

## ***Interactive comment on* “Snowmobile Impacts on the Physical and Mechanical Properties of Different Snowpacks in Colorado, U.S.A.” by Jared T. Heath et al.**

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This is a field-based study on the impacts of snowmobiles on the snowpack in several areas in Colorado USA. I've carefully read the manuscript as well as the first referees comments, which I mostly agree with. My overall assessment is that the study may be publishable after revision based on corrections that I've included in an annotated PDF. As the authors discuss, snowmobile use in the US is sizable yet there are very few studies on how snowmobiles affect the snowpack. In fact, I also reviewed one of the only two studies cited in the manuscript [Thumlert and Jamieson, 2015] where the impacts of snowmobiles were quantitatively measured on a backcountry snowpack.

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Thus, there is a significant gap in the research, but the authors do not present convincing evidence that this gap is worth addressing. The authors need to motivate the study. »The introduction has been rewritten to highlight the lack of research in this area, as well as the number of recreational users that this could impact.

Why study changes in stratigraphy related to snowmobiles? Who will this research benefit? »This work will benefit managers who need to make decisions about multi-use areas that are used by snowmobilers. As there has been limited related work, this also provides more quantitative information on how snowmobile use changes the snowpack. The text has been changed accordingly.

The main conclusion that I came away with from this study is that regular snowmobile use, starting with a thin (30 cm) snowpack, results in a denser and harder snowpack with smaller basal grains. That conclusion is unsurprising, in that it could likely be predicted based on a basic understanding of snow mechanics, but given the lack of study on snowmobile effects, I still suggest the results are worth publishing. However, I worry that a reader might be tempted to conclude that snowmobiles can be used to strengthen the snowpack and prevent avalanches that fail on basal facets, similar to a boot packing program [e.g. Sahn, 2010]. While this may be true for isolated small areas, I cannot see backcountry snowmobile use reducing avalanche hazard, as the tracks will never carpet a slope densely enough. The authors should consider addressing this problematic conclusion that readers may come away with. »This is an interesting comment. This has been added to the discussion.

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