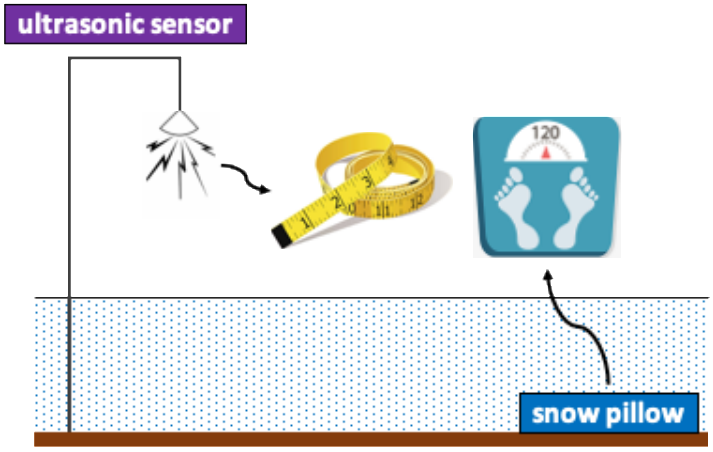
Why do we care about snow?

Figure 1: MODIS snow cover on Feb 2-9, 2002.

Snow is a BIG deal. Every year, the snow on the ground at the end of the winter in the western United States is five times the volume of water stored in Lake Mead (Mote et al., 2018[1])! This water is important for water supply, stream ecology, and recreation.

How do we measure the snow?



Snow telemetry (SNOTEL) stations are a great option. They measure the depth (Hs) and the weight of the snowpack, which are used to calculate SWE. There are about 800 of these stations operating continuously in the western USA.

[1] https://www.nature.com/articles/s41612-018-0012-1

Great, so can we measure the snow everywhere?

No. SNOTEL stations are expensive to install and maintain. They tend to be in areas of gentle terrain with easy access. Therefore, they miss the areas of high elevation, complex terrain where snow depths area greatest and snow distributions are the most complicated.

Umm…that's too bad, what else can we do?

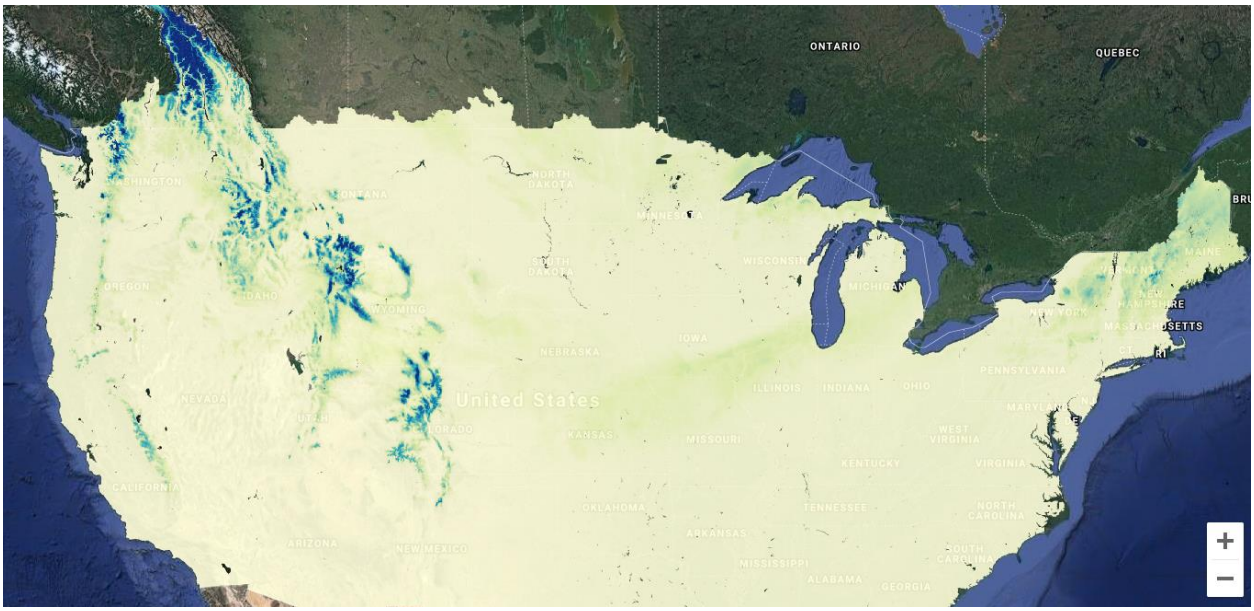
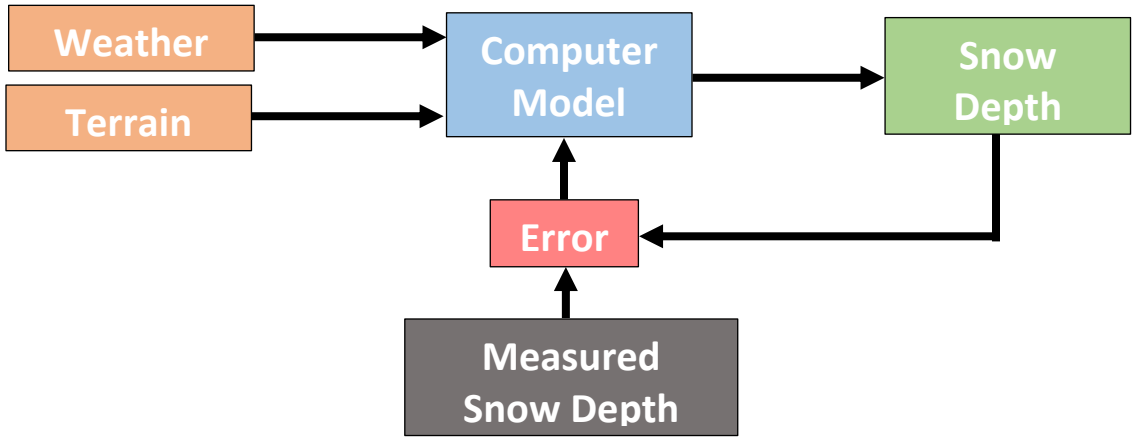


Figure 2: SNODAS simulation for Jan 1, 2019.

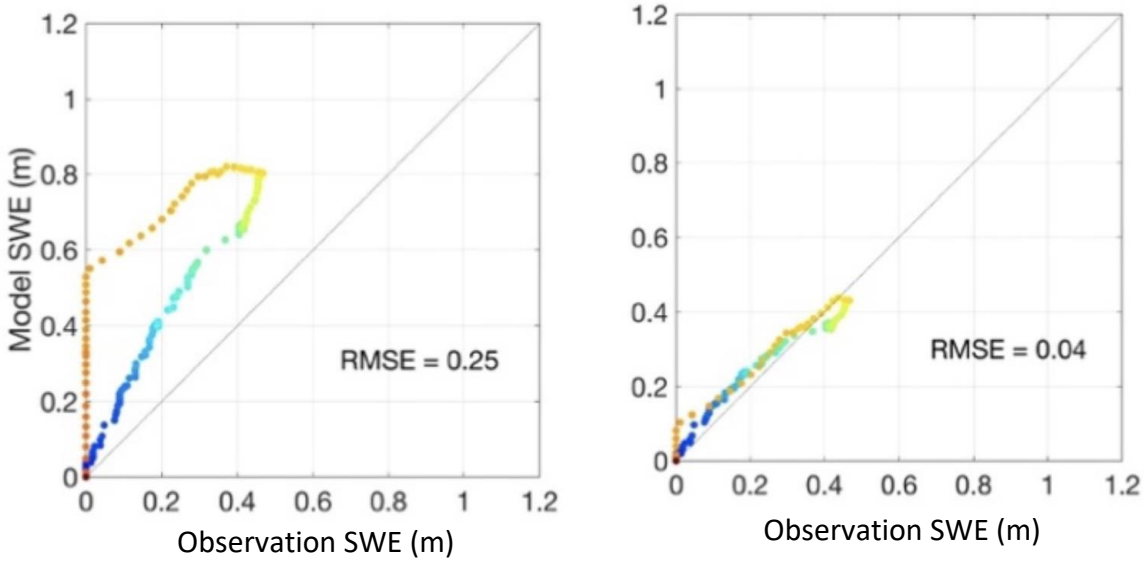
One option is that we can use computers to simulate snowpack distribution. The figure above shows a simulation of SWE by the SNOw Data Assimilation System (SNODAS). Greens and blues indicate deep snow. Yellows indicate no snow. This computer simulation runs daily using a grid of 1 km x 1 km squares to cover the USA.

Nice, so computers can tell us everything?



Not quite. Computers are fast, happy to work all day, and don't get cold toes. But, we need to help them out by 'checking' their results. This is called 'ground truth.' If the computer tells us the snow depth is 1 meter, but we measure it to be 2 meters, that measurement can help the computer learn and improve.

Really? does this actually work?



Sure does! In the left of the figure, we plot 'simulated' SWE against 'measured' SWE at a SNOTEL site. If the model was perfect, all of the data points would fall on the diagonal line (simulated = measured). But, they don't. The model just can't get the snowpack evolution correct. In the right of the figure, we repeat the process, but with extra 'training' of the model provided by occasional measurements of snow depth. These measurements help the model to get the snowpack evolution 'right' and the points fall very close to the diagonal line.

That’s rad. can I get involved?

Figure 3: Measuring snow depth at Tuckerman's Ravine, New Hampshire. Photo: J. Klementovich.

You sure can. The Community Snow Observations project starts with ‘the community.’ We need volunteers to submit data on a regular basis throughout the snow season. Can you find snow? Do you have a measuring device (meter stick; tape measure; avalanche probe)? Do you have access to a smart phone or a computer? If so, you’re in. Visit our website for tutorials on how to participate and follow our social media accounts for the latest news, updates, information on measurement contests, and much more. Join citizen scientists from around the world who are learning about how snow evolves and who are contributing to scientific advances in our ability to predict this evolution.