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Monitoring snowpack evolution with meteorological reanalysis data in the Atlas Mountains

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The seasonal snow cover in the Atlas mountains of Morocco is an important resource, mostly because it provides melt-water runoff for irrigation during the crop growing season. However, the knowledge on physical properties of the snowpack (e.g., snow water equivalent (SWE) and snowmelt) is still very limited due to the scarcity or the lack of ground measurements in the elevated area. In this study we suggest that the recent progresses of meteorological reanalysis data (e.g., MERRA-2 and ERA-5) open new perspectives to overcome this issue. We fed a distributed snowpack evolution model (SnowModel) with downscaled ERA-5 and MERRA-2 reanalyses and evaluate their performance to simulate snow cover. The modeling covers the period 1981 to 2019 (37 water years). SnowModel simulations were assessed using observations of river discharge, snow height and snow cover area derived from MODIS.

For most of hydrological years, the results show a good performance for both MERRA-2 and ERA-5 with a slight superiority of ERA-5, to reproduce the snowpack state.

Key words: snow, snow water equivalent, reanalysis, MERRA-2, ERA-5