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Investigating global changes in snow dynamics and the impact on water resources

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Snow is a key component of the hydrological cycle in many regions of the world, providing a natural storage of water by accumulating snow in winter and releasing it in spring. Many ecosystems, societies and economies rely on this mechanism as a water resource. There is strong evidence in the literature that global warming leads to decreasing snowfall and snow accumulation and shifts the onset of the melt season to earlier in the year. However, little is known about how rising temperatures affect snowmelt rates and timing, and how these can have an impact on water resources for instance by changing the time and magnitude of streamflow. Some studies predict slower snowmelt rates in a warmer world, due to the onset of melt being earlier when there is less energy available for melt, but there is not yet an observation-based study showing such trends. As a first step, here we present preliminary results of observed long term trends in snowmelt rates from different climates. We use a dataset that has already shown strong decreasing signals for winter snow accumulation. Here we also present potential avenues to investigate the sensitivity of snowpacks and snowmelt regimes in different climatic settings to further rising temperatures using modeled snow dynamics. A few possibilities on how to link the snowpack dynamics to impacts in water resources are also discussed, for instance by comparing modelled dynamics to hydrological models and observations.