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Hydrology and Earth System Sciences
Discussions

Interactive comment on "High-resolution modelling of interactions between soil moisture and convection development in mountain enclosed Tibetan basin" *by* T. Gerken et al.

Anonymous Referee #1

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General comments
This paper presents results from numerical simulations of interactions between soil moisture and convection in a mountain enclosed Tibetan basin. As the soil moisture precipitation feedback is a currently widely discussed topic, the findings are of general relevance to the community. The paper is very well structured and provides a comprehensive overview of the available literature. The methodology and conclusions drawn from the results are justified in the concluding discussions. In general, the paper is well written and most of the illustrations are ok (see further remarks below).

Specific comments

1. In their simulations, the authors set the initial soil moisture to 2.0 $\times$ the field capacity, which corresponds in their case to realistic conditions. I wonder why the authors did not increase the soil moisture further to more humid conditions?

2. The only thing I was really missing in this paper is an analysis of convection indices, like CAPE and CIN. Especially, the response of CIN to soil moisture variations is decisive for convection initiation. Perhaps the authors could include some text or even a Figure describing the response of these parameters to different initial soil moisture.

3. P4646, L19-21: "Through changes in the Bowen-ratio, there is a strong modification of the surface energy budget due to soil moisture." As the Bowen ratio is derived from the sensible and latent heat flux, I would formulate it the other way around: Soil moisture strongly modifies the partitioning of the availabe energy into sensible and latent heat, evident in the Bowen-ratio.

4. P4648, L10: "As deep convection is primarily driven by the release of latent energy..." In my opinion, this is not true. Convection is driven by boundary-layer processes or synoptic processes. The release of latent heat during condensation of water vapour gives additional buoyancy, but it is not the main driver.

5. P4648, L17: "The equivalent potential temperature profile (θ_e) reveals a predisposition for convection" In order to assess this, the profile of equivalent potential temperature assuming saturation should be plotted as well ($\rightarrow$ conditional instability).

6. P4651, top: The authors state that the upper level wind speeds used in this work are unrealistically low. The role of the background wind on the soil moisture precipitation feedback was recently investigated by Froidevaux et al. (2014): Influence of the background wind on the local soil moisture-precipitation feedback

(10.1175/JAS-D-13-0180.1). Some text relating these findings could be inserted here.

7. Figure 5: One could insert another panel (h) showing the Bowen-ratios.

Minor technical or textual comments

1. P4637, Site description: A reference to Figure 1 could be inserted already at the end of the first sentence of this section. Furthermore, the small lake and the 500m wide land bridge is not visible in Figure 1. I suggest to include a zoom on this area (Figure 1 a and b).
2. P4238, L13: sytem → system
3. P4640, L16: vecinity → vicinity
4. P4642, L10: "The first two columns of Fig. 3 show..." This figure consist of just 2 columns. → Fig. 3 shows...
5. P4643, L23: statistic nature of turbulence → stochastic nature of turbulence
6. P4643, L24: "impossible": It is not impossible, it is perhaps not meaningful.
7. P4645, L7: The formulation "evapotranspiration during the diurnal scale" is clumsy, how about "evapotranspiration during the day/in the daytime"?
8. P4645, L11: courbse → course
9. P4646, L8: evaporation is with less than 0.5 mm is approx.
10. P4646, L14: "The surface energy balance on the Tibetan plateau..." This was already mentioned in the introduction and can be removed here.

11. P4646, L14: northers side → northern side
12. P4647, L10: "While..." This is not a sentence, please rephrase.
13. P4647, L22: cloud bottom → cloud base
14. P4650, L17: When using 2D simulations, strictly speaking, there is no such thing as a control volume. I would prefer control domain or area.
15. P4652, L4: dependens → depends
16. Table 1: and **which are also** used for the simulations.
17. Fig. 3: The red contour lines for the clouds makes this figure hard to read. Perhaps only one red contour line for the cloud boundary would be sufficient?
18. Fig. 8: The legend for the grey shades is missing and the number of thin black isolines it too high, they mask the grey shades. Furthermore, the upper panel showing precipitation (?) is not explained.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 4631, 2015.