



Towards a comprehensive sensitivity of global snow to changing temperatures

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Seasonal snow is a major component of global water storage, particularly at high elevations and latitudes, has a large influence within the earth's climate system, and one that is most sensitive to warming temperatures. Compared to glaciers, changes to the seasonal accumulation and melt of snow has received comparatively little attention. Losses to seasonal snow, which are currently being observed, have major implications for climate, hydrology, biogeochemical cycling, and ecosystem functioning, and would require extremely costly adaptation measures. However, constraining these potential losses has proved difficult due to the wide variety of local factors which can impact snow accumulation and melting processes. Here, we use global meteorological datasets and an analytical snow model to develop a simpler constraint on the sensitivity of this resource to both accumulation and melting under warmer temperatures. We examine this sensitivity at the scale of the snow season, and at annual time scales. Finally, we highlight the large spatial differences in this sensitivity between latitude and elevation dependent snow, as well as the differences between the mountain snow resources of the world.