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

Received and published: 9 September 2013

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
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.

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