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Calibration of a distributed hydrological model using satellite data of land surface temperature

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Calibration and validation of distributed models at basin scale generally refer to external variables, which are integrated catchment model outputs, and usually depend on the comparison between simulated and observed discharges at the available rivers cross sections, which are usually very few. However distributed models allow an internal validation due to their intrinsic structure, so that internal processes and variables of the model can be controlled in each cell of the domain. In particular this work investigates the potentiality to control evapotranspiration and its spatial and temporal variability through the detection of land surface temperature (LST) from satellite remote sensing. This study proposes a methodology for the calibration of distributed hydrological models at basin scale using remote sensing data of land surface temperature.
The distributed energy water balance model, Flash–flood Event–based Spatially–distributed rainfall–runoff Transformation - Energy Water Balance model (FEST-EWB) will be calibrated in the Upper Po river basin (Italy) closed at the river cross section of Ponte della Becca with a total catchment area of about 38000 km2. The model algorithm solves the system of energy and mass balances in term of the representative pixel equilibrium temperature (RET) that governs the fluxes of energy and mass over the basin domain. This equilibrium surface temperature, which is a critical model state variable, is comparable to the land surface temperature (LST) from satellite. So a pixel to pixel semi-automatic calibration procedure of soil and vegetation parameter is presented through the comparison between the model internal state variable RET and the remotely observed LST. A similar calibration procedure will also be applied performing the traditional calibration using only discharge measurements. 260 diurnal and nocturne LST MODIS products are compared with FEST-EWB land surface temperature over the 11 years of simulation from 2000 to 2010 where meteorological and hydrological ground data are available.