EGU21-10264, updated on 20 Oct 2021
https://doi.org/10.5194/egusphere-egu21-10264
EGU General Assembly 2021


# Simulation of Mesoscale Convective Systems near the Tropical Andes: Insights from Convection-Permitting Simulations of Two Events

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Mesoscale Convective Systems (MCSs) are associated with an important fraction of total precipitation in the vicinity of the Tropical Andes, and are related to high impact weather events and extreme rainfall. Important ingredients include input of moisture and synoptic conditions particular of each location, depending on the regional scale circulation and the local topography. Convection-Permitting (CP) simulations can help to better describe events with MCSs, including details of surface processes, low-level moisture transport and mountain-related circulations. Here we present a description of two MCSs in the vicinity of the Tropical Andes based on gridded observation-based data (ERA5 and GPM), in situ measurements and CP simulations with the Weather Research and Forecasting (WRF) model. One of the events took place near the Andes-Amazon transition region (Mocoa-Colombia), with, reportedly, more than 100mm of precipitation accumulated in 3 hours in one location, accompanied with strong low-level transport of moisture by the (nocturnal) Orinoco Low-Level Jet (OLLJ) and strong mid-tropospheric easterly winds towards the Andes, favorable for orographic enhancenment of precipitation. The other event took place over the low-lands of the Magdalena-Cauca basin (Cordoba-Colombia), with an approximate size of 71304 $km^2$ , according to its cloud top temperature pattern. In this region a sea-breeze provides moisture from oceanic origin, and the nearby Andes might help to enhance low-level convergence via orographic blocking and other mountain-related effects. Based on kilometer-scale CP simulations we describe details of the initiation and life cycle of these two MCSs as simulated by WRF, including a description of the low-level input of moisture provided by the sea-breeze and the nocturnal jet during the initiation and mature stages, the corresponding mesoscale circulations in the vicinity of the Andes, and the intensity of the simulated precipitation. Preliminary 3-km simulations of the Mocoa event show the low-level flow blocking by the Andes, the enhanced orographic precipitation, and an underestimation of the maximum intensity of rainfall. This study might help on understanding the skill and limitations of CP simulations for representing weather systems associated to extreme rainfall in the Tropical Andes.