Monitoring precipitation variations in Europe

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Projections from climate models show that the changing climate will influence the hydrological cycle, while its effects are already observed at global and local scales. This study aims to support climate services in Europe by monitoring pan-European changes in precipitation and drought. Timeseries with the fraction of the area with low or high precipitation, related to the local climate, are compared to the Standardized Precipitation Index (SPI), based on E-OBS v11.0 (1950-2014), the CRU TS-based Standardized Precipitation Evaporation Index (SPEI) and the self-calibrating Palmer Drought Severity Index (scPDSI). The analysis shows an increase in the area with excessively wet conditions and a decrease in the area with severe drought in North Europe, while for South Europe the trend in these quantities is less obvious.

Special attention is given in the uncertainties in the E-OBS precipitation and how these relate to the uncertainty in the indices used for monitoring. The relation between the quality of a precipitation product and any drought index is non-linear; errors in the precipitation can be amplified or dampened when a drought index is computed. Within this analysis we present the uncertainties in E-OBS v11.0 and how uncertainties are cascaded in the SPI calculation.

Finally, the main differences between the SPI, SPEI, and scPDSI indices are discussed in relation to the inclusion of evaporation and in their ability to reflect pan-European variations in satellite-based soil moisture.