

Interactive comment on “Combined impacts of current and future dust deposition and regional warming on Colorado River Basin snow dynamics and hydrology” by J. S. Deems et al.

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This manuscript continues a set of simulation analyses done by the lead author and the co-authors on the impact of dust on snow on hydrologic response during snowmelt in the Colorado River basin. The importance of this system to water resources across the Southwest United States makes this paper an important contribution to understanding best management approaches in the region.

While the paper overall is very good I have one key concern. The point the authors make about dust increasing the rate of snowmelt and thus shortening the melt season

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is a very good one; however the decrease in total streamflow is still an improved modelling result and thus needs to be stated more carefully than the authors currently do. My key concern, as it has always been, is that the most significant effect of dust on snow is above tree line where soils are shallow and vegetation is not deeply rooted as a result. These conditions in result in relatively little opportunity for significant changes in evapotranspiration between the end of melt season and the start of the next snow cover season. Thus I remain skeptical about the impact of dust on snow on the overall water budget of the system. The effect of timing is still very important in the upper basin due to lack of multi-year storage and I would emphasize there may be an effect on total flow I am just not convinced lock stock and barrel yet.

I do think the authors should emphasize the diminishing return aspect of more dust. The fact that the season still gets shorter but not by much is important. Conversely reductions could have a big impact on minimizing dust impacts and this should be emphasized as well.

Other minor comments- Authors seem to like opening sentences with Figure 7 shows the result of our model.

For example- on page 6247 1st paragraph 1st sentence can be deleted and replaced with a figure call to Figure 7 after second sentence.

Alternatively when the authors state that the figure shows some aspect of models results they should offer the reader a narrative of what the potential meaning of the results is and then offer a parenthetical call. This avoids wasting words on telling the reader to go look at the figure which can be accomplished with the parenthetical call.

This problem occurs in several places in the manuscript and the paper would read better and more clearly if they were corrected.

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