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Hydrology and Earth System Sciences Discussions

Interactive comment on "Influence of thermodynamic soil and vegetation parameterizations on the simulation of soil temperature states and surface fluxes by the Noah LSm over a Tibetan plateau site" *by* R. van der Velde et al.

Anonymous Referee #1

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General comments:

This study investigates the ability of the Noah Land Surface Model to simulate temperature states in the soil profile and surface fluxes at a Tibetan Plateau site. The Plateau is one of regions with strong land-atmosphere interactions while the performance of current coupled models and offline LSMs are poor for this region. By comparing simulations with Noah default model structure and parameter values, the study shows how

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to improve soil and vegetation parameterizations for improving the model performance for the Plateau harsh climate. Undoubtedly, improvements of the land modeling will contribute to clarifying the role of the Plateau in the context of Asian water and energy cycle. This is a well-organized paper, and readers can easily follow the data, the methodology and the results. I suggest accepting this paper after considering following major issues.

Major comments

(1) The observed turbulent fluxes were derived from Bowen ratio. As the accuracy of this method highly depends on the accuracy of air temperature and humidity profile, it is desirable to evaluate the Bowen-ratio derived fluxes agaist EC measurements if EC measurements were available during the simulated period or other periods.

(2) A formula to describe the relationship between quartz content (qtz) and kh is required. This formula is crucial for understanding the soil thermal parameterization; otherwise, the readers do not understand the range of qtz and how qtz affects kh. At least, it is difficult for the reviewer to understand the unit of qtz.

(3) The simulated period is a 7-day dry period (3-10 September 2005). This period is nearly post-monsoon and the vegetation greenness had decreased. You may need to consider this issue when setting vegetation parameters.

(4) In the Noah LSM, the Reynolds number dependent methodology proposed by Zilintinkevich (1995) is employed for the determination of the kB-1. Yang et al. (2008) shows it is the Zilintinkevich (1995) scheme among seven schemes that produces the largest under-estimates of heat transfer resistance and over-estimates of heat flux. This should be one reason why Noah over-estimates heat flux while underestimates Tskin.

(5) Linear correlation of Eq.(2) can be applied only when soil moisture did not change much during the simulated period. This should be clarified.

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(6) LAI is a very sensitive parameter, and this study used its default value. As LAI is a measurable parameter through remote sensing (e.g. MODIS), it would be better to use a realistic value. At least, the default value of 5 m2/m2 is too large for the site of interest. This will, then, contaminate the calibrations of soil and vegetation parameters.

(7) The soil parameterization is discussed before the vegetation parameterization. As the output of temperature and land fluxes are affected by both soil processes and vegetation processes, please clarify whether you have used the improved soil model structure and parameters presented in Section 5.1 when you discussed the vegetation parameterization in Section 5.2.

Minor comments

(1) "LSM" instead of "LSm"

(2) P460: "The soils can be classified as sandy loam (70% sand and 10% silt) with a high saturated hydraulic conductivity (Ksat=1.2md-1) on top of an impermeable rock formation. Due to the high root density from the short grasses, organic matter content in the top-soils is relatively high (14.2%)"; Please clarify these data were observed or default values.

(3) It is not necessary to list all soil types and vegetation types. Table 2 and Table 3 can be merged and only show the relevant information.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 455, 2009.