Return values for extreme precipitation in Norway - a comparison of estimates from a new approach combining ensemble data and gridded observations to PMP values

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ABSTRACT

The occurrence of extreme precipitation events causing surface water excess and flooding is becoming an increasing societal expense due to the rise in precipitation levels. It is therefore crucial to understand and get better knowledge about extreme precipitation events to predict their likelihood and frequency, as well as to estimate design values for critical infrastructure and constructions.

Analysis of extreme precipitation events requires long timeseries, which can be challenging using conventional or relatively short observational data records. To increase the event sample size we have applied a data set from the numerical seasonal prediction system SEAS5 at ECMWF. The data were fitted to a GEV-distribution and compared to an equivalent GEV-distribution for the gridded observational data set SeNorge. A method to estimate return values by combining the two datasets, taking advantage of the large sample size from SEAS5 and the spatial distribution from SeNorge is proposed. By using a normalized "growth curve" from both data sets and the location parameter from SeNorge the correct level of the frequency curve for short return periods is determined.

An additional correction to the scale parameter was employed to ensure appropriate levels of the curve for return values at longer return periods, based on a spatial adjustment factor.

The resulting return value estimates are considered to be more robust than previous calculated estimates, due to the inherited small confidence interval from SEAS5. We compare the new estimates of long return period values with existing values for PMP (Probable Maximum Precipitation), where we also evaluate the spatial variability of the traditional method for PMP values, which are point estimates, to the new spatially consistent approach.

Keywords: precipitation; desing values; long return periods