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Analyses of global evapotranspiration datasets

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Several global multi-year evapotranspiration (ET) datasets are currently available. The LandFlux-EVAL initiative (www.iac.ethz.ch/url/research/LandFlux-EVAL) aims at the evaluation and intercomparison of these datasets and at the assessment of respective uncertainties in the estimation of ET. For the presented analyses, the observations-based datasets are grouped into three categories:

1) Diagnostic estimates, where observational data from various sources (e.g. remote sensing estimates, ground observations) are combined to derive ET estimates using simple algorithms

2) Land-Surface Model (LSM) output (driven with observations-based forcing)

3) Reanalysis datasets

In addition, ET from IPCC AR4 global climate model simulations is evaluated with the above listed observations-based estimates. Uncertainties in the ET datasets are estimated from the spread within each of these categories (interquartile ranges for global maps, spreads for several large river basins across the world). The consistency of spatial patterns of these datasets is analyzed with a cluster analysis. To investigate the role of climate forcing for the resulting uncertainties, ET from several LSMs which use common forcing data is analyzed and compared to output from LSM runs that use the same model but different forcing data.

The analyses show a general good agreement of the datasets from the different categories. In semi-arid regions, where ET is largely dependent on water availability, global climate models (IPCC AR4 simulations) show larger uncertainty ranges than other datasets categories, such as diagnostic datasets, LSMs or reanalyses. LSMs driven with common forcing data show the highest congruence of their spatial ET patterns. With our analyses, we show that forcing data has a strong influence on the resulting ET estimates. The major constraints of the validation of ET products is the lack of large-scale in-situ validation data as well as the interdependence of several ET datasets which may share common biases.