as high equivalent potential temperature and moderate to high relative humidity between the low and mid troposphere—can be responsible in further intensifying the low-level vortex of the AEW that then leads to the development of a Tropical Cyclone. Results also show an evident role of the embedded MCSs in the propagation speed of both the AEW that underwent tropical cyclogenesis and the null case.