



Hydrological and Water Quality Simulation and Real Time Forecasting in Finland: The Watershed Simulation and Forecasting System (SYKE-WSFS-VEMALA)

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A watershed simulation and forecasting system is widely used in Finland for simulation of hydrological cycle, simulation of water quality and for making real-time forecasts. The system is based on watershed model, which simulates the hydrological cycle on one day time step using standard meteorological data. The operational version of the system simulates the whole land area of Finland, including cross-boundary watersheds, total of 390 000 km². The inputs of the model are precipitation and temperature and the simulated components of hydrological cycle are snow accumulation and melt, soil moisture, evaporation, ground water, runoff and discharges and water levels of main rivers and lakes. The remote sensing data that is used in the model includes satellite data of snow covered areas and snow water equivalent and precipitation data from weather radars. Water quality component of the model simulates erosion and the leaching of total phosphorus, total nitrogen, suspended solids and total organic carbon from land areas and concentrations in rivers and lakes. In phosphorus and suspended solids simulation the leaching from land areas mainly depends on runoff and season. In nitrogen simulation also main processes in the fields are included. System provides real time simulated concentrations for about 16 000 river water quality observation points and for about 58 000 lakes, which includes all one hectare and larger lakes in Finland. Water quality simulation is used for real time monitoring of water quality and for climate change and load reduction scenarios. Since agriculture is the main source for nutrient loading, fields are described in detail. In the model there is slope, plant and soil type data for each about 1 100 000 fields in Finland, which is about 2 450 000 hectares of fields. The model is used for making country wide scenarios how to adjust into the effects of climate change and how to achieve good water quality by different load reduction methods. In the scenarios agricultural practices of each field can be adjusted separately. Hydrological and water quality forecasts for main simulation and observation points are provided for public by www interface where forecasts are updated automatically daily.