Spatial SWE estimates: Even harder than we thought

Jeff Lukas

With Ursula Rick, Heather Yocum, Leanne Lestak, Dominik Schneider, and Noah Molotch

Western Water Assessment, CIRES, CU-Boulder

CO Water Availability Task Force

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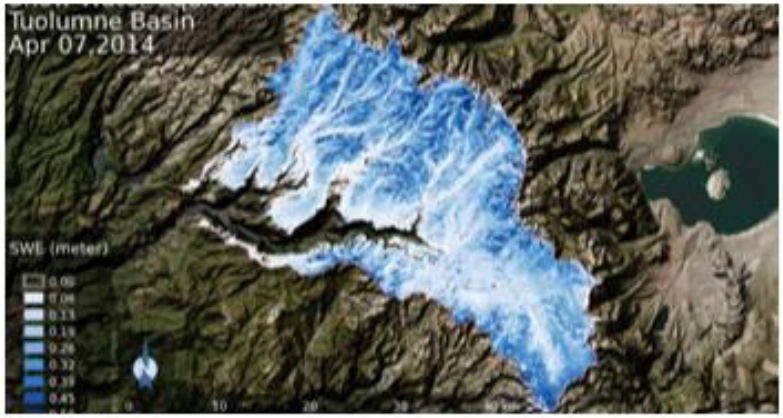
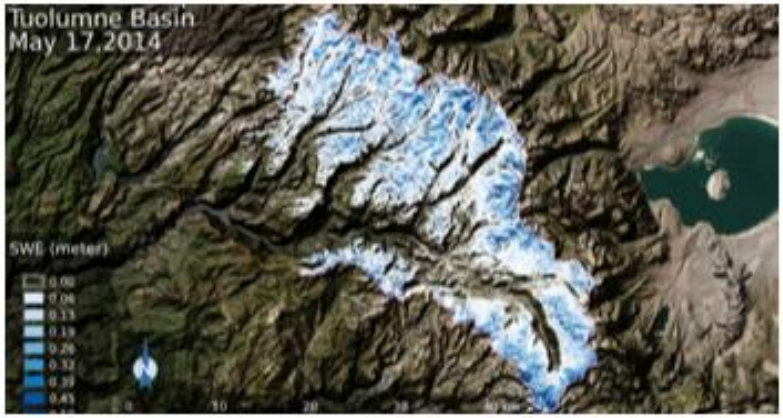
Why spatially-explicit estimates of SWE?

- SNOTEL may not capture anomalous conditions between sites, or above and below the network
- Later in melt season, SNOTELs start going to zero while still significant snow in basin
- Simple to generate volumetric SWE estimates (e.g., in acre-feet) for any watershed or elevation band
- Can make visually compelling maps

NASA/JPL Airborne Snow Observatory (**ASO**)

Tom Painter (JPL), Jeff Deems (WWA), and ASO Team

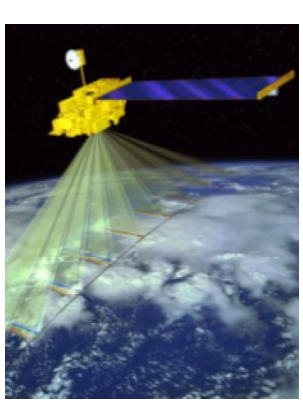


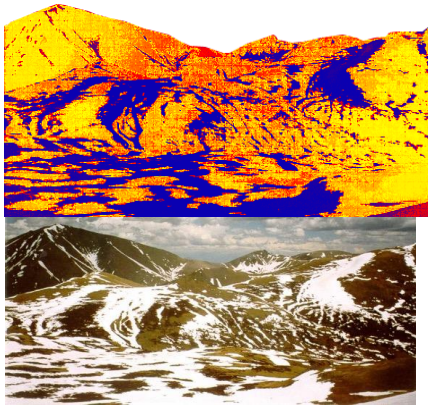


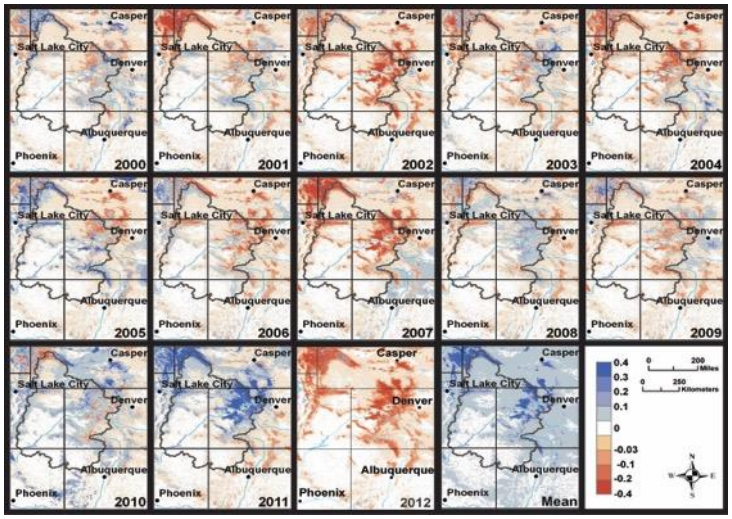
- **Watershed-scale, high-resolution (50-m) snow product**
- Measured LIDAR surface-height data is combined with snow density model to estimate SWE
- Very accurate, very expensive
- **Colorado** – test flights of Rio Grande, Uncompahgre, Grand Mesa, and East River basins

MODIS-based, real-time SWE product

Noah Molotch, Leanne Lestak, Dominik Schneider

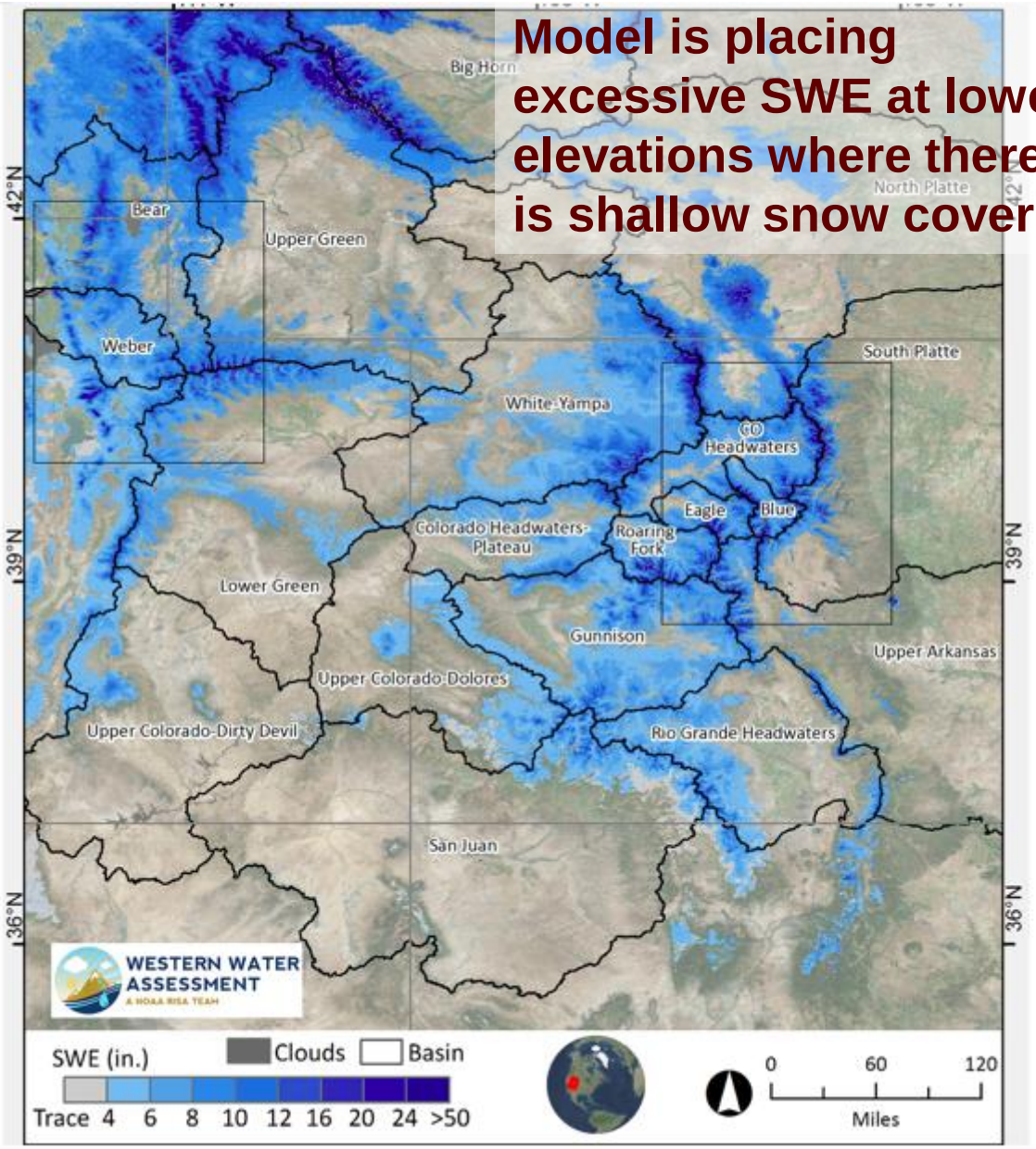


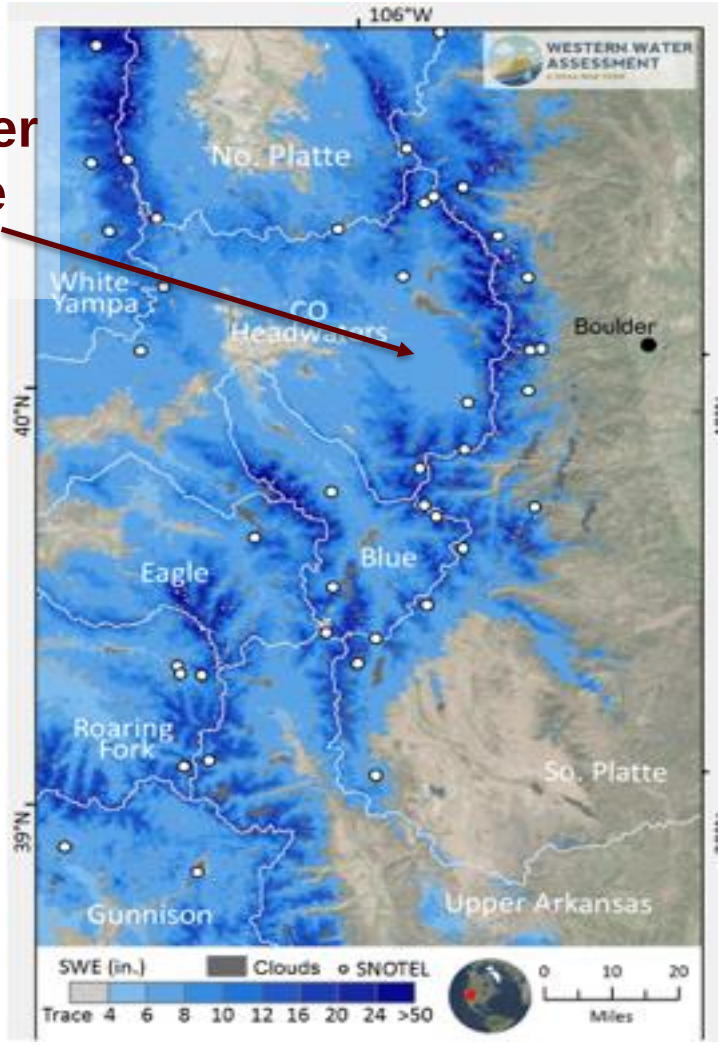




- **Regional-scale moderate-resolution (500-m) snow product**
- Interpolates SNOTEL SWE observations based on topography, historical SWE reconstructions using MODIS and an energy-balance model, and real-time MODIS snow cover
- Produced for CA since 2013, trying to produce for Upper Colorado region
- Difficult past 6 weeks to get cloud-free MODIS imagery to test model

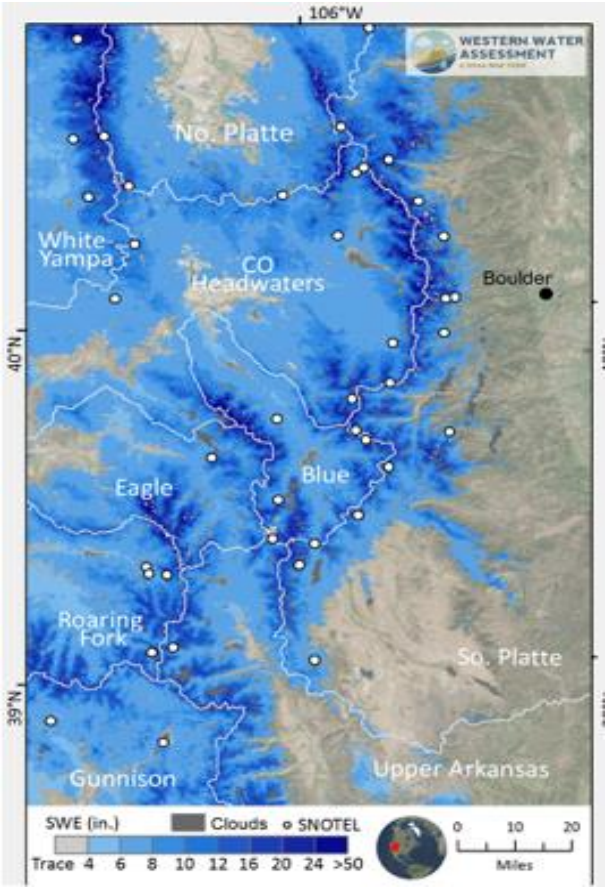
Model is placing excessive SWE at lower elevations where there is shallow snow cover





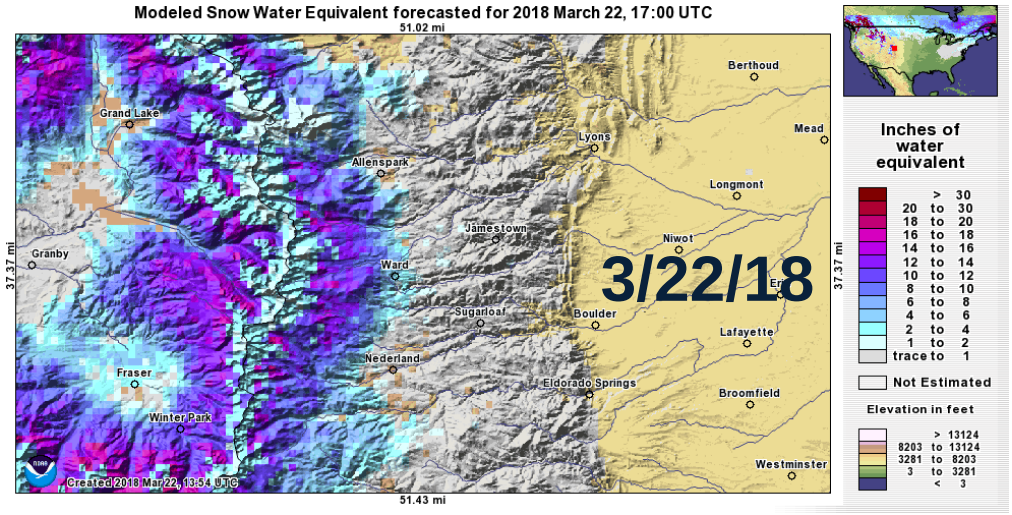
TEST SWE product for March 13, 2018 – ***DO NOT USE***

MODIS-based, real-time SWE product – What can we say from the most recent test?

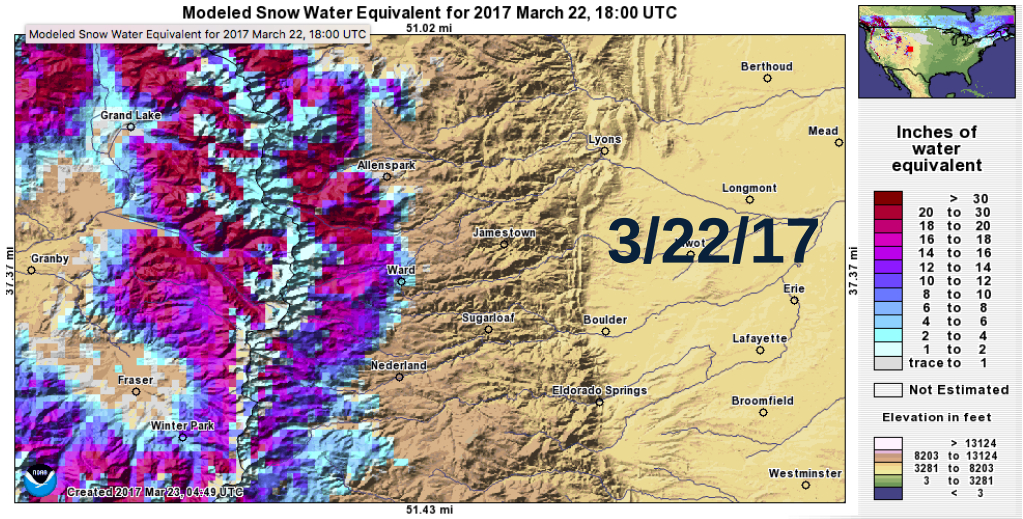


- **Overall picture of the current CO snowpack looks just as grim as that from SNOTEL**
- It's really hard to do real-time spatial SWE estimates that add value to SNOTEL
- Not clear we'll get the bugs worked out of the product this season

NOAA NOHRSC Snow Analyses (**SNODAS**)



Interactive Map tool



- **National-scale, moderate-res (1-km) snow product**
- Operationally produced since early 2000s
- Snow model that builds and melts the snowpack at each pixel; uses obs from SNOTEL, others
- Mixed results on accuracy for Colorado

https://www.nohrsc.noaa.gov/

What next for spatial snow estimates?

- We'll keep trying to get the MODIS-based product out for CO/UT/WY
- Comparisons of ASO, MODIS product, and SNODAS are ongoing in California
- We could start comparing them here in CO, and in particular evaluate SNODAS