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## ***Interactive comment on “A WRF simulation of the impact of 3-D radiative transfer on surface hydrology over the Rocky–Sierra Mountains” by K. N. Liou et al.***

### **Anonymous Referee #1**

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Review of “A WRF simulation of the impact of 3-D radiative transfer on surface . . .”, by KN Liou et al.

This study presents results of the topographical impact on surface radiation and hydrology over the Western United States using WRF model simulations. It shows that the topographical impact is significant, and it is important to be included in climate studies using model simulations. To improve the clarity of the paper, the authors might need to consider the following- comments/suggestions:

(1) Figure 4 shows the spatial distributions of the impact of topography on the surface

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solar radiation at three local times. The authors stated that the overall distributions of the topographical impact are locations relative to mountains. For example, “In the late afternoon, . . . , increases in solar flux are located on the southwest of the mountains, while decreases in solar fluxes are found in the northeast region.” This statement needs to be clarified. It implies that decreases in solar fluxes in the northeast region are due to the mountains to the south and west. In fact, surface solar radiation cannot be affected by mountains hundreds of kilometers away. Figure 4 does not provide any information on the relative location of a 30-km resolution grid box with respect to surrounding mountains. I suspect that the solar zenith angle should have an impact on the latitudinal distribution of the surface radiation. The small impact at higher latitude in panels (a) and (b) should at least be partially related to a larger SZA.

(2) In April and May, the topography-induced impact on the surface sensible heat flux is very large at noon (Figure 5), which is drastically different from the months in and before March. Further, the magnitude of the impact increases systematically throughout the length (Dec-May) of the model simulations. What are the causes?

(3) Some of the figures are hard to read. Some letters and numbers are illegible.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 19389, 2013.

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