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Systematic deviation between COSMO-EU precipitation forecast and measured precipitation

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The Flood Forecast Agency of Baden-Württemberg (HVZ) uses the precipitation forecast from COSMO-EU forecast by the German Weather Survey (DWD) for flood forecasting of major rivers in Baden-Württemberg. Differences between forecasted and measured precipitation has been observed for a number of larger precipitation events in the past. Since event based investigation is not sufficient for detecting systematic errors a longer time period was systematically investigated. We compared precipitation forecasted by COSMO-EU with measured precipitation between January 2007and March 2012 for the area of Baden-Württemberg and the upper Rhine basin in Austria and Switzerland. For each day within the investigated period two 72-hour forecasts, one issued at 00:00 and one at 12:00 pm, were analysed. Measured and forecasted precipitation was interpolated to a 1 km input grid used for the flood-forecast model. In order to focus on flood relevant precipitation events a selection was made among the forecast periods. Only forecasts that at least predict a mean 24-hour sum over the whole investigation area of 5 mm or a local maximum 24-h our sum of at least 15 mm were considered. The resulting data set was investigated as a whole and in subsets. Subsets where build with the aim to gain information on possible processes specific errors. One subset took only forecasts into account that predict locally high maximum 24-sums (at least 15 mm) but only comparatively small mean values (less then 5 mm). We assumed that this subset focuses on convective rain events. Alternatively a subset was selected with at least 5 mm mean 24-h-sum over the whole investigation area focusing on advective rain events. Furthermore the dataset was spitted in different seasons and according to circulation patterns. Specific deviation patterns between predicted and measured precipitation were found, that are highly correlated with the topography. The analysis showed that there are pronounced differences of the direction of deviation among the different subsets. For the convective events precipitation was underestimated in large areas of Baden-Württemberg and the upper Rhine basin but also overestimated in some regions. For the subset of convective events precipitation was significantly overestimated almost over the whole investigation areas, with very high deviations especially in the luv of the mountain chains. The separation of the data in summer and winter season shows equal patterns as the respective periods for convective and advective events. Also for the different weather patterns distinctive deviation patterns could be observed. We will test in future if the observed patterns could be used directly for a regional bias correction to reduce the uncertainty in precipitation forecast for flood forecast in this topographically complex region.