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Long-term trends in European precipitation extremes from station and NWP data

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We present an analysis of the interannual to decadal-scale variability in heavy and extreme European precipitation using station daily data as well as precipitation estimates from different reanalyses. Station data consist of inputs from different collections (Royal Netherlands Meteorological Institute, National Climate Data Center, German Metoffice, Russian Metoffice) and covers the 20th century period. Reanalyses data were taken from the four major reanalyses (NCEP/NCAR Reanalysis versions 1 and 2, ECMWF Reanalyses ERA15 and ERA40). The diagnosed differences in the statistical characteristics of precipitation between different NWP products and between reanalyses and station data vary within 30-40% on average. This is larger than the differences in these characteristics simulated by climate models in greenhouse gas experiments, which report normally the largest changes between the greenhouse gas experiments and the present climate to be within 10 to 20%. We quantified trends and decadal-scale variability patterns over European continent in major precipitation characteristics - mean precipitation intensity, the number of wet days and extreme precipitation statistics. These statistics represent the parameters of the Gamma distribution of daily precipitation and quantiles for the heavy and extreme precipitation. The analysis of linear trends of statistical characteristics of heavy precpitation in ERA40 and NCEP1 for a 43-year period shows similarity of the trend patterns in winter and identifies strong local disagreements, resulting in the trends of opposite signs during summer. Comparison of trends in extreme precipitation from reanalyses with those from station data also shows significant differences in trend estimates, especially for summer. For the Northern and Central Europe station data imply growing occurrence of extreme precipitation events over the last century.