The HYDROTEL distributed hydrological model: a simulation and forecasting model making good use of GIS and RS data

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The HYDROTEL distributed hydrological model has been developed to simulate streamflow either within an operational forecasting framework or study framework. In HYDROTEL, spatial variation of watershed characteristics is taken into account using GIS and remote sensing (RS) data. Vertical water budgets are computed separately on small, relatively homogeneous, hydrological units (RHHUs). These units correspond to small sub-watersheds whose drainage structures are derived from a relatively high resolution DEM (digital elevation model). Land use classes of each RHHUs are obtained from high resolution RS data, whereas soil types come from GIS data. The data base describing these watershed characteristics is prepared using PHYSITEL, a software package developed for that specific purpose and that is also compatible with other GIS. Both HYDROTEL and PHYSITEL have a friendly GUI (graphical user interface) that can be easily translated in various languages.

The model can be run using 1, 2, 3, 4, 6, 12 and 24-hour time steps, with algorithms assuring compatibility between results acquired at various time steps. Standard meteorological station data and radar data may be fed into the model. Calibration of model parameters can be performed through comparison between observed and simulated streamflows and snow water equivalents. Other variables could also be used. For instance, spatial distribution of snow cover and soil moisture can be monitored using appropriate field or RS data.

The model is now being used for hydrological forecasting purposes on a few rivers in Southern Quebec (Canada) by the Quebec Ministry of Sustainable Development,

Environment and Parks (that is its « Centre d'Expertise Hydrique ») as well as by Hydro-Québec on rivers where the company has power plans. Other hydrological applications using HYDROTEL are also in progress in Mexico, Côte d'Ivoire, France and Argentina.

Demonstrations of both HYDROTEL and PHYSITEL will be presented on a portable computer during the session.