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Exploiting remote sensing LST in distributed hydrological modelling: the example of the Continuum model

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Complete and distribute models, based on physical equations must mimic a variety of hydro-meteorological processes. This can produce very complex models with a high degree of parameterization.
The necessity to assimilate data of different nature observed by ground stations and remote sensors can be sometimes incompatible with the degree of complexity and parameterization of such models.
In this work a model that balance the need of reproducing the physic of the processes and the practical goal of avoiding over-parameterization is presented. It is developed to be easily applied in different contexts even in data scarce environments. All main hydrological phenomena are modeled in a fully distributed way: overland flow, infiltration, sub-surface flow, vegetation, deep flow, water table evolution and evapotranspiration. Complete mass balance and energy balance are introduced with the capability of soil surface temperature estimation.
A performance evaluation, based on both traditional and satellite derived data, is presented with a specific reference to the application to an Italian catchment. The model has been firstly calibrated and validated following a standard approach based on streamflow data. The capability of the model in reproducing both the streamflow measurements and the land surface temperature from satellites, has been investigated.
The model has been then calibrated using satellite data and geomorphologic characteristic of the basin only in order to test its application on a basin where standard hydrologic observations (e.g., streamflow data) are not available. The results have been compared with those obtained by the standard calibration strategy based on streamflow data.