**Project: 983**
**Title: Decadal variability of flood triggering extreme precipitation events**
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The objective of this project is to produce realistic highly resolved historical precipitation and temperature time series to assess flood triggering precipitation events for Europe. With this aim, we are using the regional climate model COSMO-CLM (CCLM) with global reanalysis data as initial and boundary conditions. It is planned to realize simulations driven both with ERA-Interim (Dee et al., 2011) and with the ERA 20C (Hersbach et al., 2013) reanalysis datasets. During 2016, the ERA-Interim driven simulation was already completed. The preparation of the ERA 20C driven simulation in terms of the generation of the required nesting files had just started. Further, it is probable that the respective CCLM simulation will also be started by the end of the year 2016. The project results achieved so far will be summarized in the following.

The CCLM simulation driven by ERA Interim data (CCLM-ERAI) is calculated over the EURO-CORDEX region at 0.22° horizontal resolution. The simulation starts in 1979 and ends in 2015. Since our analysis is focusing on Central Europe, we concentrate on the flood triggering precipitation events in the catchments of the Danube, the Rhine, the Elbe, the Oder, and the Vistula. After the simulation was completed we have started the validation process, where we compare the simulated data to observations. For validation, the daily E-OBS gridded data set (0.25° horizontal resolution) is used (Haylock et al., 2008), which also uses grid box averages and thus it is appropriate to use for comparison with regional climate model data.

To give a first overview of the model performance, the annual precipitation sum is evaluated for Central Europe. Figure 1 shows the relative difference of the mean annual precipitation sum between E-OBS and CCLM-ERAI for the 37 year period 1979-2005. Over most of the region the relative bias is less than 25% in both directions, and only at few grid points values higher than 50 % are found. These values typically occur in the mountain areas like e.g. the Alps and the Carpathian Mountains, where the model overestimates the precipitation sum.

To evaluate the annual cycle of the precipitation we calculated the mean daily precipitation in the different river catchments. Here, only exemplary results for the Danube catchment are shown, since it is the largest considered catchment. The annual cycle of precipitation for the Danube catchment (Figure 2) is generally well captured. Nevertheless the model shows a slight overestimation during winter and an underestimation during summer.

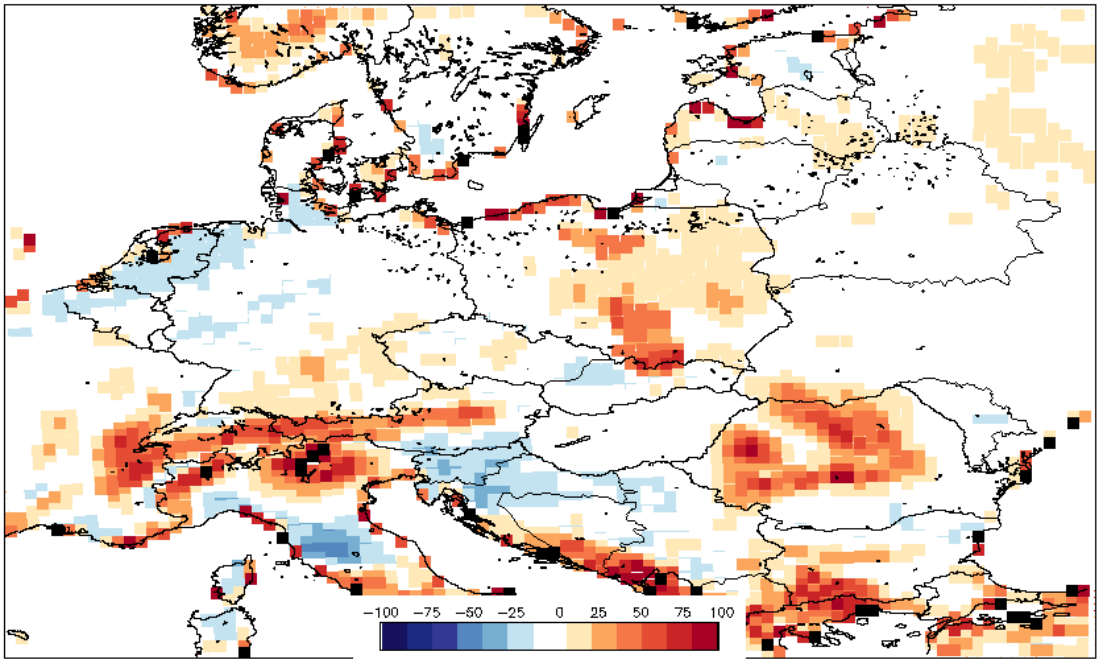


Figure 1. Relative difference (%) of mean annual precipitation sum between the CCLM-ERAI simulation and the E-OBS data (1979-2015) relative to E-OBS.

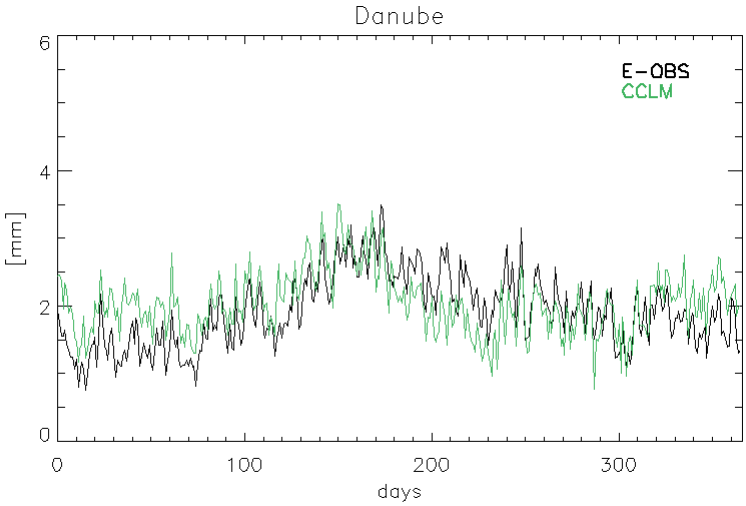


Figure 2. Mean annual cycle of the daily precipitation in the Danube catchment from E-OBS (black) and from CCLM-ERAI (green).

For the analysis of flood triggering precipitation events, the representation of extreme values in the modelled data is crucial. The quantile-quantile plot (Figure 3) compares the distribution of the spatial mean precipitation of the model and the observational data in the Danube catchment. The quantiles lay along the y=x line, which means that the two distributions are very similar. However, the highest quantile values are overestimated by CCLM-ERAI dataset and the tail of the distribution is more dispersed in the modelled data, while the maximum (last quantile) precipitation value is higher in E-OBS.

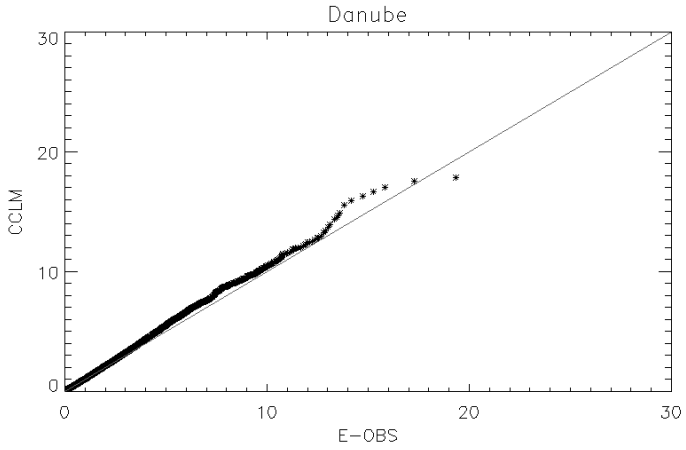


Figure 3. Quantile-quantile plot comparing the quantiles (in mm) of the spatial mean daily precipitation in the Danube catchment in E-OBS (x-axis) and in CCLM-ERAI (y-axis).

In summary the CCLM-ERAI captures the characteristics of precipitation in Central Europe quite well. However, it is planned to bias-correct the simulated data, as it will be used in impact studies. Our aim for the end of 2016 and for year 2017 is to complete the ERA 20C driven CCLM simulation and to apply a bias correction to both simulated datasets.

References

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