Macropore infiltration

The macropore approach implemented into WaSiM follows the „bypass-flow-concept" after Jansson und Karlberg (2001). This approach allows the simulation of macropore runoff in layered soil profiles. The approach describes macropores by three parameters: depth of the macropores, capacity of the macropores and reduction of the macropore capacity per meter soil depth. By means of these parameters a maximum possible macropore flow can be calculated for each soil layer (potential macropore runoff). An additional parameter is given by the precipitation threshold value. Only if this predefined precipitation intensity is reached or exceeded, water can infiltrate into the macropores and macropore runoff can be generated. The real amount of macropore infiltration depends on the actual water content of the adjacent soil layers. Water which exceeds the free capacity of these soil layers, can not infiltrate into the macropores.

The infiltrated macropore water is used to fill up the adjacent soil layers from bottom to top. When an actual soil layer is saturated then the remaining macropore water will infiltrate into the next upper soil layer. Macropore water is not stored from one simulation time step to another but rather has to infiltrate completely into the soil layers within the actual time step. As the macropore infiltration is strongly dependent on the non-filled pore volume of the soil, the actual macropore runoff can be reduced with respect to the potential runoff considerably when the soil is (partly) saturated – thus it is common to have macropore runoff at the beginning of a heavy rainfall event rather.

The parametrization of the macropores is optional and done with the following parameters in the soil table. Missing entries are automatically replaced by the following values (i.e. deactivation of the macropore system):

- *PMacroThresh* = 1000 [mm/h]
- *MacroCapacity* = 0 [mm/h]
- *CapacityRedu* = 1.0 [1/m]
- *MacroDepth* = 1.0 [m]