Delft University of Technology

Efficient pan-European flood hazard modelling through a combination of statistical and physical models

http://rain-project.eu

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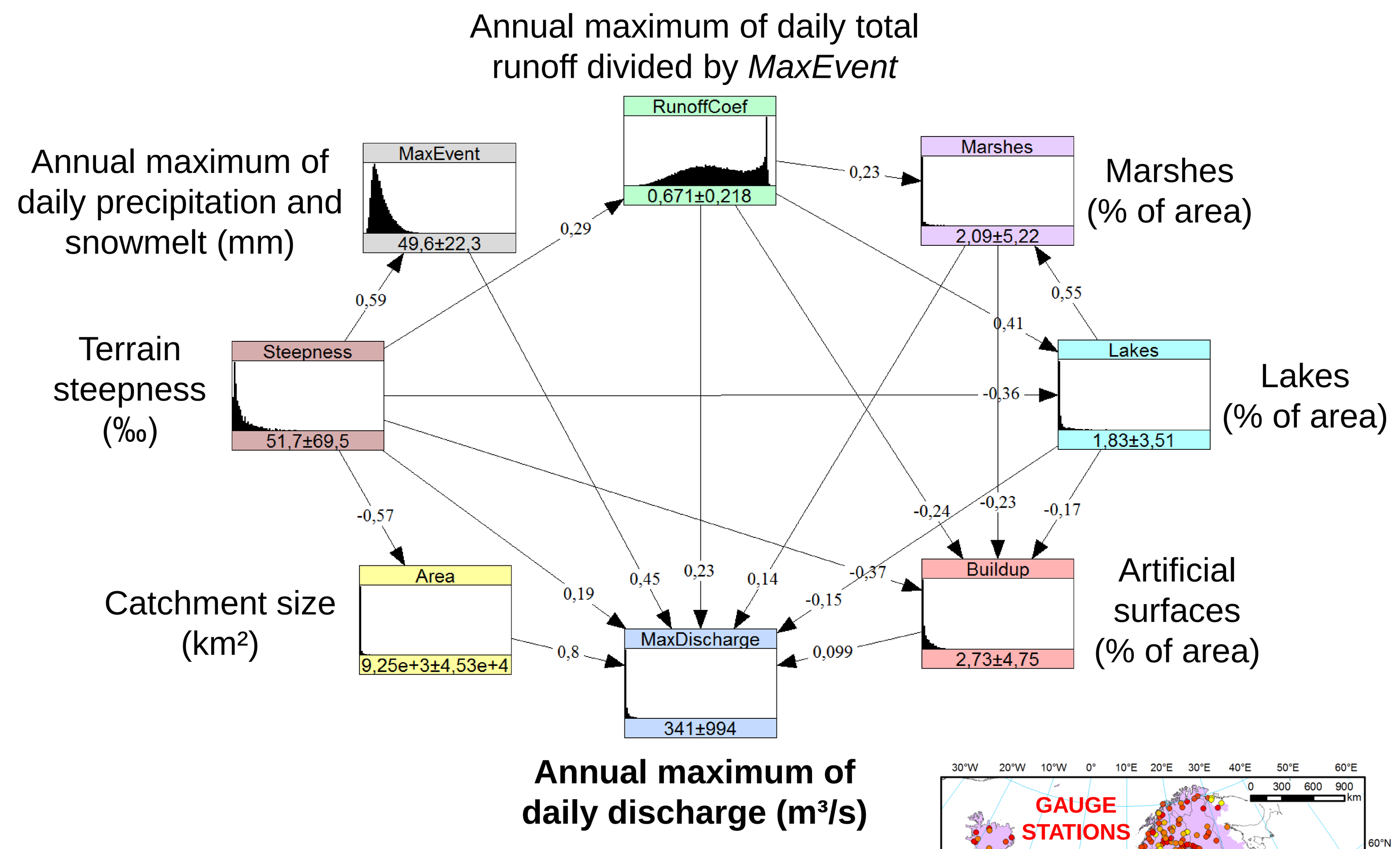
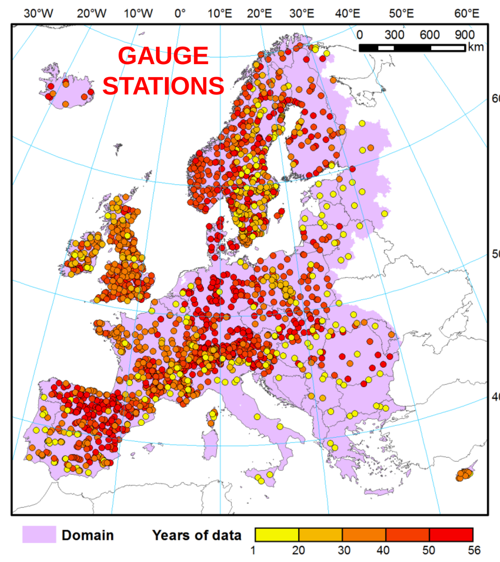
Poster D. 226 | Abstract EGU2016-10118

Flood scenarios

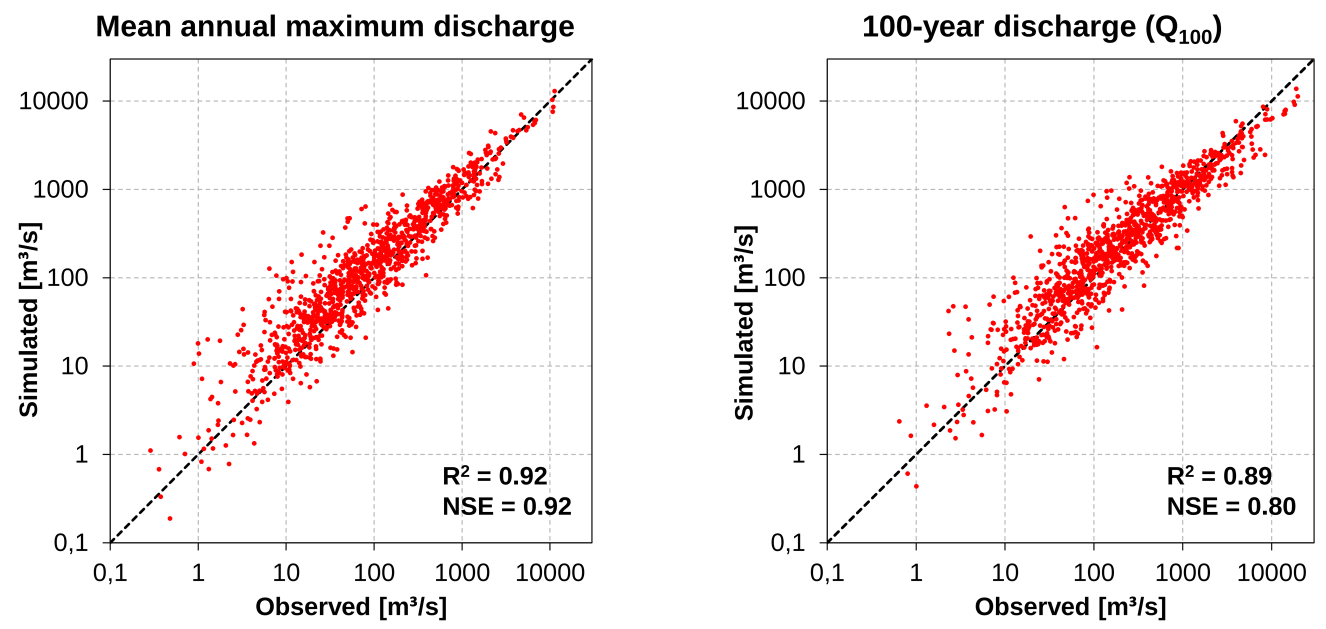
Method



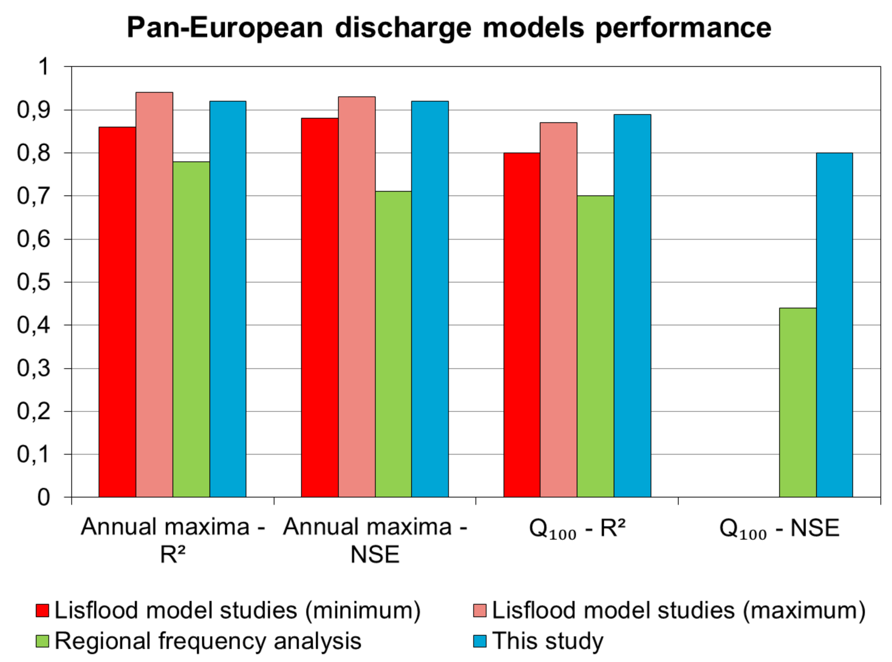


- Extreme daily river discharge is estimated using a **Bayesian network** based on c. 75,000 annual data (1950-2005) for 8 variables.

Validation



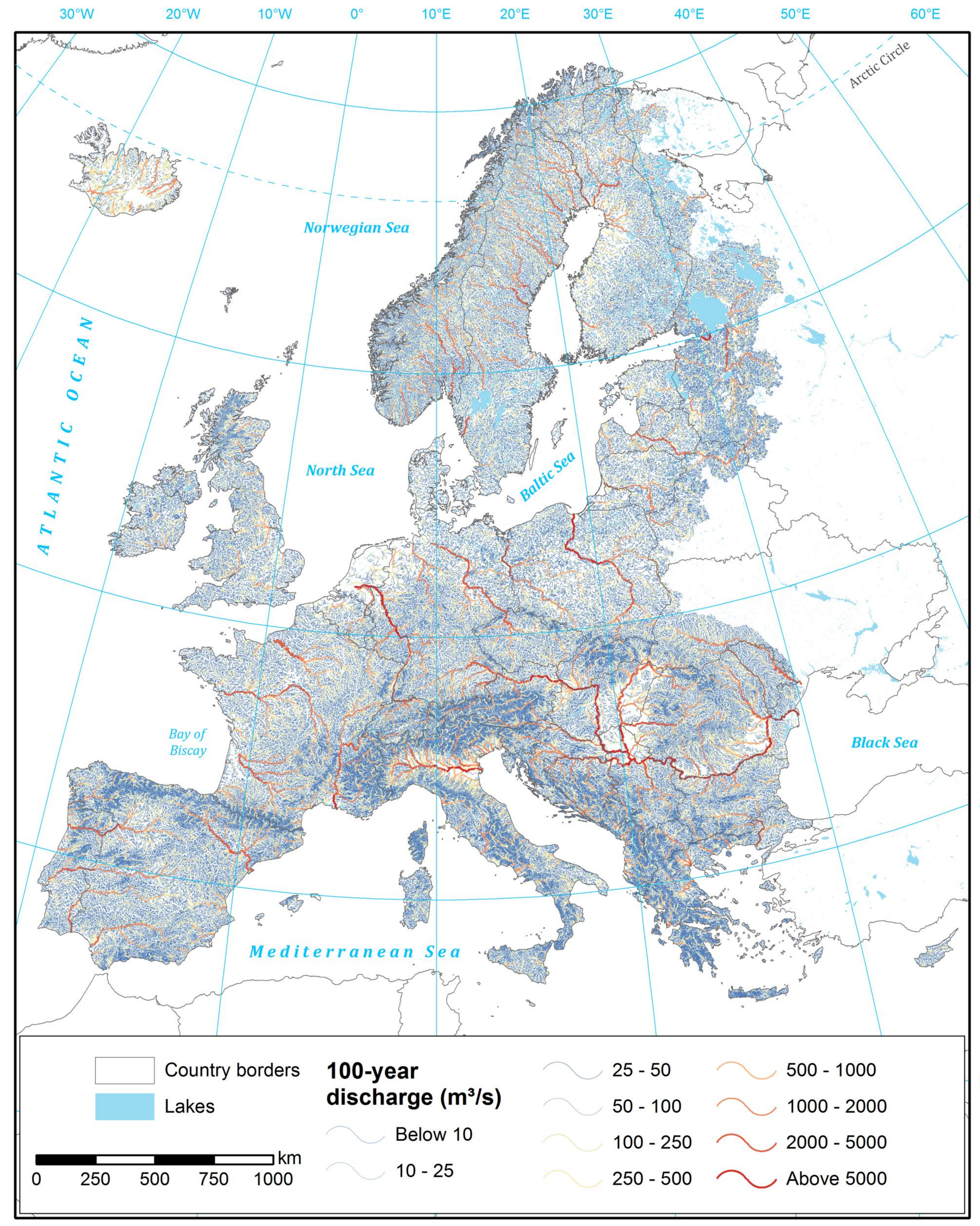
- **NSE** indicates Nash-Sutcliffe efficiency, i.e. bias of the model.
- **Return periods** were calculated with Gumbel distribution



- **↑ Modelled vs observed discharge.**
- The performance was mostly consistent between spatial and temporal sub-selections of gauge station data.

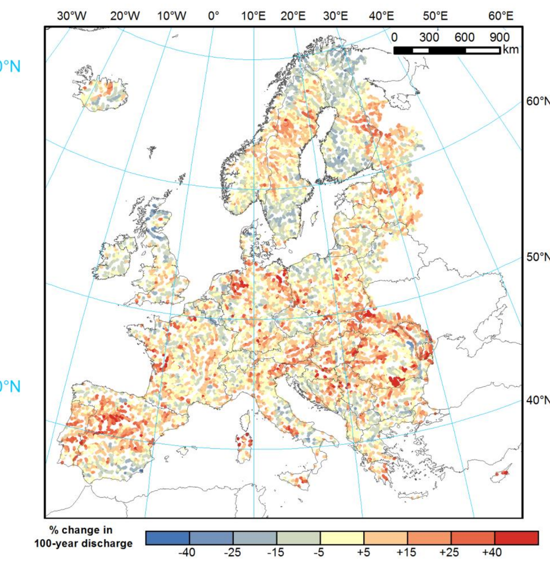
- Lisflood model values are those reported in 4 publications.
- Regional frequency analysis was done by us according to methodology by Smith et al. (2015) *Water Resour. Res.* 51, 539–553.

Results



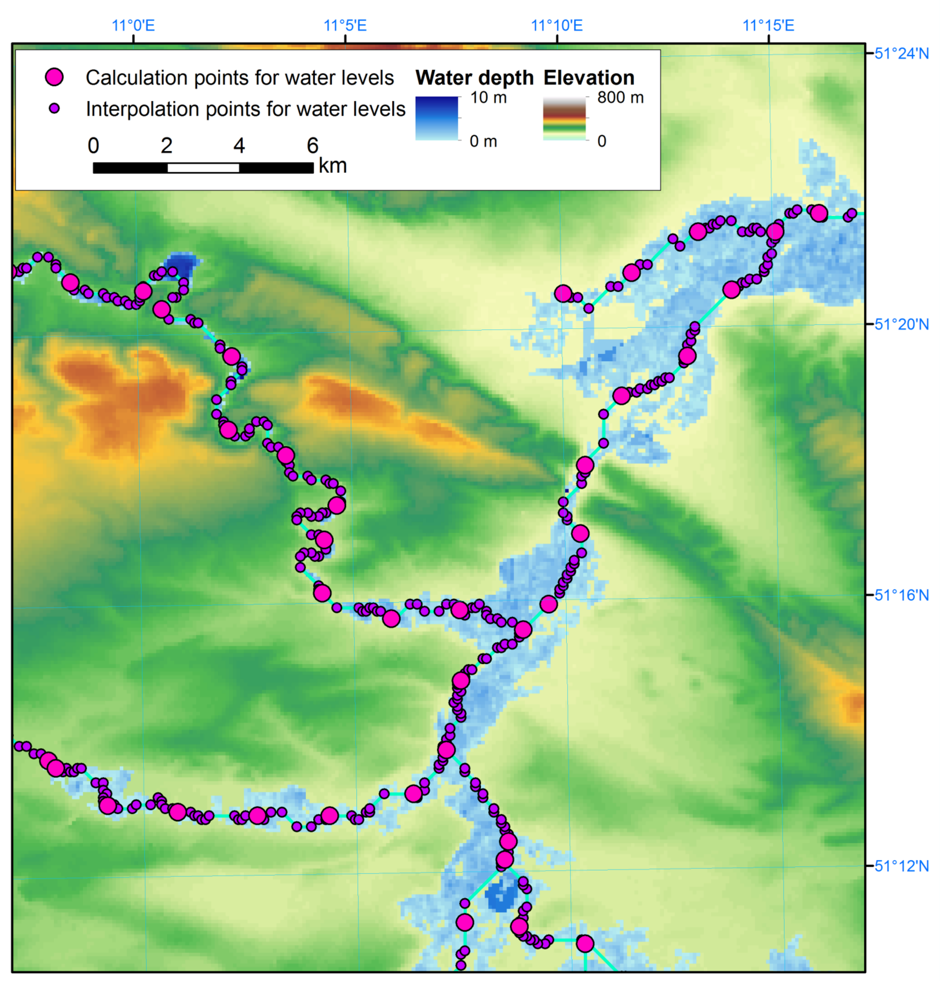
←Estimated extreme daily river discharge, 1971-2000, Q_{100}

↓Change in river discharge, 2071-2100 RCP 4.5, Q_{100}

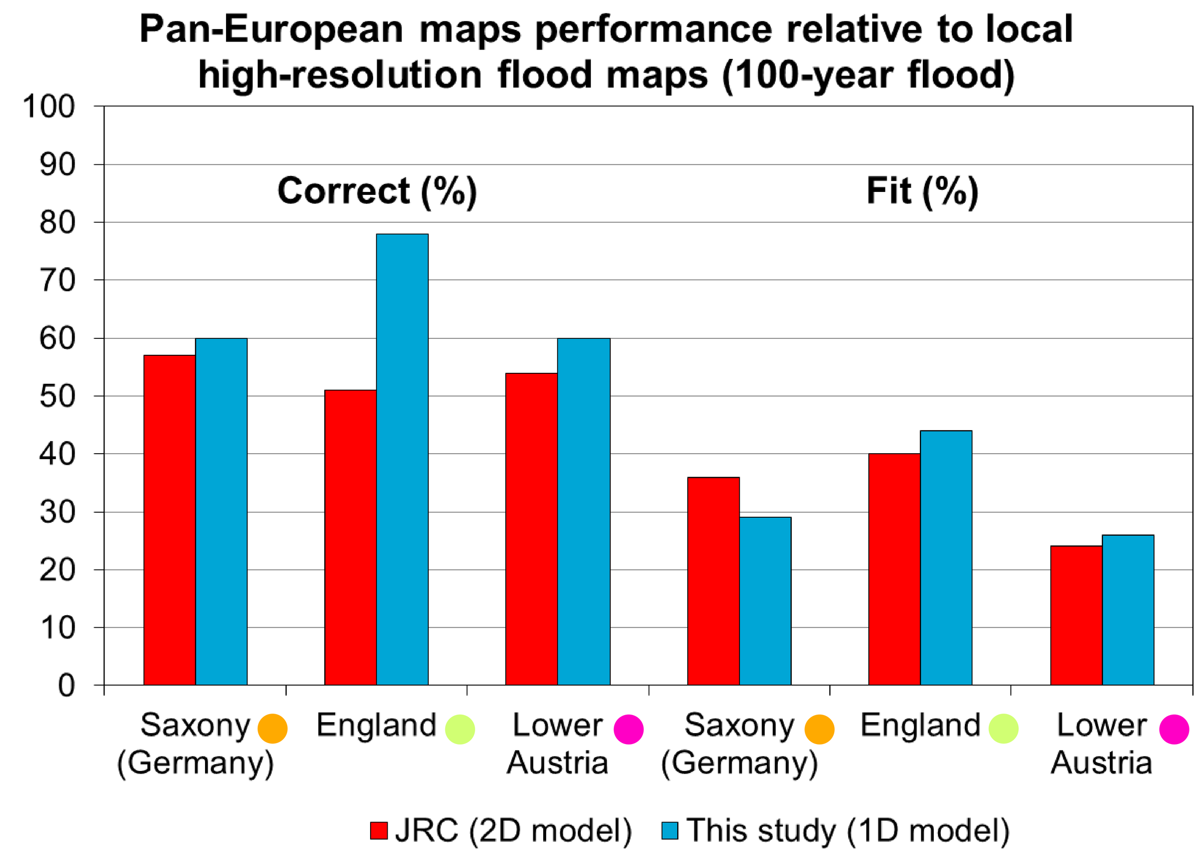


Flood extent

- Discharges from the **Bayesian network** were used in a **1D** steady-state hydrodynamic simulation in **SOBEK**.
- Includes 0.5 mln km of rivers (drainage area 100+ km²).
- Water levels were derived at points c. 2 km apart and intersected with a 100 m DEM.

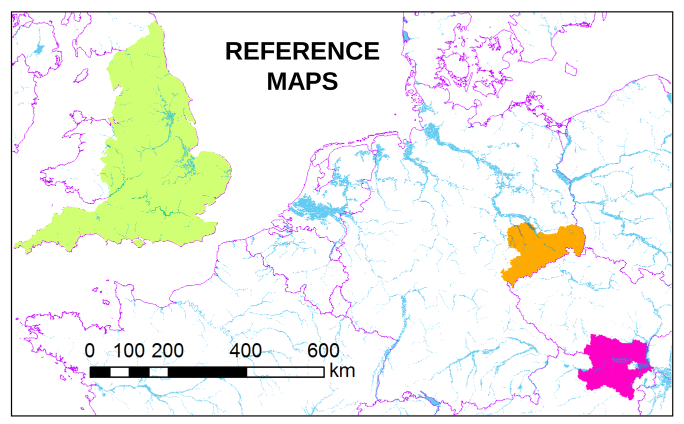


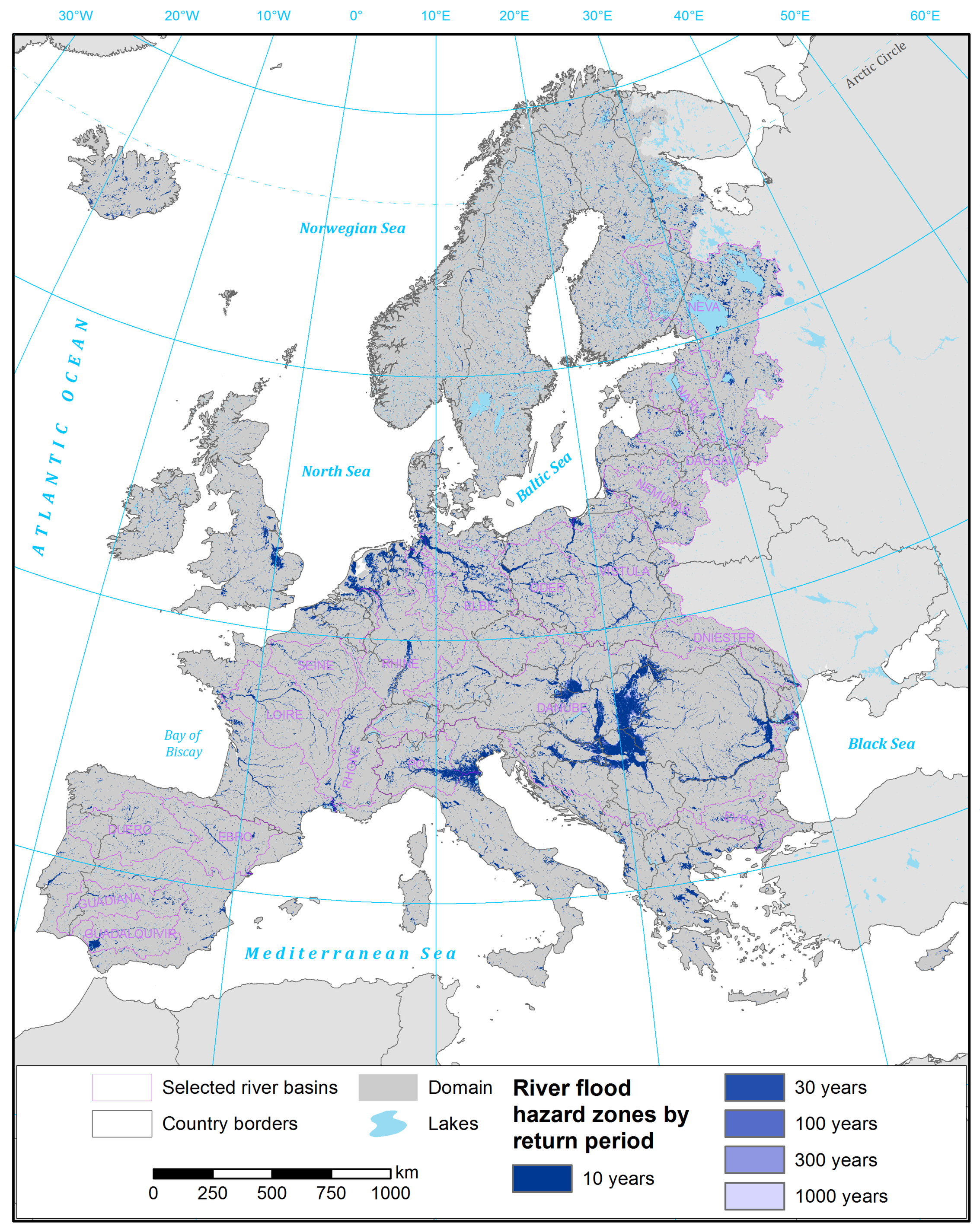
- Computational time of the full domain incl. scenario calculation: c. 1 day on normal PC



- **JRC** indicates Joint Research Center's flood map in Alfieri et al. (2014) *Hydrol. Process.* 28, 4067–4077
- **"Correct"** indicates what percentage of the local map is recreated correctly in the pan-European map.
- **"Fit"** indicates what percentage of a union of local and pan-European maps is overlapping.
- The comparison was made for rivers with catchment area above 500 km²

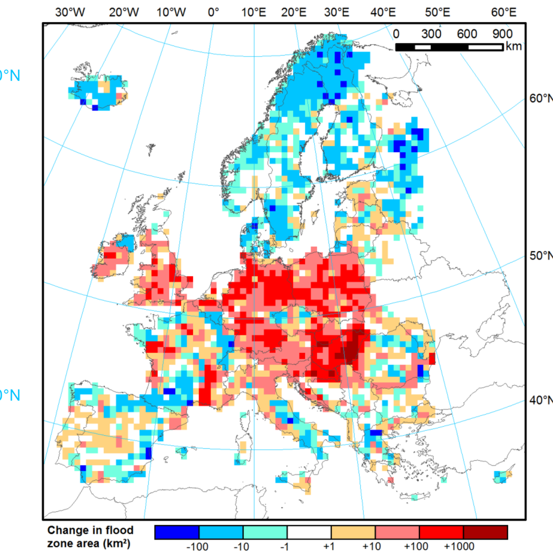
- Using **1D** instead **2D modelling** still gives **comparable performance** if confronted with JRC's map and high-resolution reference maps.





←River flood hazard zones, 1971-2000, no flood protection assumed.

↓Change in flood extents, 2071-2100 RCP 4.5, Q_{100}, incl. flood protection



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