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Characterizing interannual variability of land precipitation at the global scale

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Many hydrological, ecological and biogeochemical processes can be influenced by the interannual variability of precipitation. Several studies have attempted to quantify temporal correlations between interannual variability in a certain region and large scale atmospheric patterns and/or teleconnection indexes. However, few research efforts provided information about spatial patterns of this variability at the global scale. We analyzed land gauge precipitation records of the Global Historical Climatology Network, Version 2, as well as reanalysis data to provide an assessment of the spatial organization of several statistics representing precipitation interannual variability. Specifically, we computed the coefficient of variation, skewness, and short- and long-range dependence of the annual precipitation as well as indexes of seasonality of precipitation. We found that the coefficient of variation of annual precipitation is strongly correlated with intra-annual seasonality. Within-year precipitation anomalies concentrated in a few months appear to be the major contributor to interannual variability. Locations with pronounced seasonality have a consistently higher variability of annual precipitation, since anomalies occurring at the seasonal scale are more likely to affect the total yearly amount. Further, the study illustrates that a positive skewness of the distribution of annual precipitation is a robust property world-wide and its magnitude is related to the coefficient of interannual variation. Short-lag (few years) autocorrelation is very weak worldwide, presenting the annual precipitation occurrence as a substantially uncorrelated process. Conversely, the intensity of the long-memory/long-range dependence is significantly different from zero and therefore this type of variability might represent an important feature of precipitation interannual process.