Hydrology and Earth System Sciences
An Interactive Open Access Journal of the European Geosciences Union

Hydrol. Earth Syst. Sci., 13, 687-701, 2009
www.hydrol-earth-syst-sci.net/13/687/2009/

Some practical notes on the land surface modeling in the Tibetan Plateau

K. Yang, Y.-Y. Chen, and J. Qin
Laboratory of Tibetan Environment Changes and Land Surface Processes, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100085, China

Abstract. The Tibetan Plateau is a key region of land-atmosphere interactions, as it provides an elevated heat source to the middle-troposphere. The Plateau surfaces are typically characterized by alpine meadows and grasslands in the central and eastern part while by alpine deserts in the western part. This study evaluates performance of three state-of-the-art land surface models (LSMs) for the Plateau typical land surfaces. The LSMs of interest are SiB2 (the Simple Biosphere), CoLM (Common Land Model), and Noah. They are run at typical alpine meadow sites in the central Plateau and typical alpine desert sites in the western Plateau.

The identified key processes and modeling issues are as follows. First, soil stratification is a typical phenomenon beneath the alpine meadows, with dense roots and soil organic matters within the topsoil, and it controls the profile of soil moisture in the central and eastern Plateau; all models, when using default parameters, significantly under-estimate the soil moisture within the topsoil. Second, a soil surface resistance controls the surface evaporation from the alpine deserts but it has not been reasonably modeled in LSMs; an advanced scheme for soil water flow is implemented in a LSM, based on which the soil resistance is determined from soil water content and meteorological conditions. Third, an excess resistance controls sensible heat fluxes from dry bare-soil or sparsely vegetated surfaces, and all LSMs significantly under-predict the ground-air temperature gradient, which would result in higher net radiation, lower soil heat fluxes and thus higher sensible heat fluxes in the models. A parameterization scheme for this resistance has been shown to be effective to remove these biases.

Final Revised Paper (PDF, 3673 KB) | Discussion Paper (HESSD)

Citation: Yang, K., Chen, Y.-Y., and Qin, J.: Some practical notes on the land surface modeling in the Tibetan Plateau, Hydrol. Earth Syst. Sci., 13, 687-701, 2009. Bibtex | EndNote | Reference Manager