



NewAge: a semi-distributed hydrological model as a dynamical system, and something more.

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We describe and analyse the performances of the semi-distributed hydrological model NewAGE. This model itself is made-up of five main parts: the radiation budget estimation, the snow modelling, the evapotranspiration part, the hillslope runoff budget and the runoff aggregation in the river network, and finally the flood propagation.

The model concept is based on the idea the elementary units are the hillslopes for each one the model gives the estimates of the prognostic simulated variables (one estimate for variable). Each “hillslope” does not need to coincide to the real hillslope, and can actually cover a small basin, up to some square kilometres. It constitutes the elementary “grid” element of the model. Each “hillslope” is connected to the others by the channel network. In turn, this is represented by an oriented graph, whose links are numbered through a generalisation of the Pfafstetter ordering. The topological partition of the basin is performed by a proper set of tools in JGrass. The mass budget for each hillslope is performed according to a suitable modification of Duffy (1996) dynamical model of hillslope runoff. Discharge in each link of the river network is evaluated according to Cuencas (2005). Radiation is calculated accounting for the sub-hillslope-variability in accord to a suitable scheme described in this contribution. Evapotranspiration estimation uses the Penman-Monteith formula, and includes hillslope variability in land use, soil cover and hydrological state. Flood wave propagation for the main streams can be estimated with a solver of the 1D de Saint Venant equation. Snow is modelled by a custom implementation of the Utah Energy Balance concepts.

This model can simulate all the parts of the hydrological cycle, but besides being also a model of the physical processes, it also implements the infrastructure dealing with human works and reservoirs. These modelling parts are supported by appropriate ancillary modules for the treatment of the meteorological data. The various pieces of NewAGE are implemented as code components according the the OpenMI 1.4 standard, and interface to the users by means of the GIS system JGrass. It is distributed under the GPL3 license.

Here we report here about two case studies made up of the model regarding the two rivers Passirio and Adige with outlet in Bozen, and covering respectively the discharge and the snow cover estimation. This last is compared to MODIS product.