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Title: Diminishing snowpack intensifies crop yields sensitivity to soil moisture in the northern hemisphere

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Recommendation: Major Revision

Summary: This paper presents an analysis of the effect of snowpack (based on various snowpack indices) on the subsequent growing seasons for rainfed croplands (spring wheat, soybean, and maize) in the Northern Hemisphere above 30N from 2000 to 2022 using ERA-5 land reanalysis and a gridded crop yield dataset. The study concludes that antecedent snowpack is an important buffer against crop losses from drought, especially when snowmelt occurs closer to the start of the growing season and for certain crops (maize and soybean). The overall topic is compelling but there are some methodological issues that should be addressed prior to publication.

Specific Comments:

1. June – September and February – May are defined as the growing season for spring crops and the period of snow accumulation and melt, respectively. However, this varies both spatially and by crop. The authors might consider reframing this analysis by time prior to planting (1-month lag, 2-month lag, etc.) instead of a fixed March/April/May snowmelt.

2. The authors use a threshold of $p<0.1$ to determine statistical significance. How would the conclusions in this study change if a stricter threshold of $p<0.05$ were used?

3. The title should be changed to “crop yield sensitivity” or “crop yields’ sensitivity.” Please capitalize “Northern Hemisphere.”

4. Please reference Supplementary Text 1 in the discussion of snowpack indices in Section 2.1.

5. Supplementary Text 1 defines a hydrological year starting 1 October, while Section 2.1 defines hydrological year starting 1 September. While the maximum SWE value won’t occur in September/October, the authors should correct this discrepancy in the text.

6. How did the authors account for relationships among the snowpack indicators (SWEmax, SCED, SWEI, and snowmelt) when establishing a dominant indicator for a pixel?

7. Significant positive correlations with SWEI were found for 5.32% of the study area for maize, 10.07% for soybean, and 9% for spring wheat. The proportion of all significant areas (positive or negative) that exhibited a significantly positive relationship are 52.99% for maize, 72.75% for spring wheat, and 82.66% for soybean. The abstract mentions the

proportion that was significantly positive but doesn't mention the size of the areas that had a significant correlation (which is somewhat small), overstating the conclusions.