

## ***Interactive comment on “Modeling the snow surface temperature with a one-layer energy balance snowmelt model” by J. You et al.***

### **Anonymous Referee #1**

Received and published: 20 January 2014

In this manuscript, the one-layer Utah Energy Balance (UEB) model is improved by considering different approaches to the modeling of snow surface temperature, by formulating and implementing a new scheme to represent refreezing penetration in snow covers, and by refining the description of effective thermal conductivity. These improvements are tested against experimental data from three different sites, and by comparing new formulations results with the ones obtained by the original model (Tarboton et al. 1995, citation in the manuscript).

According to my opinion, the topic of this manuscript is very interesting, the theoretical presentation, as well as the state of the art, is rigorous and exhaustive, and proposed improvements are relevant to improve modeling performances in current snow hydrology. In view of these comments, I suggest to accept the manuscript with some minor

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revisions.

As a minor remark, in fact, results presentation and discussion is a bit dispersive. Since you have to discuss three different improvements using three different datasets, I think the presentation of the results and their discussion could gain clarity by reorganizing them in categories (i.e., snow surface validation, internal energy validation, etc.) and by stating in a better way which data and which model formulation you use in each case.

Minor revisions:

1. In the first lines of the abstract, I would stress the coupled dynamics of snow surface temperature and energy exchanges in a more explicit way;
2. You could consider splitting Section 2 in subsections, since it could orient the reader in this great amount of relevant information;
3. In Section 4, it could be useful to provide some details about the resolutions and the accuracies of the instruments used;
4. Lines 4-26 page 15092 seem out of context here, since they mainly deal with previous results;
5. Fig 4, 5 6, 7, 8, 10, 11, 12, 13 and 14: please consider using colors to differentiate lines, since at this stage it is very difficult to discern the different results;

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 15071, 2013.

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