A Multiscale analysis of the West African Monsoon

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From a large-scale perspective the West African monsoon (WAM) can be described in terms of the annual march of the ITCZ and its associated regional circulations. On the synoptic and mesoscale, the WAM is comprised of a complex collection of wave patterns, organized weather systems and deep convection. These include synoptic systems such as African easterly waves (AEWs) and mesoscale convective systems (MCSs), the main rain-producers in the region. AEWs also initiate many of the Atlantic tropical cyclones (TCs) downstream and thus are an important part of the interactions that take place between West Africa and the tropical Atlantic.

Since MCSs provide a majority of the rainfall over West Africa it may be argued that the WAM is strongly linked to the statistics of these MCSs and that the variability in the WAM in turn is linked to variability in these statistics. In this context it is important that we improve our understanding of the 2-way interactions between the MCSs and the synoptic environment in which they develop including, in particular, the interactions with the African easterly jet (AEJ) and AEWs, features that we expect to explicitly predict in weather and climate models.

The multi-scale analysis provided in this talk will emphasize a PV-θ thinking approach to understanding interactions between the AEJ, AEWs and convection including MCSs. It will include discussion of three phases of the AEW life-cycle: (i) genesis, (ii) baroclinic development and (iii) West coast developments including tropical cyclogenesis. Some perspectives for future avenues of research will be provided.