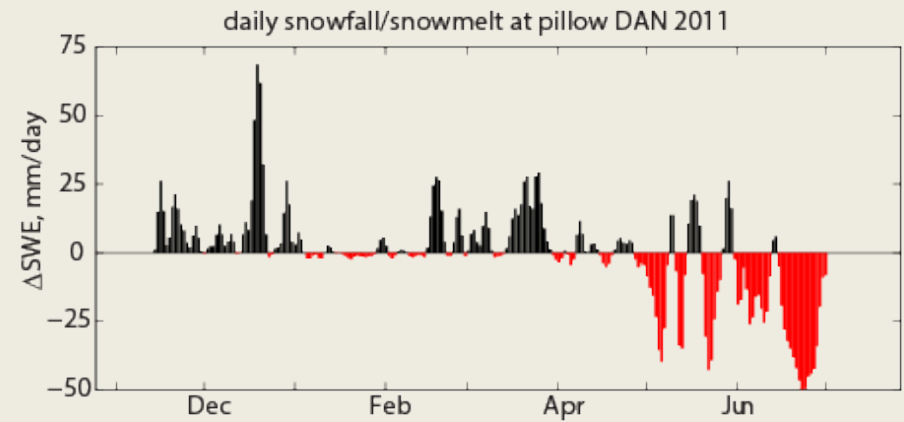
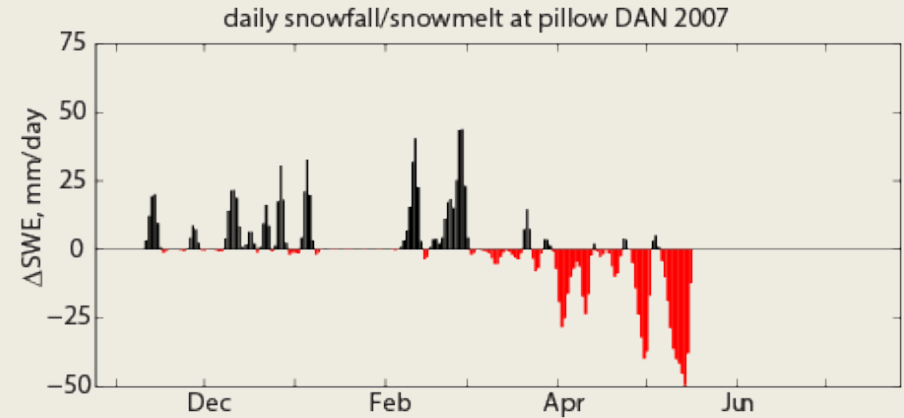
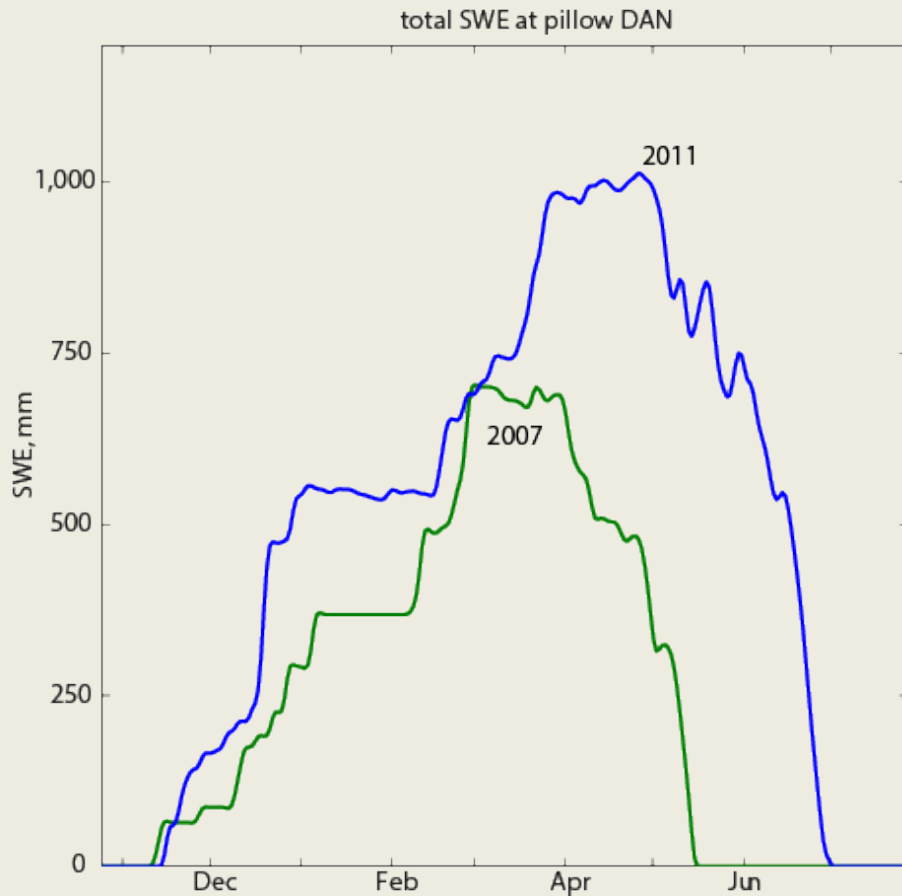
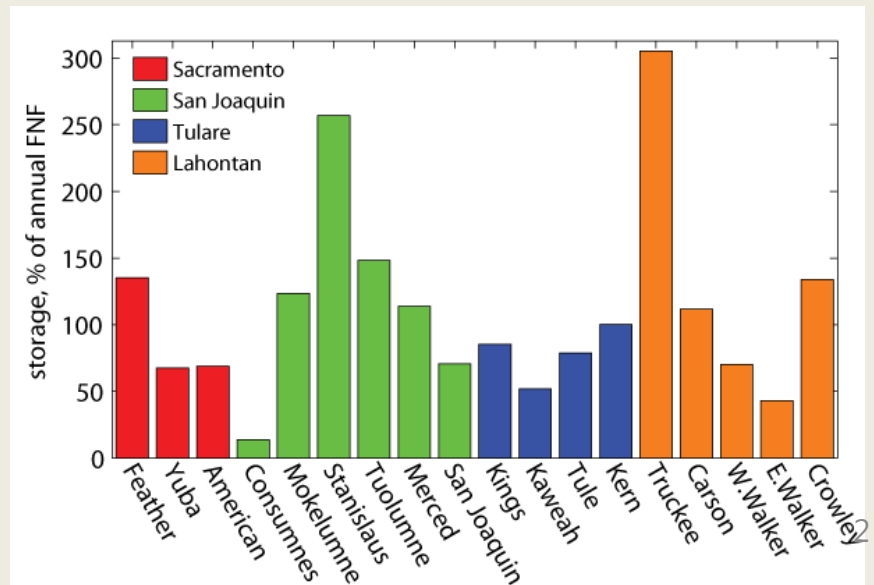
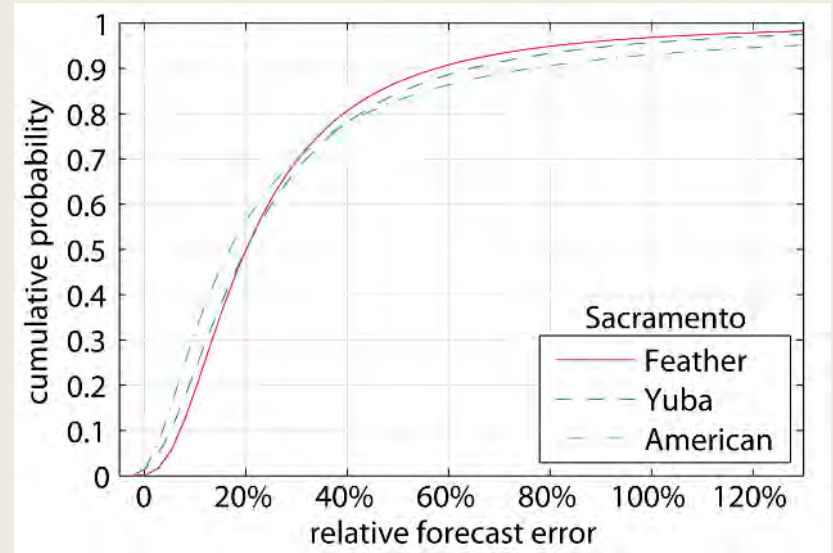
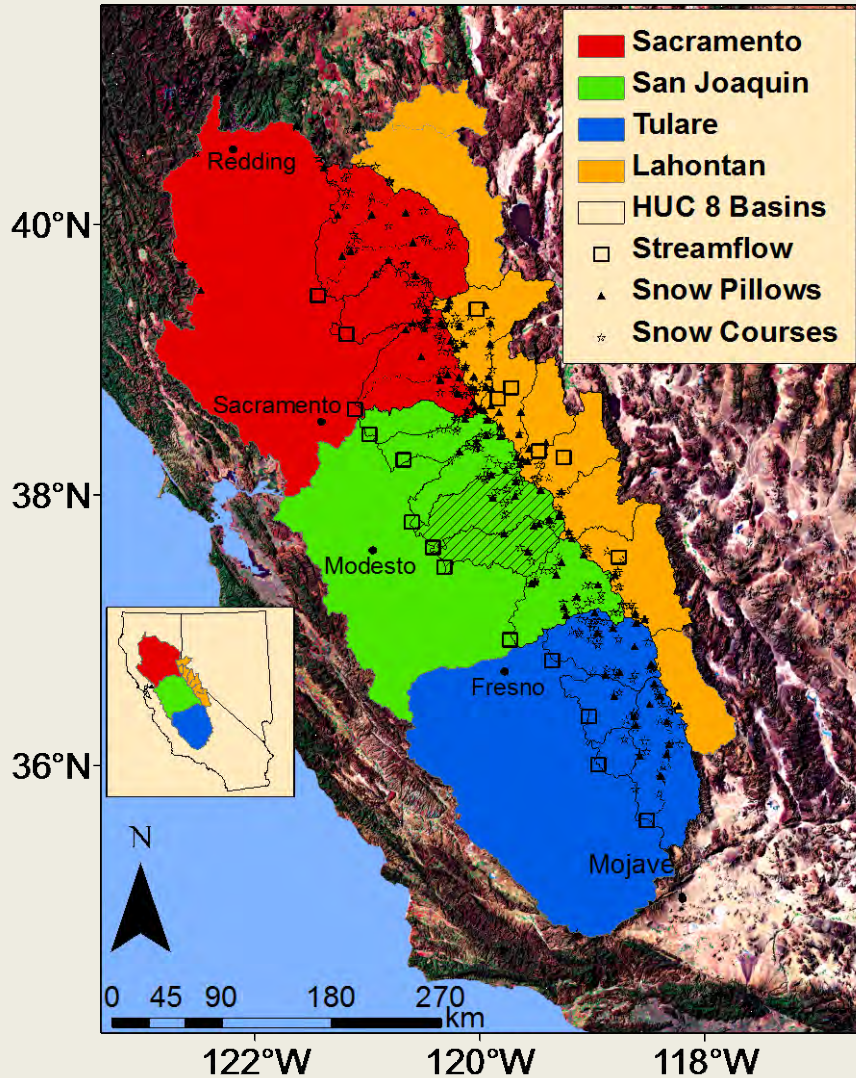


Snow-pillow data for Dana Meadows, 2987 m, Tuolumne River drainage

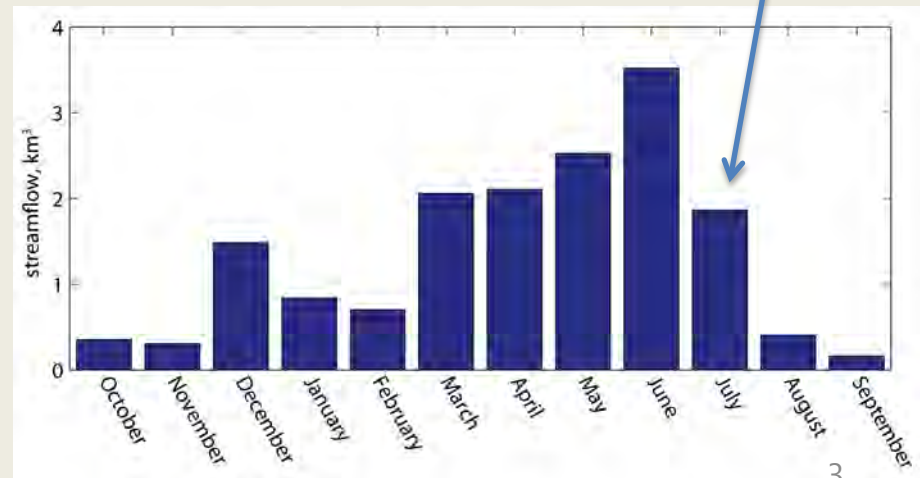
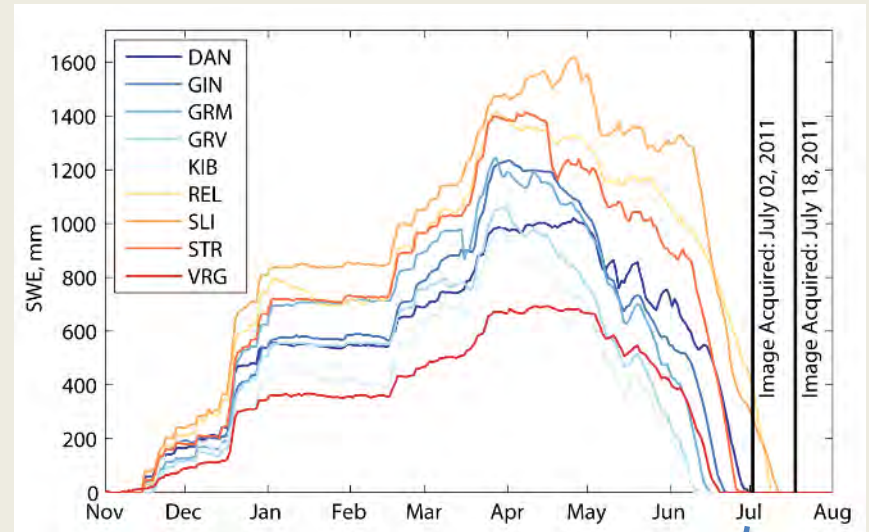
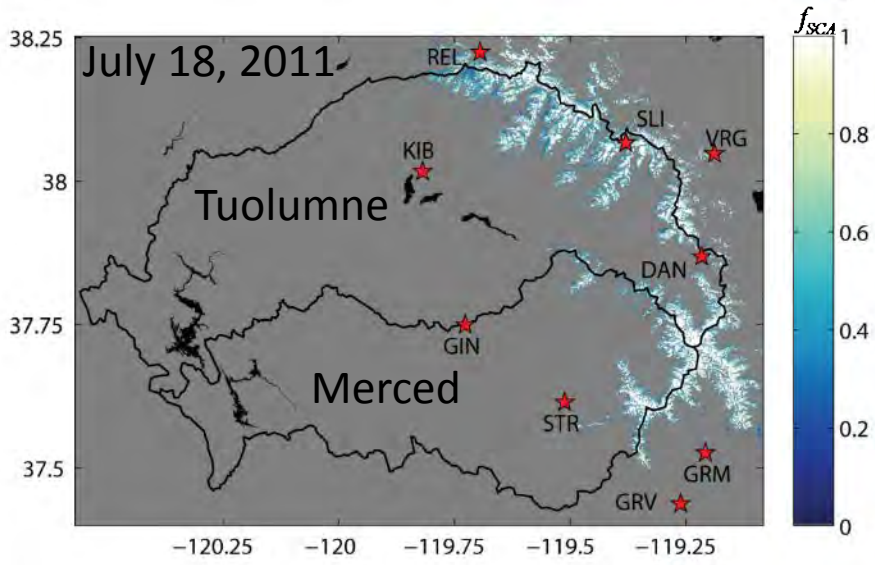
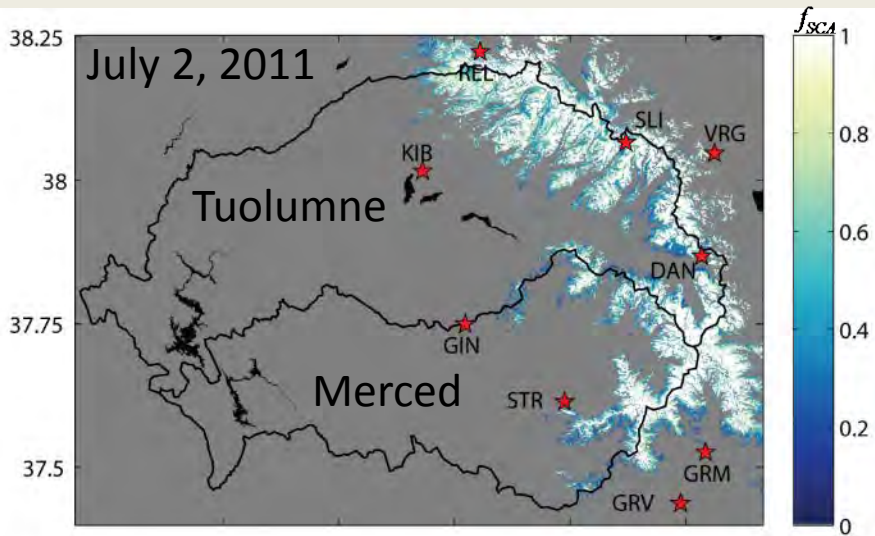


(SWE: snow water equivalent)

Forecasting errors and reservoir storage



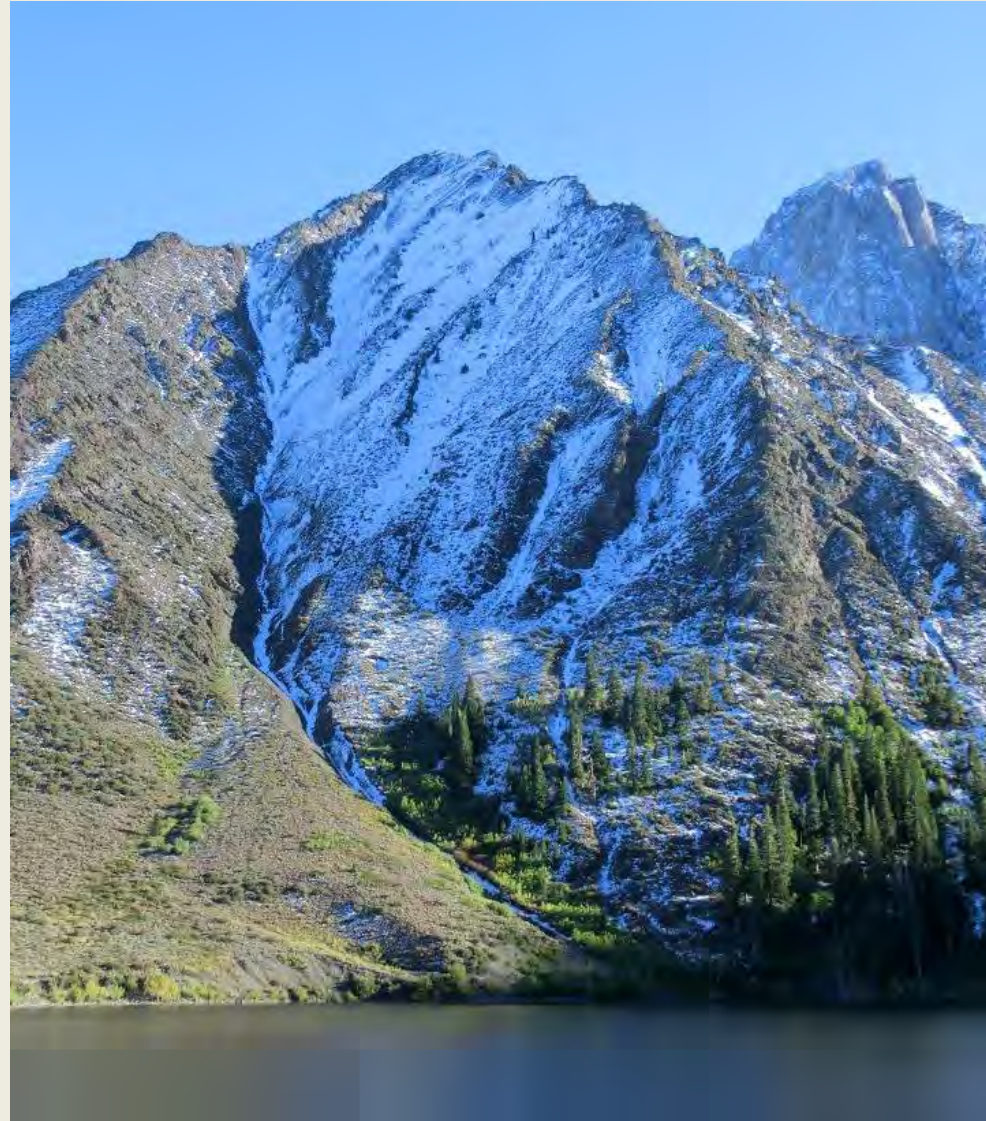
Snow sensors don't cover the highest elevations



Snow heterogeneity



Wind redistribution (D. Marks)



Differential ablation (E. Bair)

Fractional snow-covered area, Sierra Nevada (MODIS images available daily)

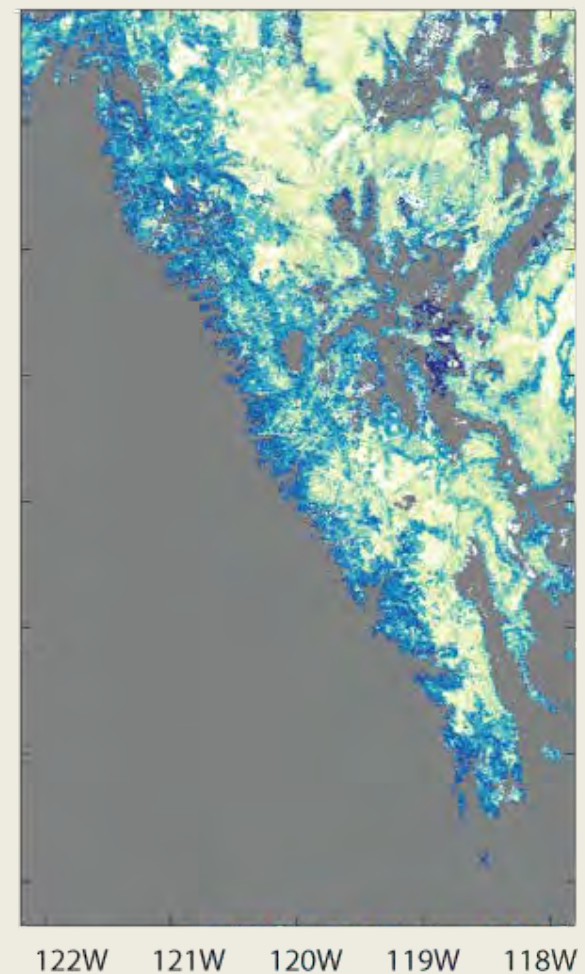
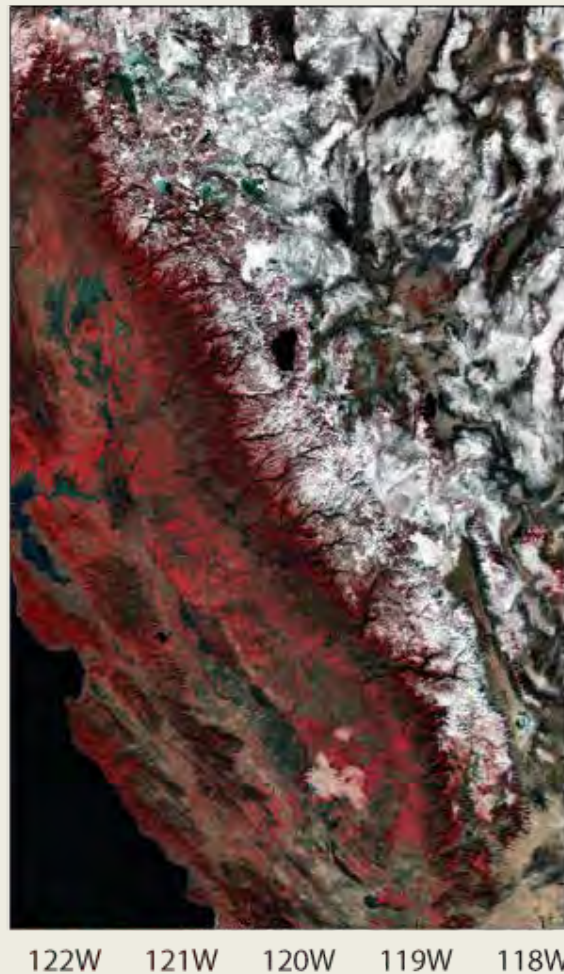
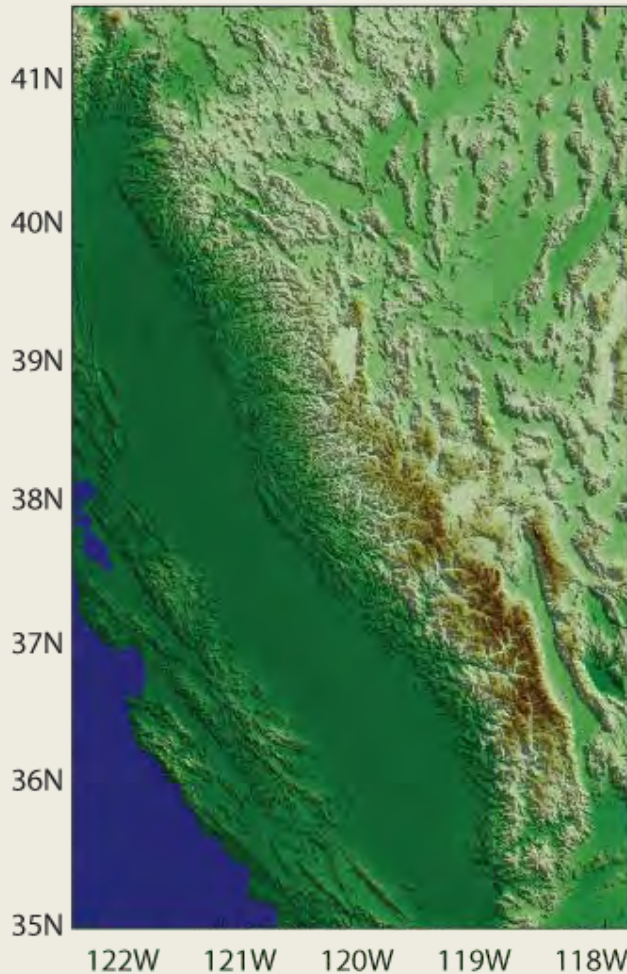
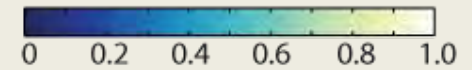
MODIS, 19 Jan 2008

Elevation, m

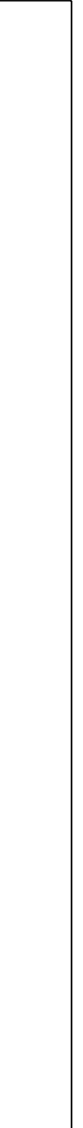
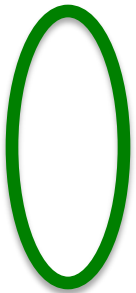
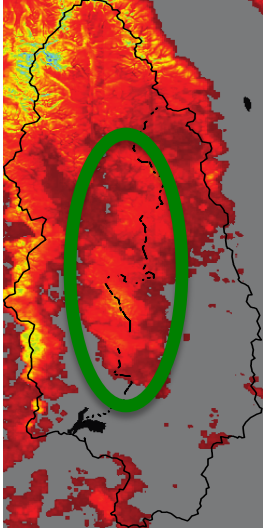


Bands 2,4,3 (RGB)

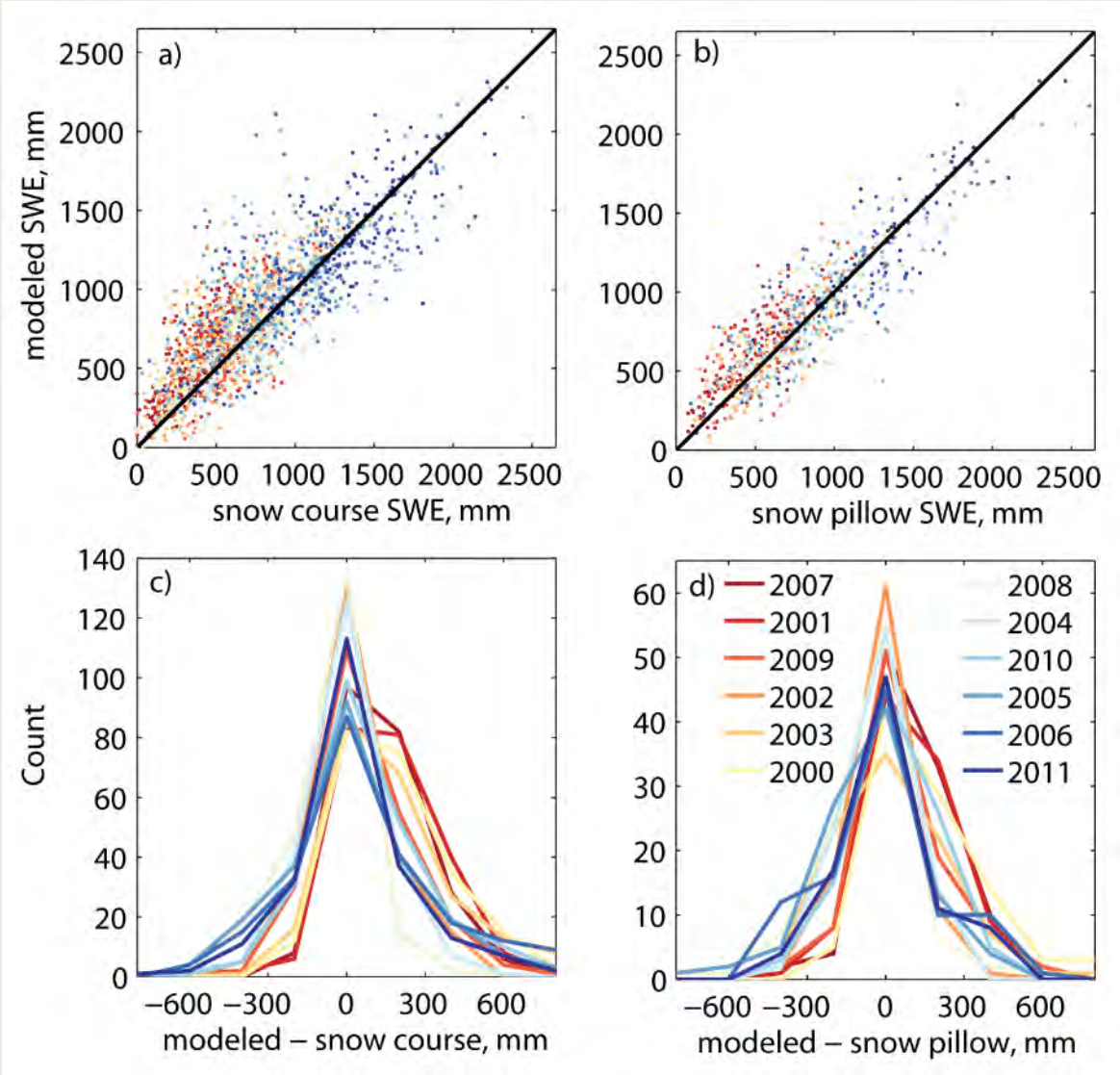
Fractional snow-covered area



Reconstructed SWE, dry and wet years

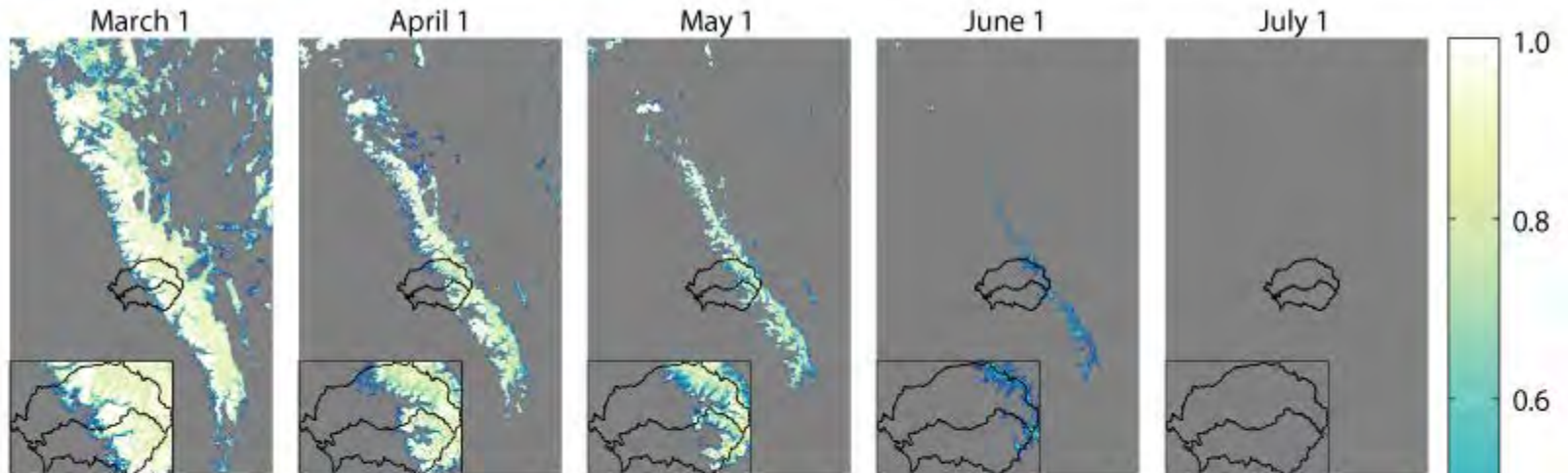


Validation of snow water equivalent

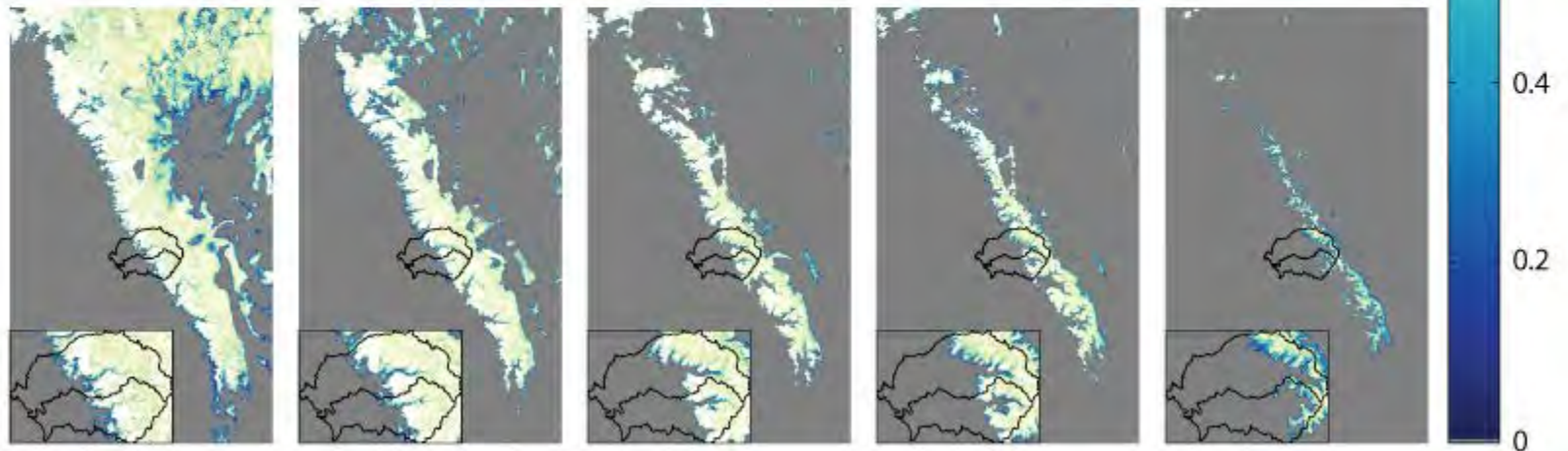


Snow-covered area, dry & wet year

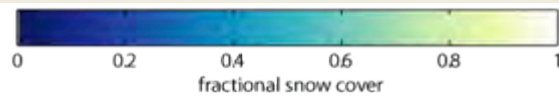
2007



2011



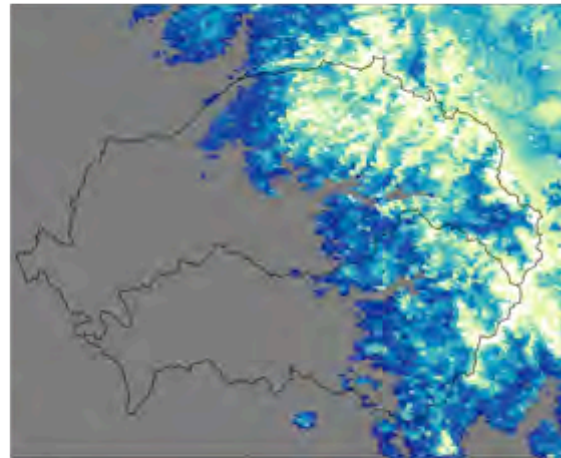
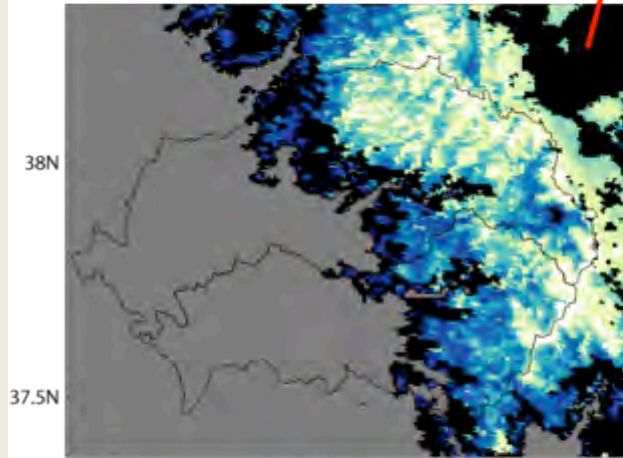
Tuolumne & Merced River Basins
01 April 2005



filtered
fractional snow

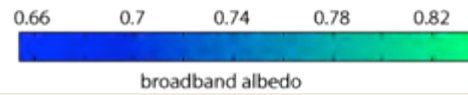
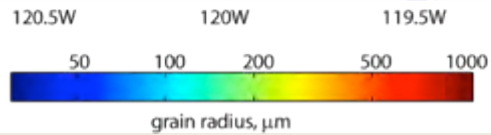
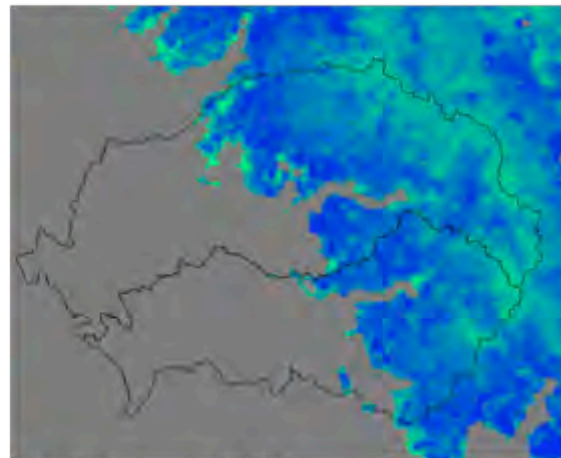
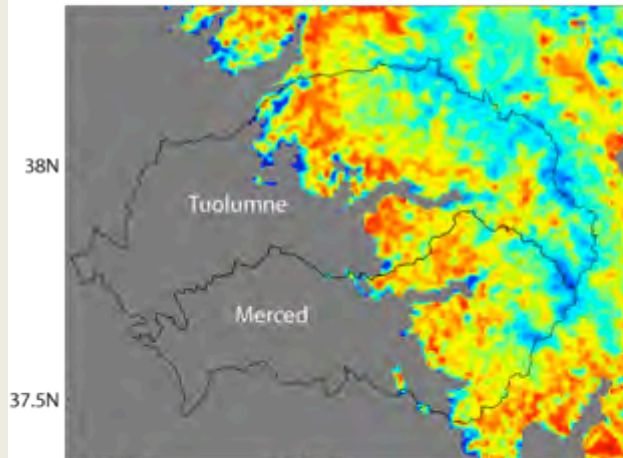
(cloud)

smoothed and interpolated
fractional snow



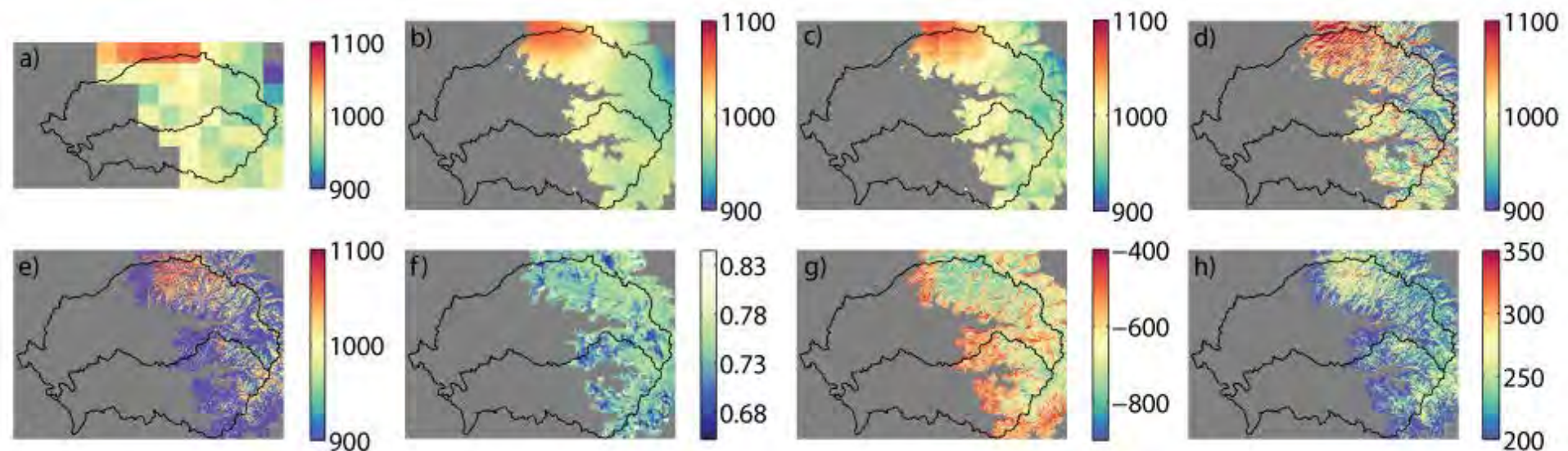
smoothed and interpolated
grain size

estimated albedo

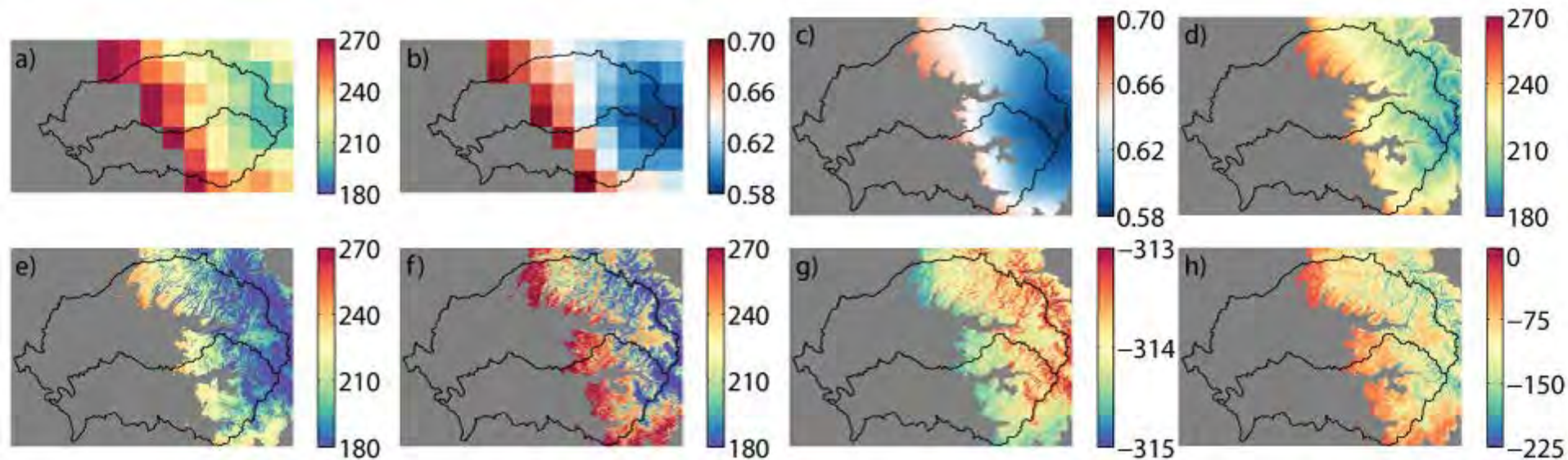


Examples of MODIS products
supporting reconstruction

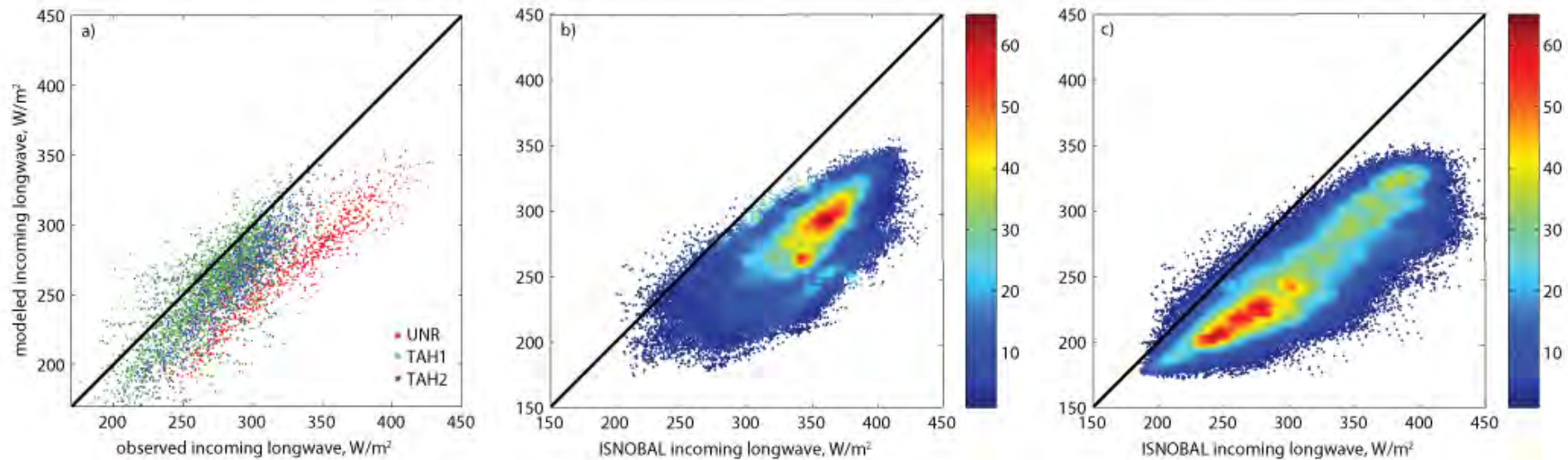
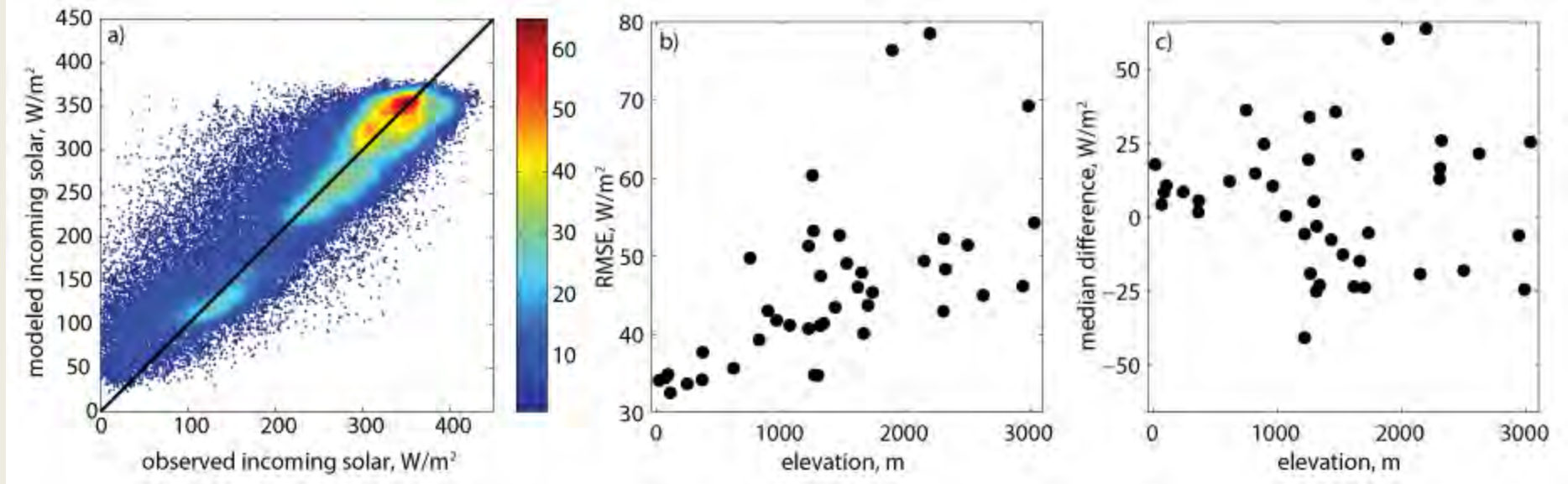
Solar radiation, hourly



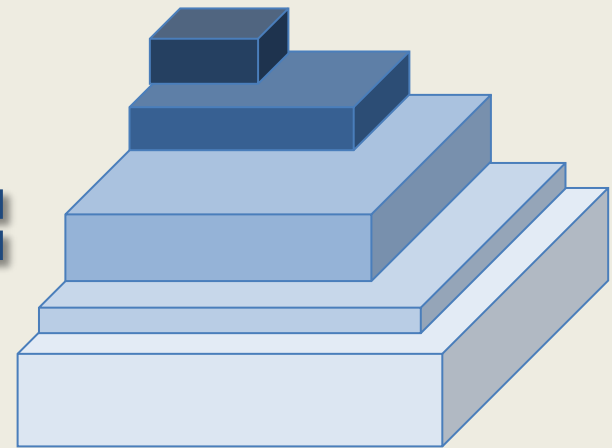
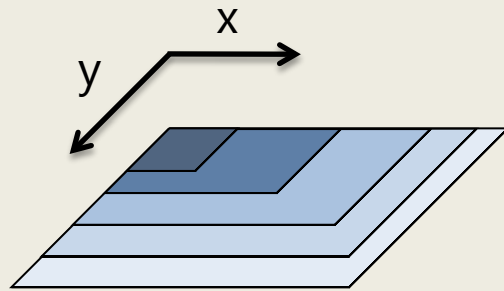
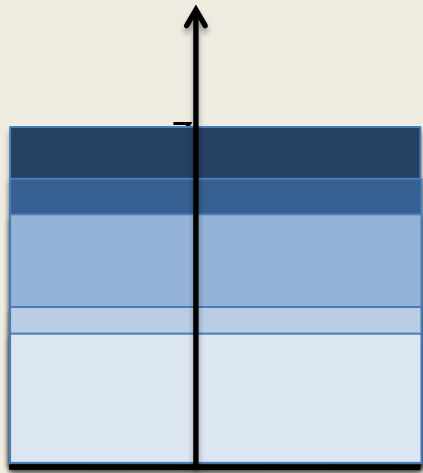
Longwave radiation, hourly



Validation of input data



Reconstruction of heterogeneous snow in a grid cell



Daily potential melt

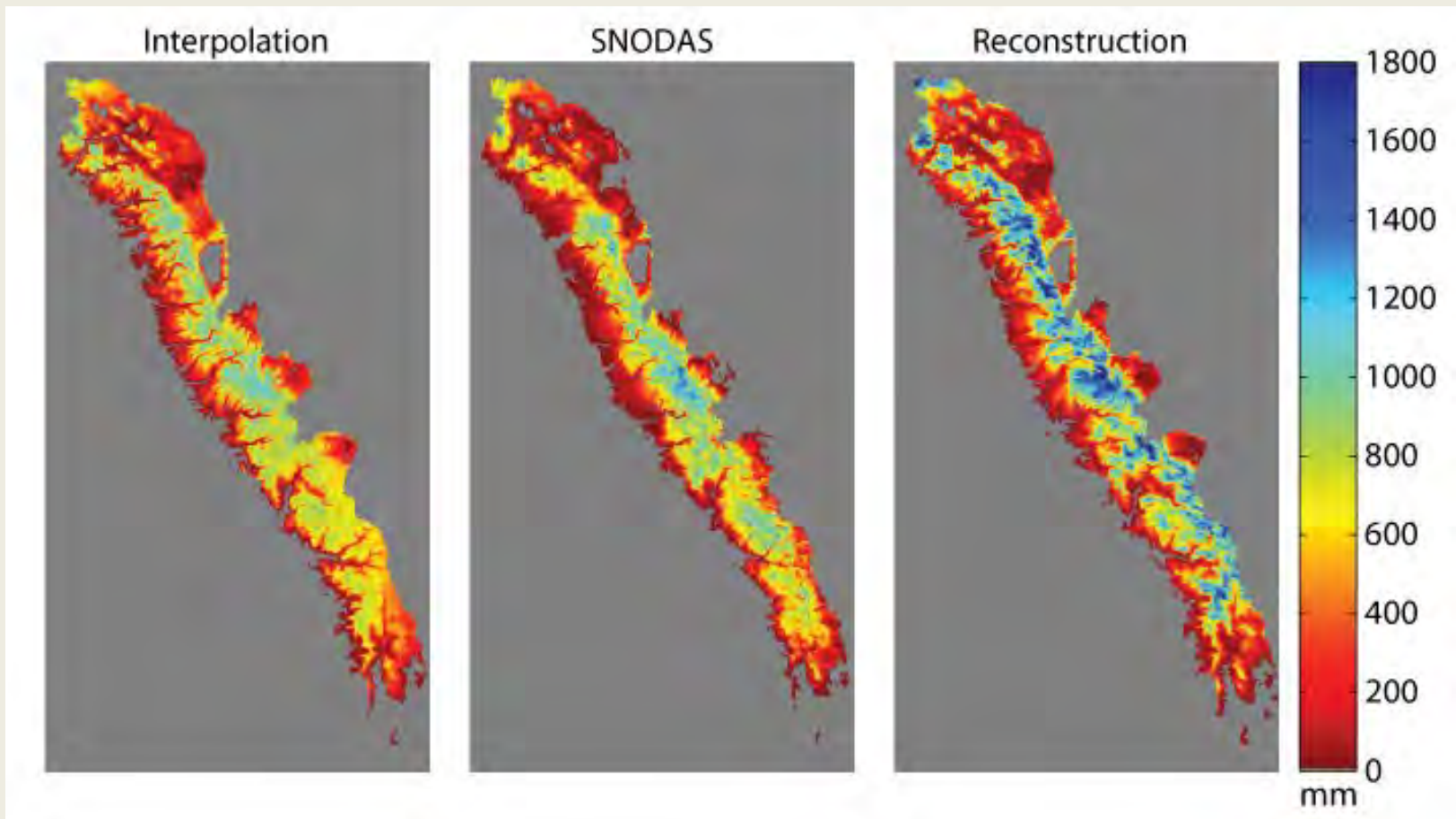
f_{SCA}

Reconstructed SWE

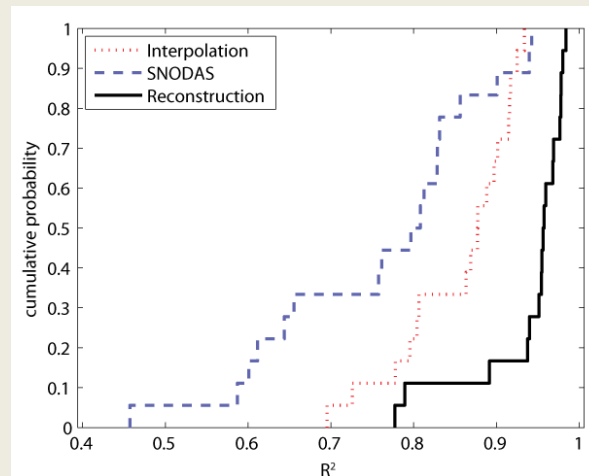
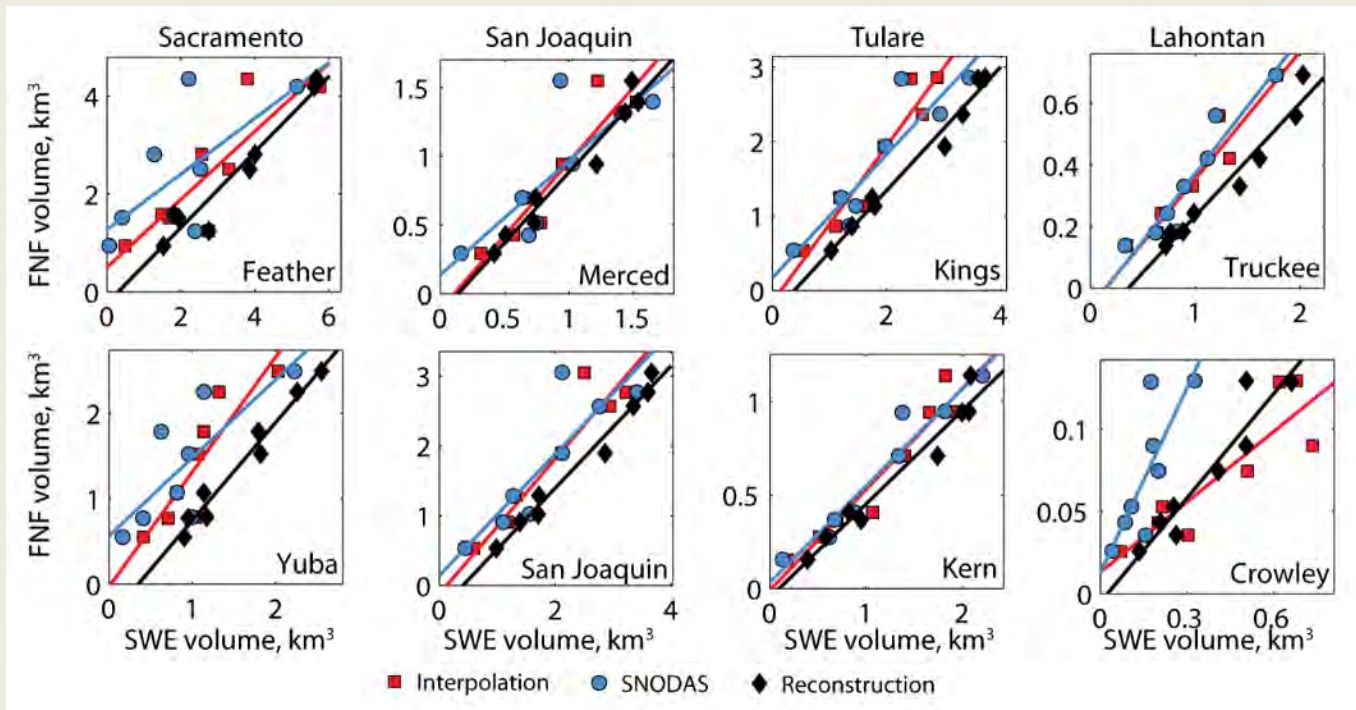
(A. Kahl
Homan et al., *Hyd Proc* 2011)

Median SWE 2004-2011 by three different methods

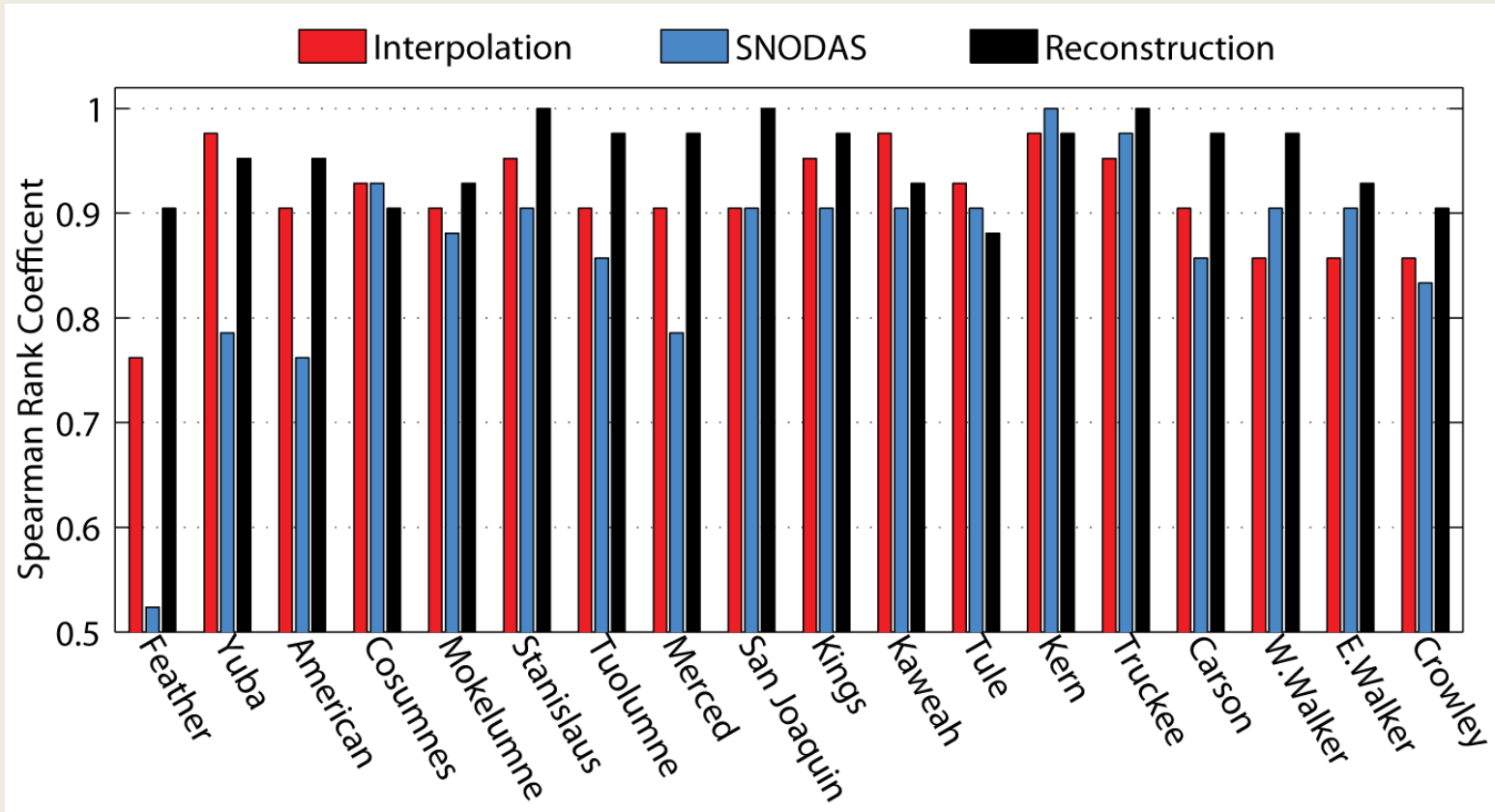
- Reconstructed SWE is more accurate, but doesn't provide a forecast

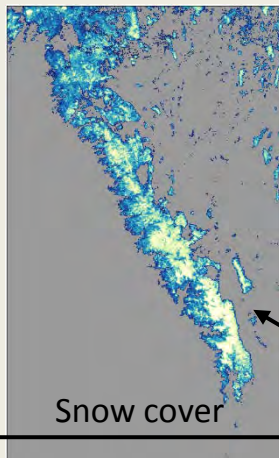
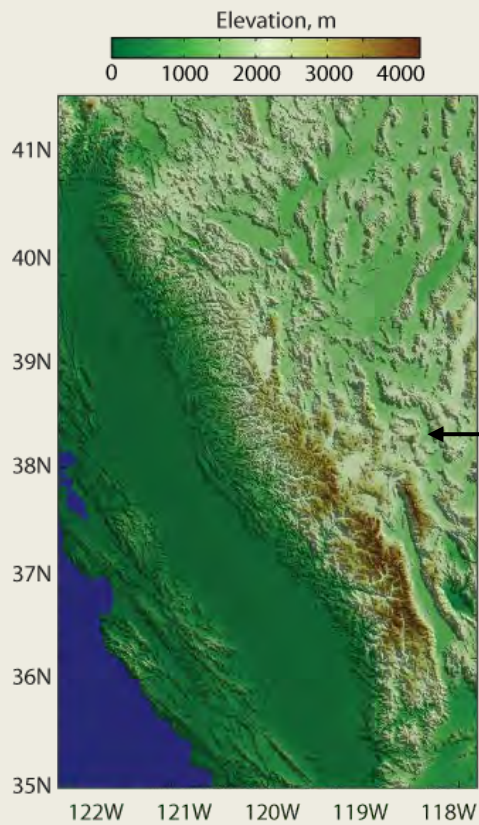


Estimating streamflow with SWE

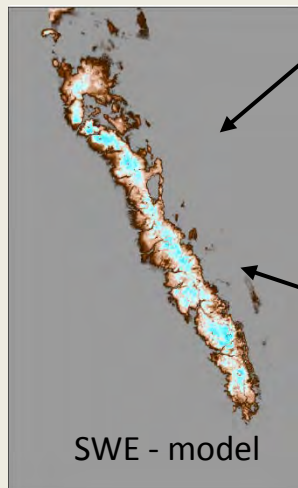


Relationship of streamflow and SWE





What patterns
can we discover
in these 3 images
to give us
this image?



And then
how do we
fix this model?

