Geophysical Research Abstracts
Vol. 19, EGU2017-16045, 2017
EGU General Assembly 2017

Statistical forecasting of tropical rainfall using equatorial waves

Andreas Schlüter (1), Manuel Klar (2), Peter Vogel (1,2), Tilmann Gneiting (2,3), Andreas H. Fink (1), and Peter Knippertz (1)

(1) Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology, Germany (andreas.schlueter@kit.edu), (2) Institute of Stochastics, Karlsruhe Institute of Technology, Germany, (3) Computational Statistics, Heidelberg Institute for Theoretical Studies, Germany

Despite their high socio-economic importance, forecasts of tropical rainfall on a synoptic timescale are still quite poor. Due to the complex nature of convection, numerical weather prediction (NWP) models largely fail to deliver reliable and accurate precipitation forecasts for the tropics. In this study, we propose a new statistical method for the prediction of tropical rainfall using the information about the phasing of equatorial waves.

For certain temporal and spatial scales, statistical forecast methods for tropical precipitation have skill comparable to complex and expensive numerical predictions. For example, recent work has shown that climatology or persistence forecasts, thus a very simple statistical model, performs as well as postprocessed ensemble forecasts from the European Centre for Medium-Range Weather Forecasts (ECMWF) over tropical Africa. Thus, we believe that additional exploitation of information about the larger-scale atmospheric setting could lead to statistical forecast models of tropical precipitation that are comparable or even more accurate than current NWP forecasts.

Predictability of tropical precipitation on the synoptic timescale is mainly governed by convectively coupled equatorial waves which modulate the distribution and intensity of rainfall. Therefore, information about the phasing and intensity of equatorial wave activity should be included in statistical models for tropical rainfall. Here, we present a simple statistical forecast that incorporates information about these waves. To obtain knowledge about future wave phasing, the current wave signal can be extrapolated or filtered from signals in NWP output.

Exemplarily, we tested the improvement of forecast quality over two locations in West Africa using the a priori knowledge about the phasing of these equatorial waves. For both locations, equatorial waves successfully predict rainfall occurrence and rainfall amount. The new model clearly outperforms the ECMWF forecast. This demonstrates the great potential of such relatively simple statistical-dynamical models. We are confident that our method has also great potential for the operational application of rainfall prediction in other tropical regions and this will be tested in the future.