

Diurnal Circle of Rainfall and Convective Properties over West and Central Africa

Authors : Balogun R. Ayodeji, Adefisan E. Adesanya, Adeyewa Z. Debo, E. C. Okogbue

Abstract : The need to investigate diurnal weather circles in West Africa is coined in the fact that complex interactions often results from diurnal weather patterns. This study investigates diurnal circles of wind, rainfall and convective properties using six (6) hour interval data from the ERA-Interim and the Tropical Rainfall Measurement Mission (TRMM). The seven distinct zones, used in this work and classified as rainforest (west-coast, dry, Nigeria-Cameroon), Savannah (Nigeria, and Central Africa and South Sudan (CASS)), Sudano-Sahel, and Sahel, were clearly indicated by the rainfall pattern in each zones. Results showed that the land-ocean warming contrast was more strongly sensitive to seasonal cycle and has been very weak during March-May (MAM) but clearly spelt out during June-September (JJAS). Dipoles of wind convergence/divergence and wet/dry precipitation, between CASS and Nigeria Savannah zones, were identified in morning and evening hours of MAM, whereas distinct night and day anomaly, in the same location of CASS, were found to be consistent during the JJAS season. Diurnal variation of convective properties showed that stratiform precipitation, due to the extremely low occurrence of flashcount climatology, was dominant during morning hours for both MAM and JJAS than other periods of the day. On the other hand, diurnal variation of the system sizes showed that small system sizes were most dominant during the day time periods for both MAM and JJAS, whereas larger system sizes were frequent during the evening, night, and morning hours. The locations of flashcount and system sizes agreed with earlier results that morning and day-time hours were dominated by stratiform precipitation and small system sizes respectively. Most results clearly showed that the eastern locations of Sudano and Sahel were consistently dry because rainfall and precipitation features were predominantly few. System sizes greater than or equal to 800 km² were found in the western axis of the Sudano and Sahel zones, whereas the eastern axis, particularly in the Sahel zone, had minimal occurrences of small/large system sizes. From the results of locations of extreme systems, flashcount greater than 275 in one single system was never observed during the morning (6Z) diurnal, whereas, the evening (18Z) diurnal had the most frequent cases (at least 8) of flashcount exceeding 275 in one single system. Results presented had shown the importance of diurnal variation in understanding precipitation, flashcount, system sizes patterns at diurnal scales, and understanding land-ocean contrast, precipitation, and wind field anomaly at diurnal scales.

Keywords : convective properties, diurnal circle, flashcount, system sizes

Conference Title : ICASCP 2019 : International Conference on Atmospheric Sciences and Cloud Physics

Conference Location : Zurich, Switzerland

Conference Dates : January 14-15, 2019