Geophysical Research Abstracts, Vol. 7, 03503, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03503

TETIS: A Catchment Hydrological Distributed Conceptual Model

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TETIS is a distributed and conceptually based hydrological model, for the simulation of flood events and continuous simulation. In the model the natural basins are discretizated in grid cells according to drainage network. The conceptualization permits all parameters do not loose its physical meaning. At each cell the main soil properties need to be estimated previously using topographical, environmental, land use, geological and soil maps. This initial approach allows capturing the spatial variability of the main soil characteristics. A geomorphological characterization at grid cell is required as well for runoff propagation through the channels river network. The interpolation procedure to obtain spatial variability from point data has been performed using inverse square distance technique, but varying the number of stations to be used and including the possibility of a correlation between height and rainfall and temperature. Runoff production is modelled using five linked tanks at each cell with different outflow relationships at each tank, which represent main hydrological processes as snowmelt, ET, direct runoff, interflow and base flow, respectively. The routing along the channel network has been proposed using basin geomorphologic characteristics coupled to the kinematic wave procedure. The SCE-UA methodology has been implemented into TETIS model to optimize the initial state variables and parameters. TETIS has been tested in several scenarios including semiarid and humid regions, basin size varying from 10 km^2 to 21500 km^2, different rain gauge density network values, cell size from 100 m x 100 m to 1000 m x 1000 m and temporal discretization from 5 minutes to 1 day. It was concluded that TETIS model has shown to be an excellent tool to simulate hydrologic processes and can be useful for different objectives, among them: to simulate different components of hydrographs at multiple sites, to perform analysis

of climate and land use changes, to feed hydraulic, erosion and water quality models and to perform real-time forecasting when on line information is available.