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The Cryosphere Discussions

Interactive comment on "Changes in Andes Mountains snow cover from MODIS data 2000–2014" *by* Freddy A. Saavedra et al.

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We thank the reviewer #1 for her/his critical comments that help us to improve our research. The reviewer's first concern is about defining the contribution of the study to the scientific literature. We have strengthened the description of this contribution in the revision. While snow trends have been studied over small segments of this region, this is the first comprehensive snow trend study that covers the region as a whole using observations alone rather than modeled reconstructions. We argue that observation-based studies are a useful complement to model-based studies, which are affected by uncertainties in input data. Moreover, multiple lines of evidence are always valuable in trying to identify spatiotemporal trends and drivers of processes such as snow. The snowpack provides a large reservoir of water in the region where Peru, Bolivia, Chile,

and Argentina all depend on snow and/or glacier melt for water supply. Additionally, seasonal snow is a critical component of the surface energy balance and hydrologic cycle, particularly at high elevations and high latitudes. We included all these arguments in a new version of our manuscript. The second concern of the reviewer is the short term of the observation (15 years). We agree that this is the most limiting factor of our analysis, but it is not a methodology error. Our manuscript addresses trend interpretation in detail by relating snow trends to corresponding temperature, precipitation, and climate cycles. We did not claim in the previous version of the manuscript that these trends are correlated with long-term trends, and we have added additional text in the discussion to make this point in greater detail. Trend analyses based on the time period of the MODIS record are common in the literature. Related to snow and ice patterns, high profile examples are Hall et al. (2013) Geophysical Research Letters and Šmejkalová et al. (2016) Nature Scientific Reports. Researchers choose to use the MODIS record alone in some cases because other products are not comparable in resolution, time step, and/or spatial coverage. This study also provides a basis for future studies testing longer-term relationships of spatiotemporal tends in snowpack with broad-scale climate divers, and weather and climate variability and change in the region. We appreciate the suggestion to link this analysis to longer-term surface observations and agree that this is important for context of the study. We refer the reviewer to Figure 7, where this was done in the original version of the manuscript. Our analysis of how snow persistence relates to climate variables is also a means of relating the snow patterns observed since 2000 to other climate records, which are generally available for longer time periods.

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