

Investigating the soil heat simulation of the Variable Infiltration Capacity (VIC) model in the Tibetan Plateau

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The most extensive coverage of middle-latitude permafrost ($\sim 1,200,000$ km 2) developed in the Tibetan Plateau (TP), the largest highland in the world and the so-called third pole. This region is highly sensitively subjected to persistent climate warming because the annual air temperature is much more near water freezing point (i.e. 0 oC) in the TP than in the circum-Arctic regions. Therefore, it is important to simulate and understand the dynamics of soil freeze/thaw for projecting the trajectory of land surface process in the TP. In the study, the capability in soil heat simulation was investigated for the Variable Infiltration Capacity (VIC) model against in-situ observations of two soil temperature profiles (respectively with the depths of 6.1 and 10.0 m) in the TP. Our results showed the VIC seriously underestimated soil temperature at both profiles, with the RMSE ranging between 2.0 and 5.5 oC, which generally increased with soil depth significantly. The simulation bias was not highly sensitive to the parameterization of soil heat transfer. It was likely the marked under-estimation of land surface temperature that led to the serious bias in the soil heat simulation of the VIC model. We will further examine the reason underlying the serious bias and plan to make necessary modification so as to produce reliable simulation of soil heat transfer in the TP.