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Dry-Season Precipitation Forecasts in Tropical West Africa and their Evaluation with Different Gridded Precipitation Products

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Precipitation during the boreal winter dry season in tropical West Africa is rare but occasionally connected to high-impacts for the local population. The dynamics and predictability of this phenomenon have been studied very little. Here a statistical evaluation of the climatology, dynamics, and predictions of dry-season wet events is presented for the region 7.5–15°N, 10°W–10°E. The analysis is conducted for two different time periods: The first covers the 23 dry seasons (November–February) 1979/80–2001/02 and is based upon GPCP merged satellite-gauge pentad rainfall estimates and five-day ERA-40 precipitation forecast. The second period is shorter, but uses the supposedly more reliable daily rainfall estimates from TRMM and a revised version of the GPCP daily rainfall products, as well as forecasts from ERA-Interim for the 11 dry-seasons 1998/99 through 2008/2009. Comparisons for selected cases have in fact shown considerable disagreement between the three rainfall products.

Wet events during the dry-season are defined as pentads with an area-averaged precipitation anomaly of more than +200% with respect to the mean seasonal cycle. Composites of the 43 events identified in the GPCP pentad data indicate an association with a trough over northwestern Africa, a tropical plume on its eastern side, unusual precipitation at the northern and western fringes of the Sahara, and reduced surface pressure over the Sahara, which allows an inflow of moist southerlies from the Gulf of Guinea to feed the unusual dry-season rainfalls. The results give evidence for a pre-conditioning by another disturbance about one week prior to the precipitation event. The ERA-40 forecasts show a high temporal correlation with observations, a general wet bias, but a somewhat too low number of wet events. With 53% of all identified events correctly forecasted and only 32% of forecasted events not verified the model shows a moderate skill in contrast to the prediction of many other tropical precipitation systems. A separate consideration of hits, misses, and false alarms corroborates the previously proposed hypothesis that a strong extratropical influence enhances the quality of predictions in this region. Overall, findings of the present study should encourage weather services in West Africa to take advantage of available dry-season precipitation forecasts in terms of the dissemination of early warnings.