



## Reply to You and Xu: Delayed wildfires in 2020 promote snowpack melting in the western United States

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You and Xu (1) present an analysis of the monthly timing of wildfires in the western United States in 2020 compared to the 2003 to 2021 mean. They find that the timing of wildfires was shifted later in the season in 2020 compared to prior years and that this is the reason for earlier snowmelt timing in 2020. With respect to our manuscript, they state that “the potential impact of changes in wildfire patterns on snowpack melting at high elevations needs to be reconsidered.”

While this analysis of wildfire timing is interesting, it does not relate directly to the findings in our paper (2). First, our results of earlier snowmelt timing after wildfire were for a specific study area, not for the full western United States. The study area fire was a late-season fire, and it was definitely affected by “impurities such as black carbon and burned woody debris,” as stated by You and Xu (1). Indeed, this is one of the reasons we highlighted as a cause of earlier snowmelt. This deposition of burned materials affects the snowpack throughout the snow season, not just during early snow accumulation. In cases where snow falls on an actively burning fire, the hot temperatures would certainly reduce the likelihood of snow accumulation until the ground cools down. However, at our study locations, the fire passed through in August, long before snow started to accumulate in October 2020.

Understanding the effect of fire timing on the snowpack would require a more nuanced analysis than presented by You and Xu (1). First, such an analysis could identify whether the onset of snowfall overlapped with active burn areas. This

would need to be a spatially explicit analysis rather than an aggregated west-wide analysis because the timing of burning and snowfall varies substantially across the region. Once the areas with overlapping snowfall onset and active burn are identified, a subsequent analysis could evaluate whether these areas have greater advances in snow-free dates compared to other fires.

The impacts of wildfire on both snow accumulation and melt are clearly an important topic for ongoing research, and we look forward to seeing future research with a more detailed analysis of how wildfire timing impacts snow accumulation.

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The authors declare no competing interest.

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1. C. You, C. Zu, Delayed wildfires in 2020 promote snowpack melting in western United States. *Proc. Natl. Acad. Sci. U.S.A.* **120**, e2218087120 (2022).
2. S. K. Kampf *et al.*, Increasing wildfire impacts on snowpack in the western U.S. *Proc. Natl. Acad. Sci. U.S.A.* **119**, e2200333119 (2022).