

# **Effect of convective organization on precipitation extremes**

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## **Abstract**

The organization of convection on various spatio-temporal scales is a key that explains recent and potentially future trends of tropical precipitation. It is often associated with extreme precipitation that have damaging effects. In this talk, we investigate the effect of two types of convective organization on tropical extreme precipitation.

The first type is the self-aggregation of convection which occurs spontaneously in Radiative Convective Equilibrium (RCE) simulations and for which some physical processes were observed in the real atmosphere. We found a significant increase of instantaneous precipitation (+30%) with self-aggregation of convection due to increased precipitation efficiency (+50%): the local increase in relative humidity drives larger accretion efficiency and lower re-evaporation. When the atmosphere is more organized into a moist convecting region and a dry convection-free region, deep convective updrafts are surrounded by a warmer environment which reduces convective instability and thus the dynamic contribution (-25%). The moister boundary-layer explains a slightly positive thermodynamic contribution (+5%).

Second, we document the effect of the Madden Julian Oscillation (MJO) on the occurrence of precipitation extremes in the western Maritime Continent (MC) using almost 20 years of high-resolution Integrated Multi-satellitE Retrievals for Global Precipitation Measurement (GPM IMERG) data. The MJO is a large scale organized system propagating from the western Indian Ocean to the western Pacific Ocean in about 40-70 days. The probability of experiencing extreme precipitation increases robustly by a factor of two, and decreases by a factor of half, dependent on location and the phase of the MJO. Extreme precipitation days over the MC are generally linked with an amplification of the diurnal cycle.

These results suggest that a potential change in convective organization regimes in a warming climate could lead to an evolution of tropical precipitation extremes significantly different than that expected from thermodynamical considerations.