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A new approach representing landscape variability for the SWAT model.

The Soil and Water Assessment Tool (SWAT) is a a river basin model that is applied widely for a variety of hydrologic and environmental problems. The Hydrological response unit (HRU) is the basic modeling unit in SWAT that represents areas with similar soil and land use characteristics. The current SWAT approach fails to capture the interaction between HRUs in an upland landscape position and HRUs in lowland position, which is one of the shortcomings of SWAT. The study presents a new SWAT modification which aims at accounting for landscape position and processes in the simulation of flow within subbasin level. In this new approach, the division of subbasin into HRUs is based on the overlay of soil, land use and landscape maps and allowing for interactions between the landscape units. The landscape map is created by dividing each subbasin into several landscape units which have different hydrological processes and transport mechanisms. This study illustrates a simple SWAT-landscape modification in which the landscape map is divided into only two units: upland and lowland and the flow routing between two units is established. The flow routing between upland and lowland is simulated separately for different flow components of the SWAT model: surface runoff, lateral flow, tile drainage and groundwater flow. The modified SWAT model was tested in a simple hypothetical case study with a single subbasin and 2 HRUs each of which also represents upland or lowland landscape unit. The test was conducted in 4 scenarios: (i) No landscape, (ii) With landscape – Groundwater dominates, (iii) With landscape – Surface runoff dominates and (iv) With landscape – Tile drainage dominates. The preliminary results showed that the application of flow routing between landscape units results in slight decrease of groundwater flow in scenario (ii) in which groundwater dominates. Nevertheless, when surface runoff is an important contribution, this flow routing results in a small increase of groundwater flow and decrease of surface runoff. Lateral flow and tile flow are also adjusted; however, the changes are insignificant.