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WAM rainfall types, their climatology, and their relation to the synoptic-scale (thermo-)dynamic environment

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At least six major types of rainfall-bearing precipitation systems/processes occur over entire West Africa that differ with respect to their seasonal and diurnal climatology, as well as with regard to their dynamics: (1) Fast moving, organized convective systems, including squall lines; (2) showers and thunderstorms associated with the land-sea breeze circulation in coastal areas; (3) isolated, unorganised, often orographically enhanced afternoon convection; (4) long-lasting, often non-thundery precipitation events associated with low-level atmospheric disturbances (vortices); (5) orographic precipitation at the windward side of mountain ranges due to the forced lifting of parcels in the south-westerly monsoonal flow; and (6) pre-, post-monsoonal and dry season precipitation events associated with upper-level disturbances embedded in a westerly flow. Examples of all six types will be presented and, where appropriate, their impact on the diurnal rainfall probability and their seasonal cycle will be highlighted.

The understanding of the major types of rainfall events is crucial to the explanation of the year-to-year and long-term precipitation variability in West Africa, as well as for assessing the credibility of future projections of rainfall changes based on meteorological models. In the talk, a statistic of the pertinent rainfall types in the Soudanien zone of Benin for the 2002 rainy season will be given. Data from the radiosonde campaign in the same area and ECMWF analyses are used to characterise the typical (thermo)dynamic and wave disturbance environments in which the different rainfall events were embedded.