Geophysical Research Abstracts
Vol. 16, EGU2014-7311, 2014
EGU General Assembly 2014
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Analysis of observed and modeled rainfall seasonality with new indicators based on information entropy

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In this study the new seasonality indicators of precipitation based on information theory – relative entropy (RE) and dimensionless seasonality index (DSI) (Feng et al., 2013) – and the mean annual rainfall are evaluated on a global scale with respect to two recently updated precipitation gridded datasets and coupled atmosphere-ocean general circulation models over the industrial period. Global regions with different precipitation regimes are classified and characterized in terms of RE and DSI. We show that observational dataset locally may differ substantially in their representation of seasonality. The DSI, introduced on general basis, provides a rigorous metrics of the global monsoon intensity and domain fairly independent from the time resolution of the precipitation data and it is used as an objective metrics for model intercomparison and ranking. It is found that coupled models generally tend to overestimate the global monsoon intensity and domains particularly in the southern hemisphere and over the oceans, and over the equatorial regions. We further show that such indexes can be used to study trends in the seasonality of the precipitation (intensity and duration of the wet season) for the period 1950-2005 over Western Africa (Sahel drought).

References

Feng, X., A. Porporato, and I. Rodriguz-Iturbe, 2013: Changes in rainfall seasonality in the tropics. Nature Climate Change, doi:10.1038/nclimate1907.