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Diurnal circle of the West and Central African monsoon: moisture fluxes, convergence and transport

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The sudden flow/flux of moisture into West and Central Africa constitute the onset of the monsoon season. The study of the West African monsoon circulation using reanalysis and satellite-based observations has contributed immensely to new findings in research, and has closed the gap to sparsity of data especially in this part of the world where ground observations are scarce. This research work investigated monsoon circulation in seven justified zones, classified as rainforest (west – coast, dry, Nigeria – Cameroon), savannah (Nigeria, and Central Africa and South Sudan (CASS)), sudano – sahel, and sahel in West and Central Africa. The goal is to examine the diurnal variation of monsoon circulations using the data from the European Centre for Medium-range Weather Forecasts (ECMWF) interim reanalysis (ERA-Interim). The extent of the moisture or monsoon depth ($\sim$ 800 mb) were established to be consistent during the morning diurnal (6Z) in each zone during June – September (JJAS) season, but only in four (west-coast rainforest, dry rainforest, Nigeria-Cameroon rainforest, and Nigeria savannah) of the seven (7) zones during March – May (MAM) season, with greater depth observed during the JJAS than MAM season, thus resulting in more monsoonal or stratiform precipitation during the morning diurnal (6Z) than other diurnals (0Z, 12Z, and 18Z). Southwesterly monsoon flow only reached CASS savannah, Sudano, and Sahel zones during JJAS season. Peak values ($\sim$100 (g/kg*m/s)) of moisture fluxes were observed during the night and morning diurnals (0Z and 12Z), consistent with the moisture depth in the various zones. Low level moisture were transported into four (4) zones (west-coast rainforest, dry rainforest, Nigeria-Cameroon rainforest, and Nigeria Savannah) south of 12oN much earlier during the MAM season, particularly during the night (0Z) and morning (6Z) diurnals, with peak values in the range of 100 – 160 kg m-1 s-1. The monsoon was observed to be fully established in the Central Africa and South Sudan (CASS), Sudano, and Sahel zones during the JJAS season. The moisture convergence showed that convergence were consistent in the Nigeria/Cameroon boundary axis at all the diurnals (0Z, 6Z, 12Z, and 18Z), in Sierra Leone of west-coast rainforest during the night (0Z) and morning (6Z) diurnals, and in the eastern axis of the CASS Savannah during the morning (6Z) and day (12Z) diurnals, for the MAM season. The results had proved that the monsoon in West and Central Africa were fully established during the night and morning diurnals.