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Semiautomatic soil parameter estimation for distributed hydrological models using GIS at cell scale

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TETIS is a conceptual distributed hydrological model developed to simulate the hydrological process in flood and continuous simulation related problems. It is a complex model that represents a watershed as a cell arrangement interconnected by the topographic configuration, derived from a Digital Elevation Model. For each cell, TETIS has a total number of 8 parameters for the runoff production processes: maximum static storage capacity, vegetation cover index for each month, infiltration capacity, surface runoff velocity, percolation capacity, interflow velocity, groundwater outflow capacity and base flow velocity. The estimation of the soil parameters at each cell is not a trivial problem. It must be considered two level of spatial variability: (1) the general tendency, which can be obtained using large cartographic units; (2) the spatial variability within each cartographic unit, resulting in a different value for each cell. To solve the second level of variability, the soil parameters must be related with some environmental variables. The environmental variables explain the spatial variability of the soil parameters within the cartographic units. Our proposal is to use linear and non-linear regressions to relate the soil parameters with the environmental variables. The regression coefficients are estimated using the soil parameters modal values and the mean values of the environmental variables at some selected sampling areas. Lastly, the soil characteristic at each cell is computed using the estimated regression expression and forcing a mean value at each cartographic unit equal to its modal value. A semiautomatic process to find the regression expression was created with the use of Arc Macro Language (AML) used in the ArcInfo GIS. In addition, an automatic process to find the best regression by a statistical analysis was developed with a Fortran routine.