The Influence of Snow Depth Observation Timing and Uncertainty on Data Assimilation Improvements to SWE

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Motivation
1. Snow water equivalent (SWE) from remotely sensed snow depth (e.g., airborne lidar) relies on modeled snowpack density

What we have: Snow Depth
What we need: Snow Density
What we want: SWE

2. But models show a wide range of uncertainty in snow density

Over 200 kg m$^{-3}$ spread

3. Snow density and depth are linked through physical processes

4. Assimilation of snow depth with the Particle Filter can guide the model to a more realistic simulation of snowpack

The Particle Filter improves density and SWE

SWE uncertainty varies with sample error AND timing

...while SWE error varies mostly with sampling error

Assimilation is feasible at the basin scale: East River, CO

...across climates and years with SNOTEL data

References

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