Geophysical Research Abstracts
Vol. 15, EGU2013-8503, 2013
EGU General Assembly 2013
© Author(s) 2013. CC Attribution 3.0 License.

Precipitation diurnal cycles in satellite, reanalysis and synoptic data and in regional climate model simulations

Uwe Pfeifroth (1,2), Richard Müller (1), Jörg Trentmann (1), and Bodo Ahrens (2)

(1) Deutscher Wetterdienst, Climate Monitoring, Offenbach, Germany (uwe.pfeifroth@dwd.de), (2) Goethe University Frankfurt, Insitute for Atmospheric and Environmental Research, Frankfurt, Germany

Precipitation is essential for life on earth and an important parameter in the energy and water cycle of the earth-atmosphere system. Owing to its high spatial and temporal variability, precipitation is challenging in terms of measuring and modeling. Precipitation is controlled by various processes, ranging from large-scale frontal systems to small-scale convective events. Some of the controlling processes have a diurnal cycle, resulting in a diurnal cycle in precipitation in certain climate regimes. In numerical atmospheric models, processes related to precipitation are often parameterized, which induces additional uncertainty. Hence, there is an essential need for model validation, what in turn requires reliable reference data and validation methods.

Here we compare precipitation data based on satellite, reanalysis and synoptic data to provide a global overview of average precipitation diurnal cycles and to estimate the reliability of the analyzed datasets. Based on these results we evaluate COSMO-CLM (CCLM) regional climate model simulations for diurnal cycles of precipitation focusing on West Africa.

Distinct diurnal cycles are present in the tropics and in mid-latitudes during summer, especially over land. Additionally, we find that different data sources partly give different precipitation diurnal cycles.

In West Africa, the satellite data shows diurnal cycles of precipitation to be influenced by land-sea contrasts and by topographic features. The CCLM is not simulating the observed precipitation diurnal cycles correctly. This might be caused by deficiencies in the representation of relevant processes and uncertainties in model parameterizations.