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?

- 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?

Results for SCF

- Based on interannual anomalies we expect temperature to control SCF and SWE in the marginal snow zone. Changes in accumulated precipitation are also expected to influence trends in snow water equivalent.
- SCF is sensitive enough to temperature that even for 30 year time periods natural variability in temperature affects the spatial variability and resulting magnitude of snow cover loss.

Results for SWE

- Temperature is negatively correlated with SWE in the marginal snow zone and positively correlated with SWE in regions of deep snow.
- Accumulated precipitation is positively correlated with SWE everywhere.
- In the CESM ensemble, these relationships are roughly independent of trend period.

- The sensitivity of SWE to accumulated precipitation is easiest to detect for short trend periods when the changes in accumulated precipitation are large.
- Observational tests of this relationship may be possible.

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