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The HYPE open source community with examples of new code

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The Hydrological Predictions for the Environment (HYPE) model is now available for open source computing under the Lesser GNU Public License. The HYPE model is a dynamic, semi-distributed, process-based, integrated catchment model. It uses well-known hydrological and nutrient transport concepts and can be applied for both small and large scale assessments of water resources and status. A kick-off meeting to launch this new open source community was held in November 2011. The community is open to everyone interested in hydrology, hydrological modelling and code development – e.g. scientists, authorities, and consultancies, and it is operated via the web site http://hype.sourceforge.net/ , along with mailing lists and regular meetings. The web site includes a model description, source code, a manual, test areas, references, and a user forum. In January 2012, around 400 users from some 20 different countries have downloaded the code. New versions of the main code will be delivered frequently.

In the HYPE model, the landscape is divided according to soil type, vegetation and altitude. The soil can be divided in up to three vertical layers. Water and substances are routed through the same flow paths and storages (snow, soil, groundwater, streams, rivers, lakes) considering turn-over and transformation on the way towards the sea. In Sweden, the model is used by water authorities to fulfill the WFD and the MSFD. The model has also been applied in a multi-basin approach for continental Europe, La Plata basin and Niger River. The poster will give three examples of new code development with inclusion and testing of algorithms:

1. *Evapotranspiration:* an algorithm including solar radiation was implemented in the HYPE model code and tested against available measurements of evapotranspiration. To validate whether or not this new routine could reduce the volume error for simulated water discharge, and improve the daily flow simulation, it was evaluated for a number of gauging stations in Europe. Volume error and other runoff simulation errors were compared for the old and new algorithms for each monitoring station.

2. *Irrigation:* a new routine calculates water demand as a function of crop type, stage in the growing season, soil moisture content, evaporation and method of irrigation. This water can then be abstracted from a set of local and regional sources (groundwater, rivers, lakes, and reservoirs) provided the demanded water is available at the source. Conveyance losses in irrigation networks and local losses caused by inefficient irrigation equipment are accounted for. The routine has been applied and tested in southern Europe.

3. *Concentrations of organic matter and nutrients from coniferous forest soils:* the general formulation of soils in HYPE was simplified in the equations for organic matter turnover, and transport of dissolved organic phosphorus was added to the soil discharge. Also the reception of deposition was changed for snowy conditions. The new formulation was tested in 9 small well-studied sites in Sweden and showed significant improvements of results, although more work is still needed to capture crucial processes regulating the concentration variability in small forested streams.