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Mapping the water balance over a wide range of European catchments.

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Getting the water balance correct is one of the major problems of hydrological modeling: inputs (precipitation) and outputs (evaporation and runoff) should be in reasonable balance before calibration can even start. Often errors on the water balance can have a bigger influence on results than model calibration.
Lisflood is a distributed hydrological model used in the European Flood Alert System and in the European Droughts Observatory of the European Commission's Joint Research Centre (JRC). It comprises a module for calculating PET; moreover, a major effort in preparing the static input for the model, such as land use, vegetation, Leaf Area Index, river networks maps, has been carried out in the last years.
The challenge to use the same model over a wide region, covering the entire Europe makes it a good tool to explore the impact of different hydrological settings (Van der Knijff et al, 2008).
As part of a new calibration exercise, we reran the model over Europe with standard calibration parameters for the period 1990-2007. The meteorological input was retrieved from the MARS database at JRC (about 6000 stations). We compared mean annual simulated discharge with observed discharge for over 400 catchments.
Preliminary results show that the water balance is offset in most regions. In lowlands there is an excess in simulated runoff production, probably attributable to underestimated drainage to deeper groundwater and to underestimation of actual evapotranspiration. In most mountainous regions and in the middle-european massifs there is a shortage in runoff production, which is probably related to precipitation underestimation.
Calibrating on parameters that increase evapotranspiration or infiltration to deeper groundwater layers could improve the results in the lowlands.
Using other high-resolution data sets or improved interpolation techniques can solve only partly the problems related to the mountainous areas: we compared three precipitation sources and found that none of them can bridge the gap. Another approach would be a smart scaling of the rainfall fields: further research is needed on how this could be done.