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An overview of HydroFOSS, a novel GIS embedded hydrological model

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Problems related to water resources cannot be solved by hydrologist alone: even if an hydrological model could perfectly simulate the real water circulation this is not enough to guarantee a correct basin management from the economic, social and ecological point of view. Therefore an increasing collaboration between hydrologists, economists, ecologists, water users, and decision makers is a key point towards more sound policies in water resource management. The needs of collaboration between different disciplines and groups imply more efficient sharing of data and methods, which may exist but are not necessarily compatible. Geographical Information System is an interdisciplinary science strongly linked to territorial problems and resources: therefore it is an ideal instrument for this kind of environmental modelling. We developed a GIS embedded hydrological model able to access all the functionalities of such a system in term of elaborations, data storage and visualization (i.e.: geo-statistic, map algebra, optimized raster management, database connections and map plotting). The "Free and Open Source Software" (FOSS) results in an ideal programming environment: in this category GRASS is one of the more widely used GIS and it is particularly prone to modelling. The new hydrological model "HydroFOSS" (Hydrological Free & Open Source Software) is the result of new developed hydrological GRASS modules (evapotranspiration, canopy interception, snow melt and accumulation, runoff calculation) called in conjunction with the existent GRASS functionalities. HydroFOSS is distributed, physically based, continuous, modular and GIS embedded. The model has been developed for the Swiss Alpine region and evaluated using a test basin in Southern Switzerland. We performed a model calibration by means of UCODE-2005, a universal inverse modelling program developed by U.S. Geological Survey (Poeter at al., 2005) and distributed as a FOSS. HydroFOSS has been modified in order to directly provide input files for the calibration procedure. Key points of this new model

are: strong flexibility in data input (forecasts, satellite, meteo-radar, climatic station, and others); customizable conceptual model (interpolation methods, used modules, and interaction between modules); easy linkage with other models (e.g. climatic and groundwater); effective result analysis (e.g. visualization of the dynamics of basin statuses, hazard assessment, and correlation investigation); full accessibility (code improvements, new modules development, low costs requirements).