Temperature and Precipitation Controls on Trends in Snow Cover and Snow Water Equivalent

Motivation

To what extent does variability in temperature and precipitation trends control trends in snow cover fraction and snow water equivalent?



and points) observation-based shown separately (brown).

- Previous work has demonstrated that variability in snow cover trends is strongly coherent with variability in temperature trends in both observations and climate models.
- Exceptions to this relationship have highlighted anomalous behavior occurring during autumn in the NOAA snow chart Climate Data Record, previously considered one of the "workhorse" data sets for calculating snow cover trends.
- What are the equivalent controls on snow water equivalent?

Snow Water Equivalent

Temperature





Observed SWEmax trends (left), spring temperature trends (center) and accumulated snowfall trends (right) for the 1981–2015 period. Stippling indicates pointwise significance at the 90th percentile.



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Correlation of SWE-Accumulated Snowfall Trends -1 -0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8 Correlation of decadal SWE trends and decadal trends in temperature (left) and 3-month • Temperature is negatively correlated with SWE in the marginal snow zone • Accumulated precipitation is positively correlated with SWE everywhere. • In the CESM ensemble, these relationships are roughly independent of trend Variability of Variability of SWE Trends Accumulation Trends 5 10 15 20 [Left] SWE trends vs Accumulated Snowfall trends for three different trend periods. [Top] SWE trends and accumulation trends for 30 CESM realizations calculated over 10 year (black), 30 year (blue) and 100 year periods (red)

• The sensitivity of SWE to accumulated precipitation is easiest to detect for short trend periods when the changes in accumulated precipitation are

