

Interactive comment on “Effects of snow ratio on annual runoff within Budyko framework” by D. Zhang et al.

Anonymous Referee #2

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This study provides an analytical extension of Budyko framework to account for the role of snow on annual water balance at the catchment scale, validates this extension in China against historical observations, and predicts the future streamflow based on CMIP5 projected forcings and this new extension. I feel that this is a very valuable contribution to catchment hydrology in general and this special issue in particular. The analysis is overall robust and the logic of presentation flows well. The writing could be improved further as pointed out by the 1st reviewer, although I think it is already good enough for most of the readers to easily follow. Above said, I would recommend a minor revision on the following aspects:

1. A friendly suggestion: be more positive when citing/referring to a very relevant work by Berghuijs et al., 2014, which no doubt has a lot of merits. For example, at Page941,

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L5, you could state that "Berghuijs et al. 2014 show that higher snowfall fraction is statistically associated with increased annual streamflow at pristine catchments, but they also pointed out that mechanistic understanding of this phenomenon is still lacking", and "inspired by Berghuijs et al. 2014, in this study we aim to provide more insight into this phenomenon using a new analytical approach based on the Budyko hypothesis". At Page951, L16, you could say that you are providing another way to quantify the sensitivity of annual runoff to snow ratio etc.

2. P947, L18. Please rephrase for better readability.

3. Fig. 7, the quality of this figure, including legend, is really poor. Please improve.

4. P947, L22, please pay great attention to the preciseness of the language when you are introducing a key assumption. In your study, most of the snow ratio values fall within 0.10, so it is likely that your assumption is only valid when snow ratio is significant but small enough. Reviewer 1 did point to significant evap. loss when snow ratio is high (0.4 or larger) in MOPEX basins. Even further, I believe adding some discussion on the limitations of your current work and possibler directions of improvements in the last section, as suggested by Reviewer 1, would in fact enhance your paper.

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