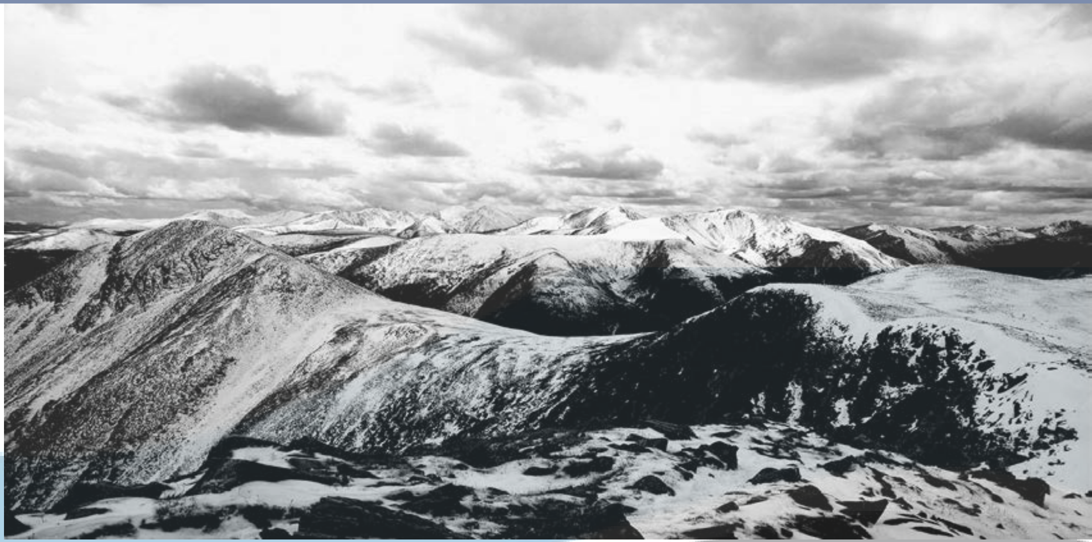
Use of Remotely Sensed Snow Observations for National Water Model Analysis

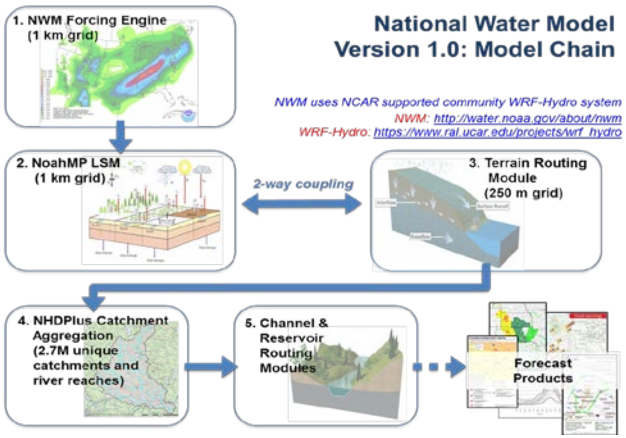
Logan Karsten - NCAR

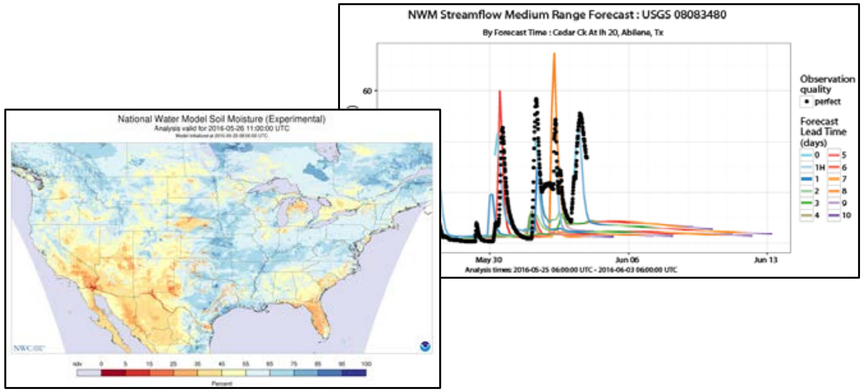
D. Gochis, J. McCreight, K. Aalstad,

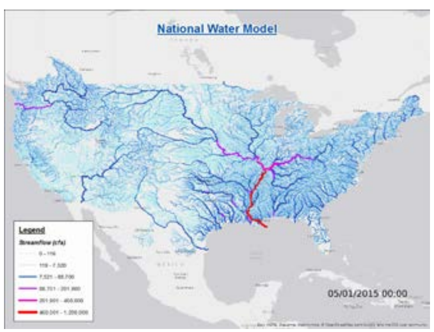
G. Fall, C. Olheser, N-Y. Wang

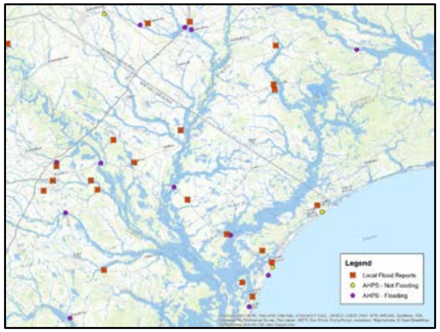


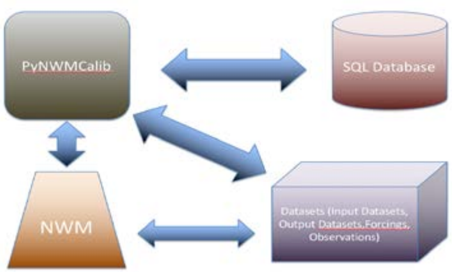
National Water Model Version 2.0









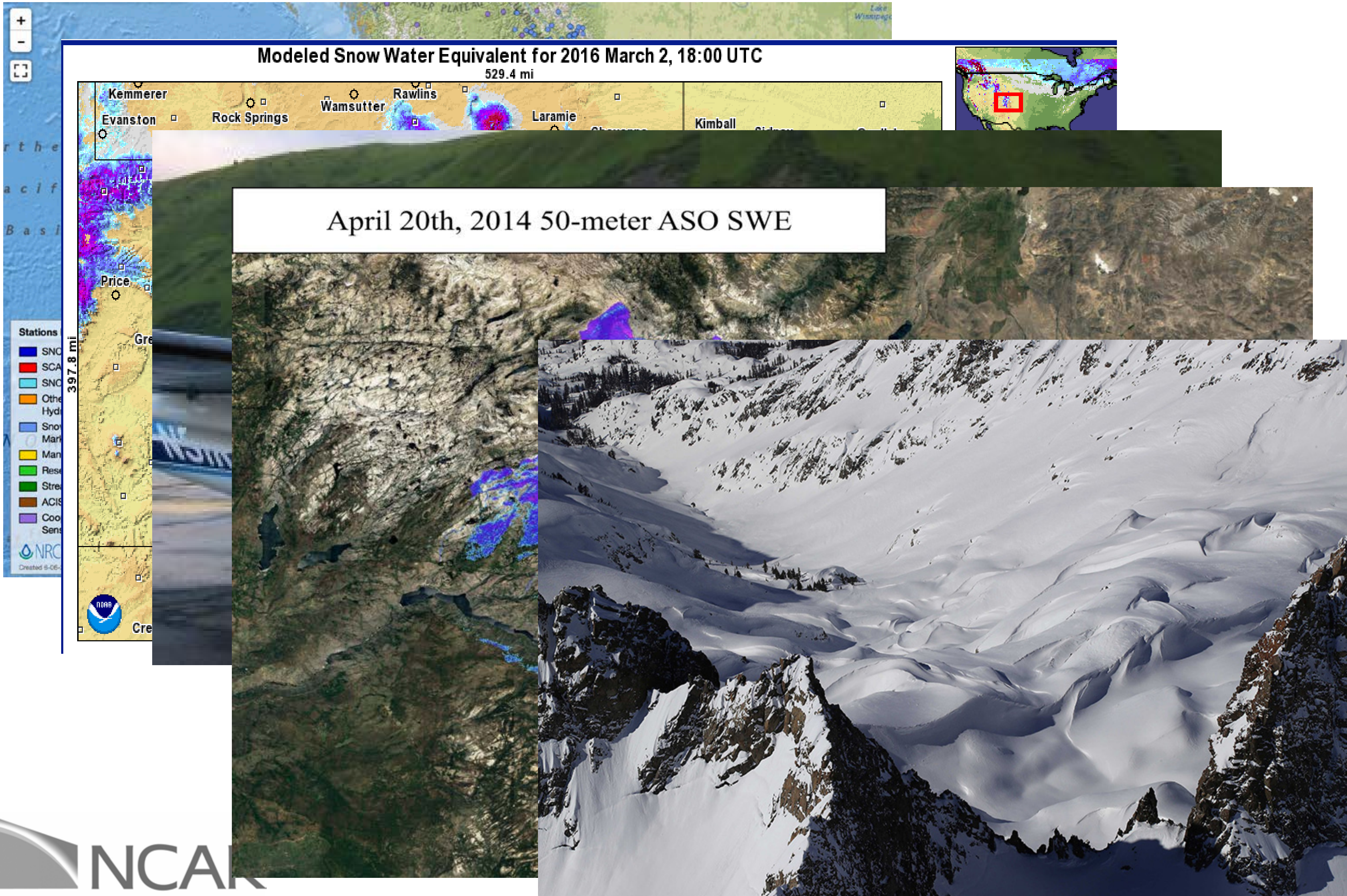


- National Water Model now uses the BATS snow albedo scheme (Yang et al., 1997).
  - Previously used CLASS (Verseghy, 1991) which used simple aging formulation.
  - More parameters now open for future calibration efforts using observed snow albedo.

Use of Mountain Mapper precipitation downscaling.
  - Better capture high-altitude precipitation.

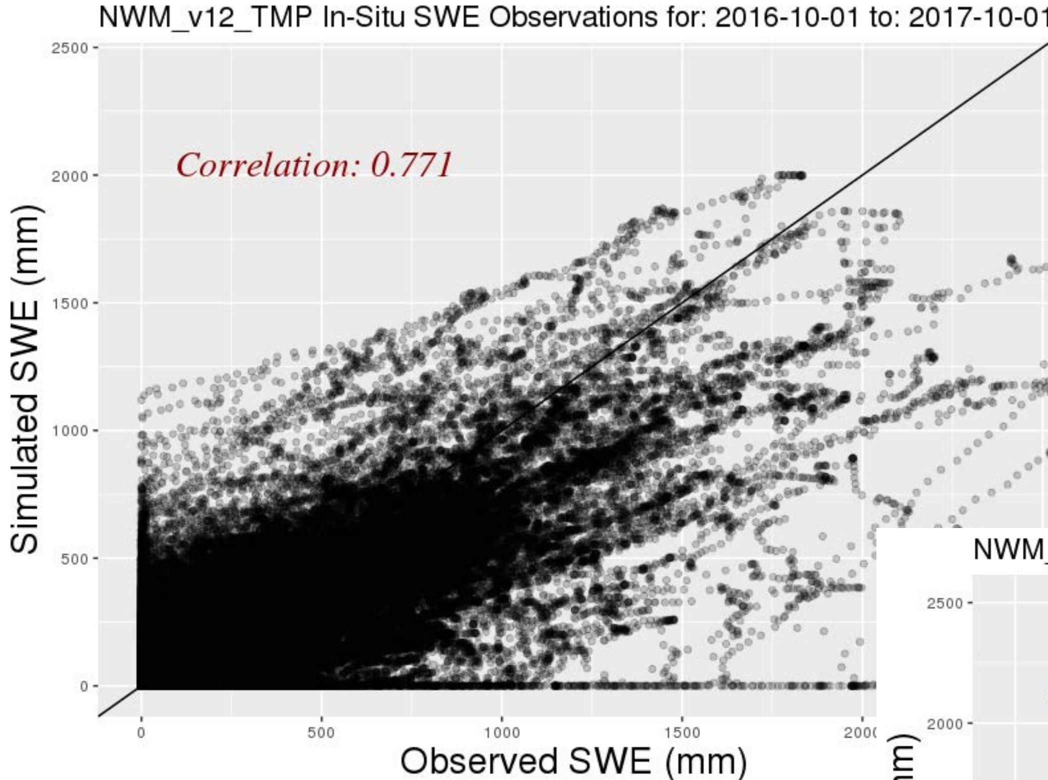
NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

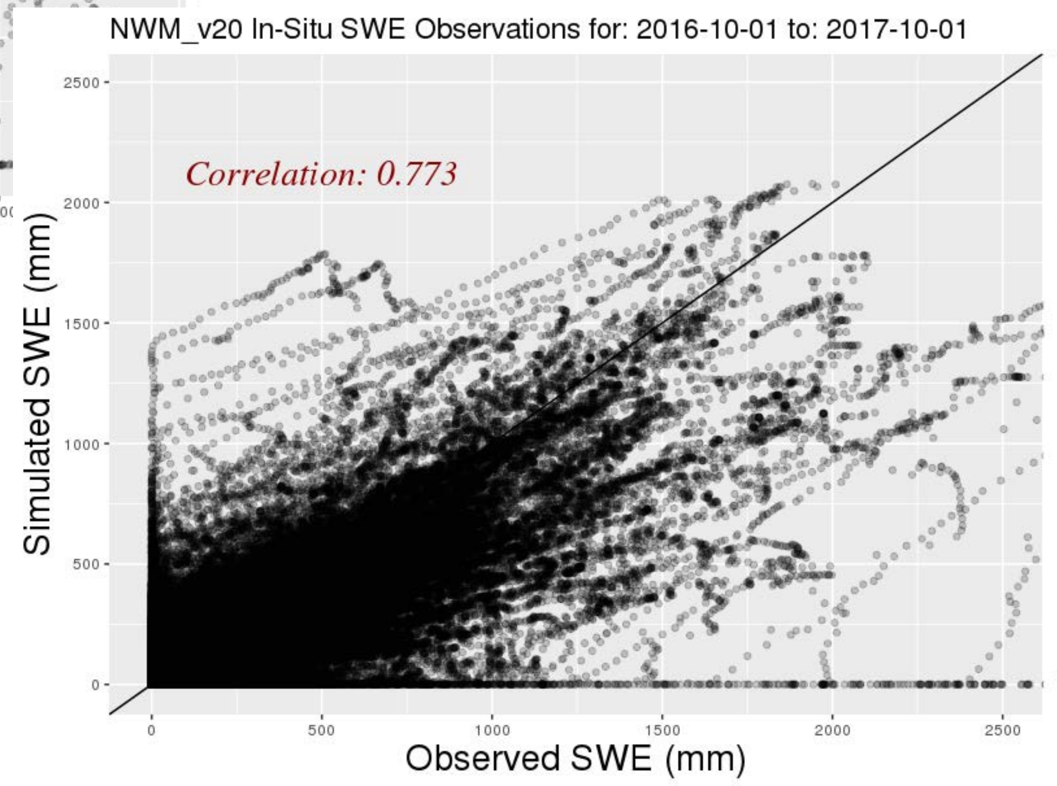
National Water Model Snow Analysis



NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

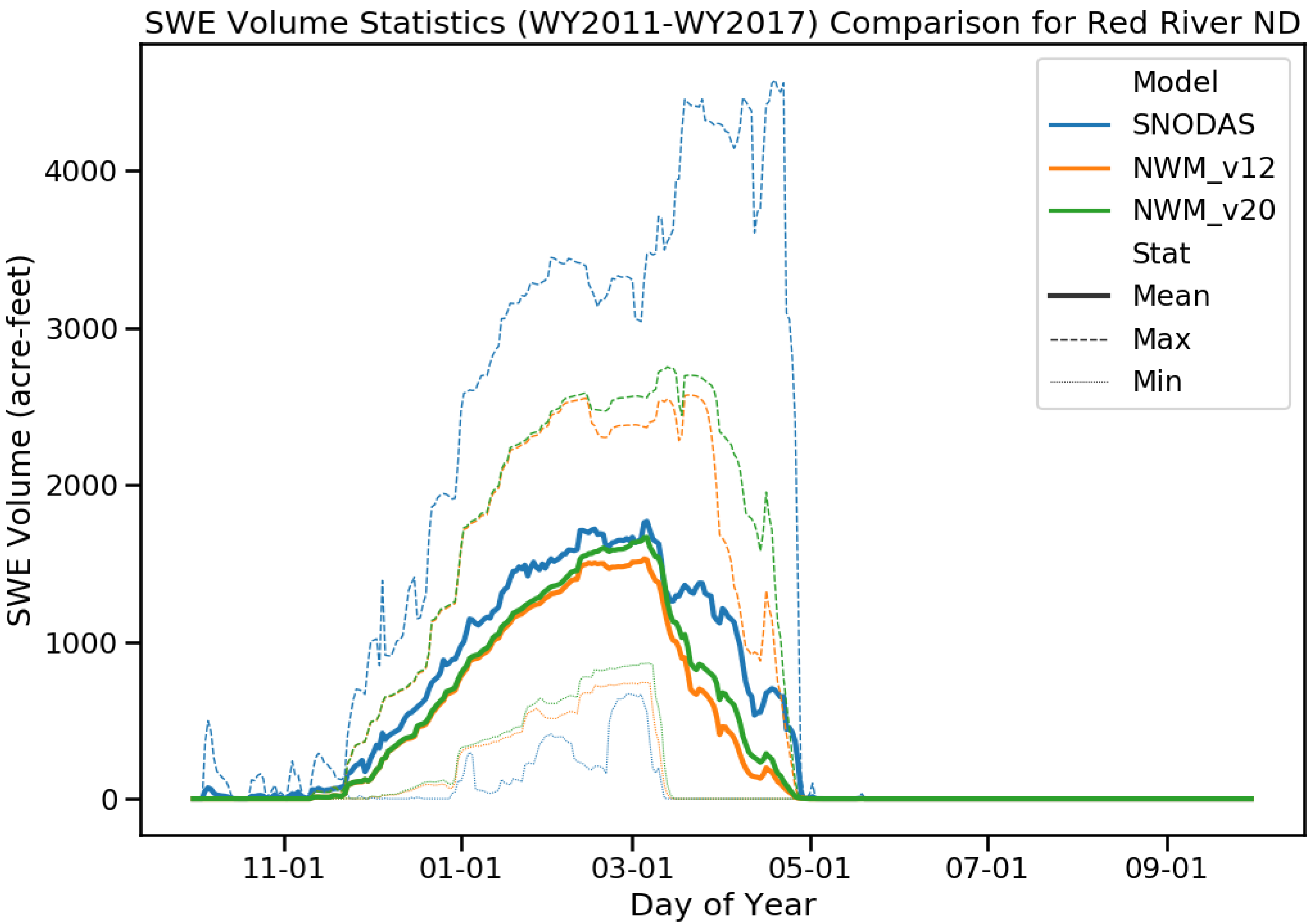
National Water Model Snow Analysis – Version 2.0



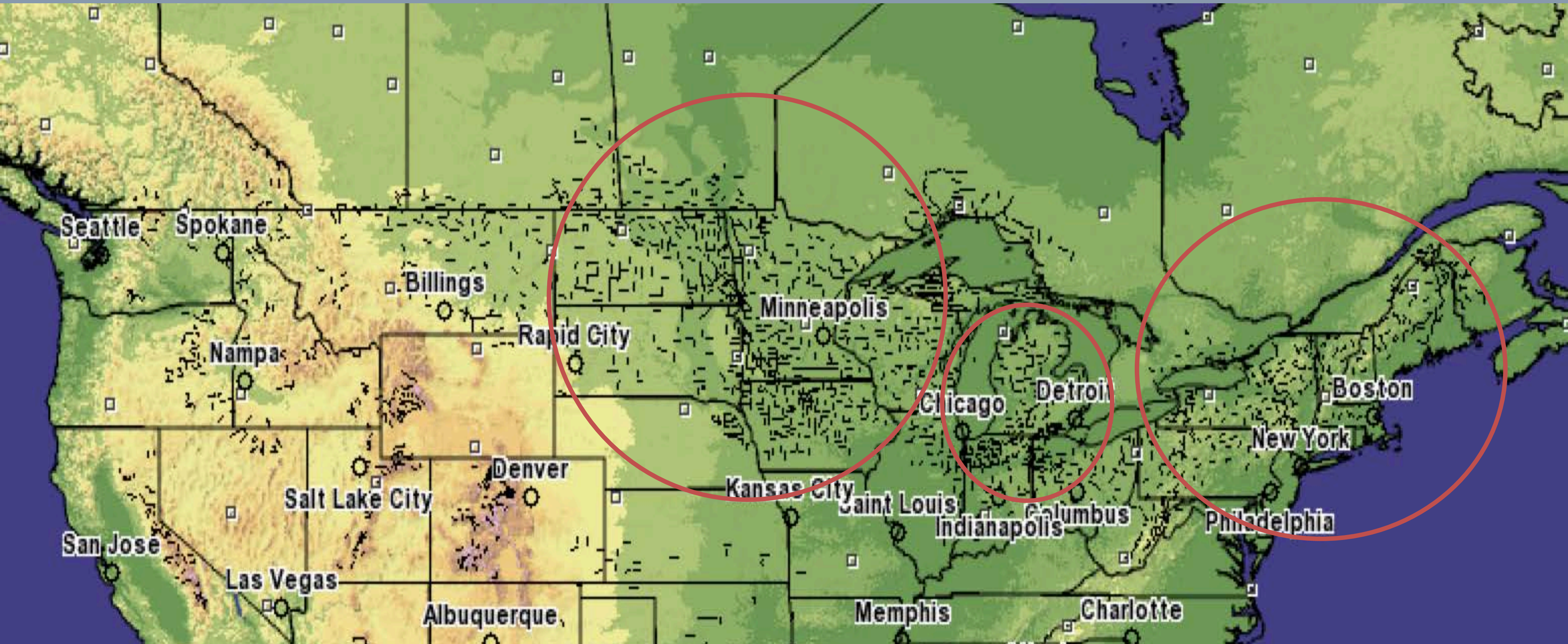


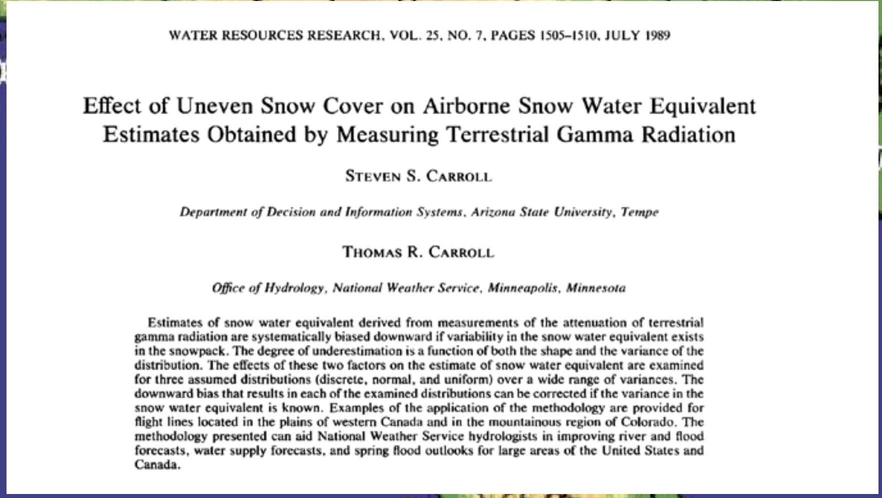
NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

National Water Model Snow Analysis – Version 2.0



National Water Model Snow Analysis – Version 2.0





WATER RESOURCES RESEARCH, VOL. 25, NO. 7, PAGES 1505–1510, JULY 1989

Effect of Uneven Snow Cover on Airborne Snow Water Equivalent Estimates Obtained by Measuring Terrestrial Gamma Radiation

STEVEN S. CARROLL

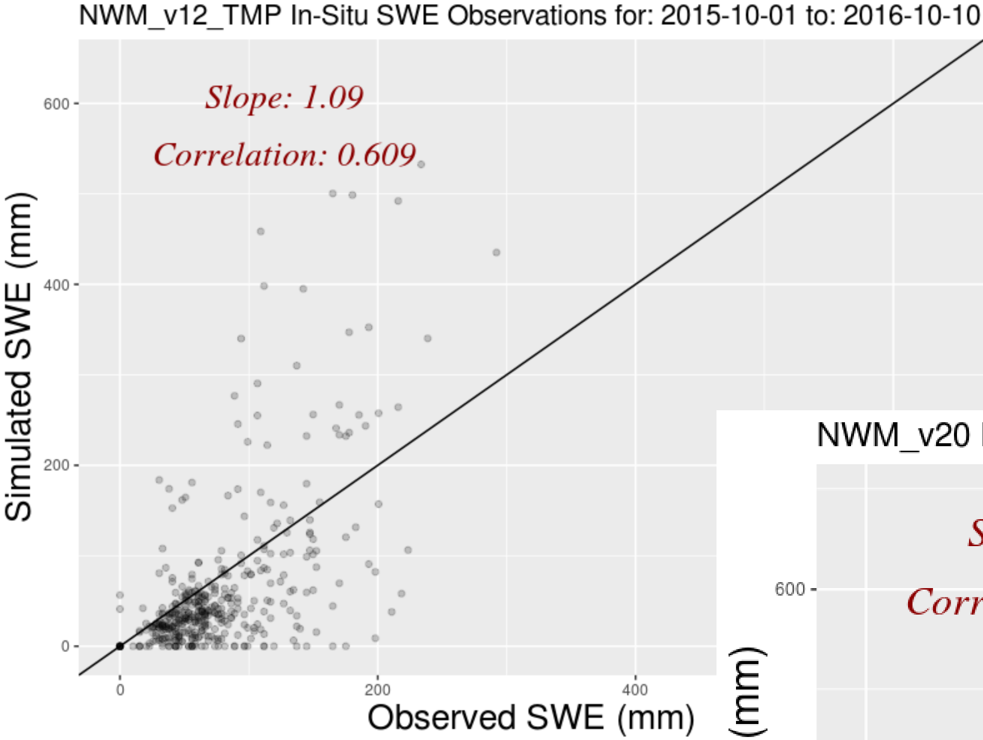
Department of Decision and Information Systems, Arizona State University, Tempe

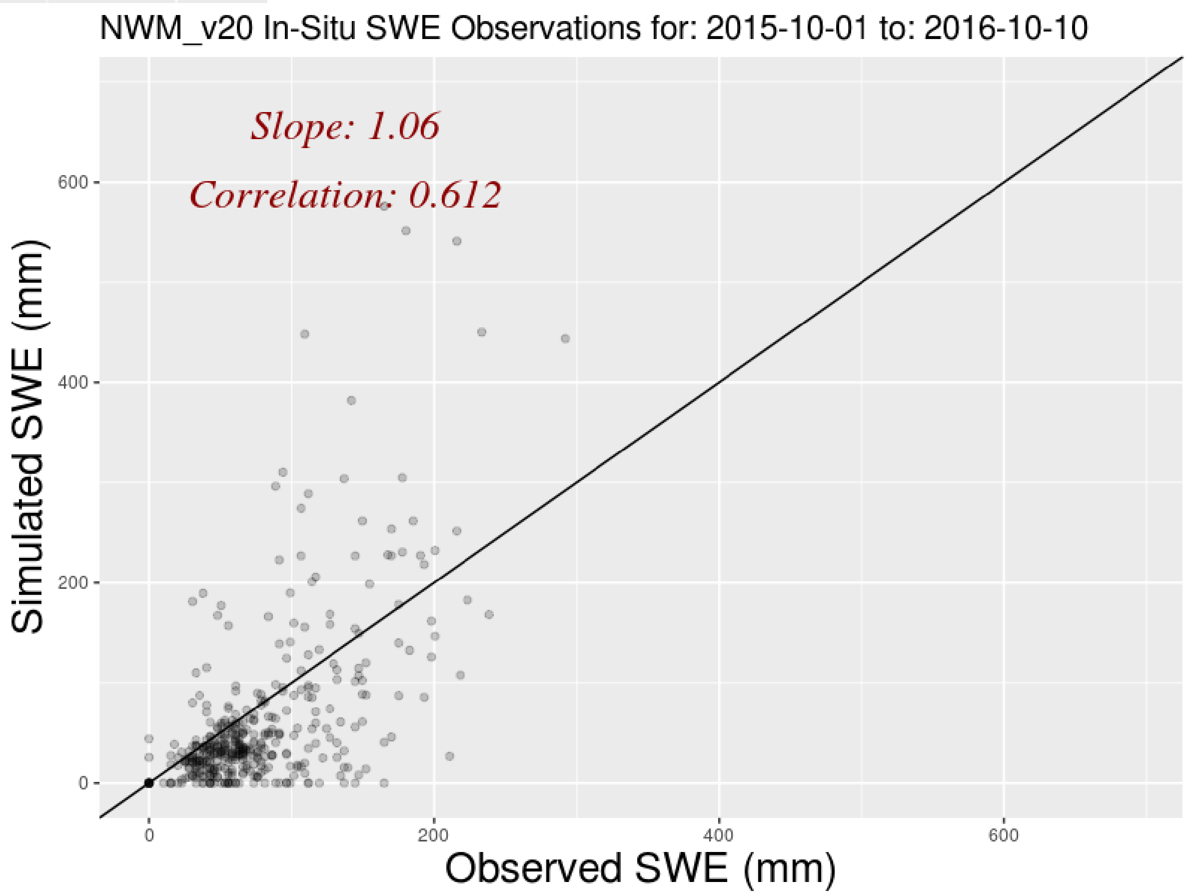
THOMAS R. CARROLL

Office of Hydrology, National Weather Service, Minneapolis, Minnesota

Estimates of snow water equivalent derived from measurements of the attenuation of terrestrial gamma radiation are systematically biased downward if variability in the snow water equivalent exists in the snowpack. The degree of underestimation is a function of both the shape and the variance of the distribution. The effects of these two factors on the estimate of snow water equivalent are examined for three assumed distributions (discrete, normal, and uniform) over a wide range of variances. The downward bias that results in each of the examined distributions can be corrected if the variance in the snow water equivalent is known. Examples of the application of the methodology are provided for flight lines located in the plains of western Canada and in the mountainous region of Colorado. The methodology presented can aid National Weather Service hydrologists in improving river and flood forecasts, water supply forecasts, and spring flood outlooks for large areas of the United States and Canada.

National Water Model Snow Analysis – Version 2.0

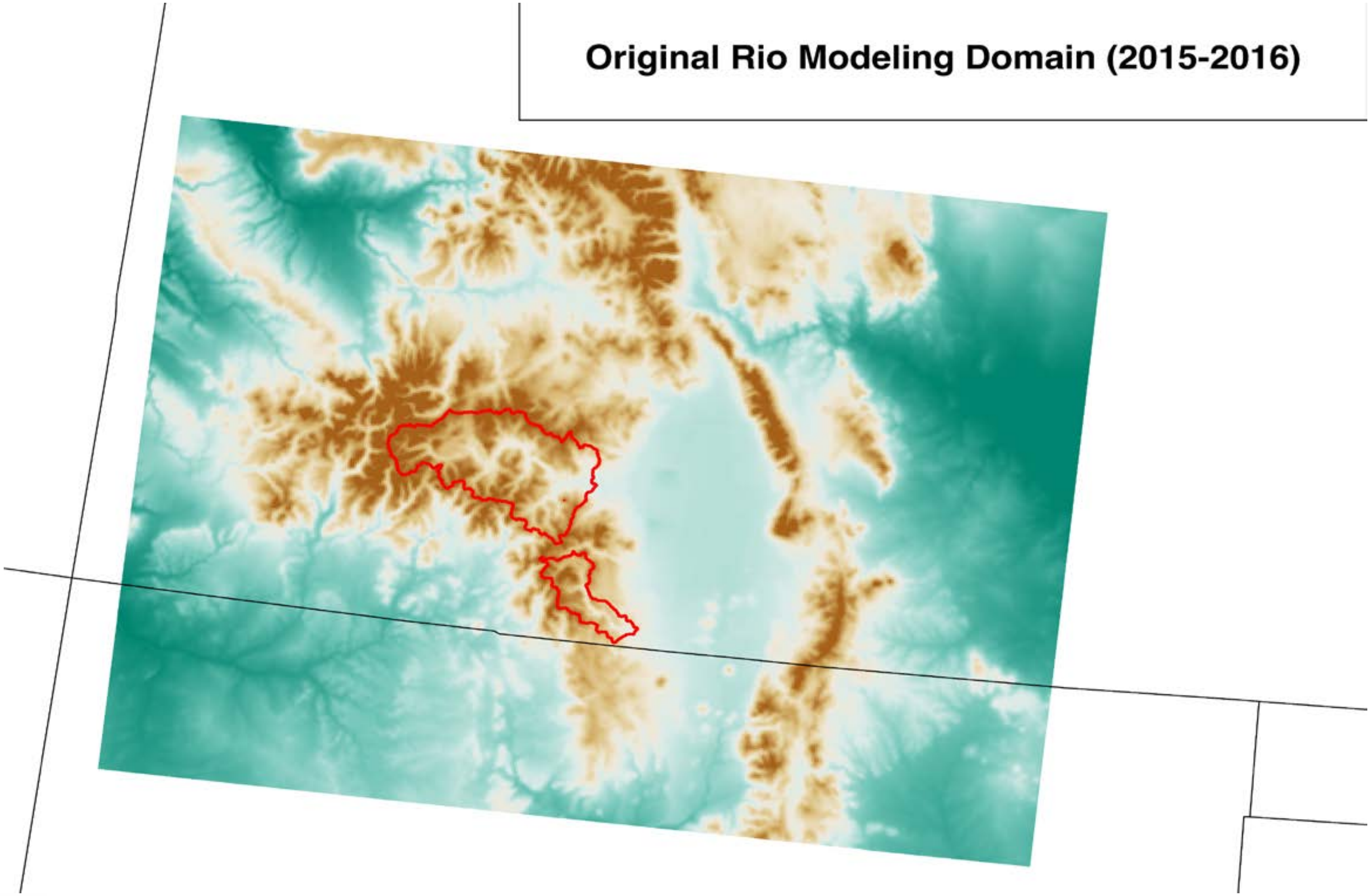




NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

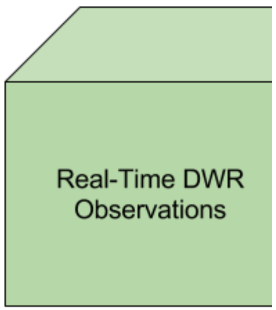
Colorado Ensemble Streamflow Prediction

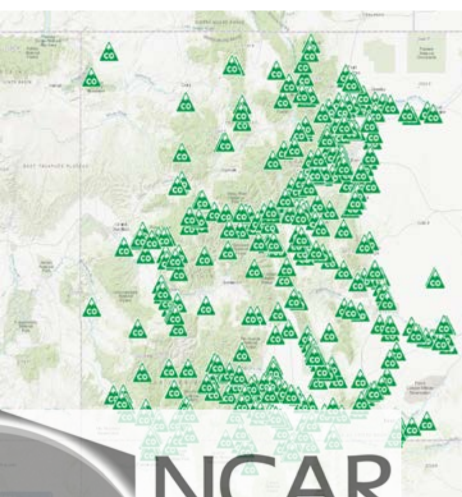
- Began focusing on headwaters of the Rio Grande in southwestern CO

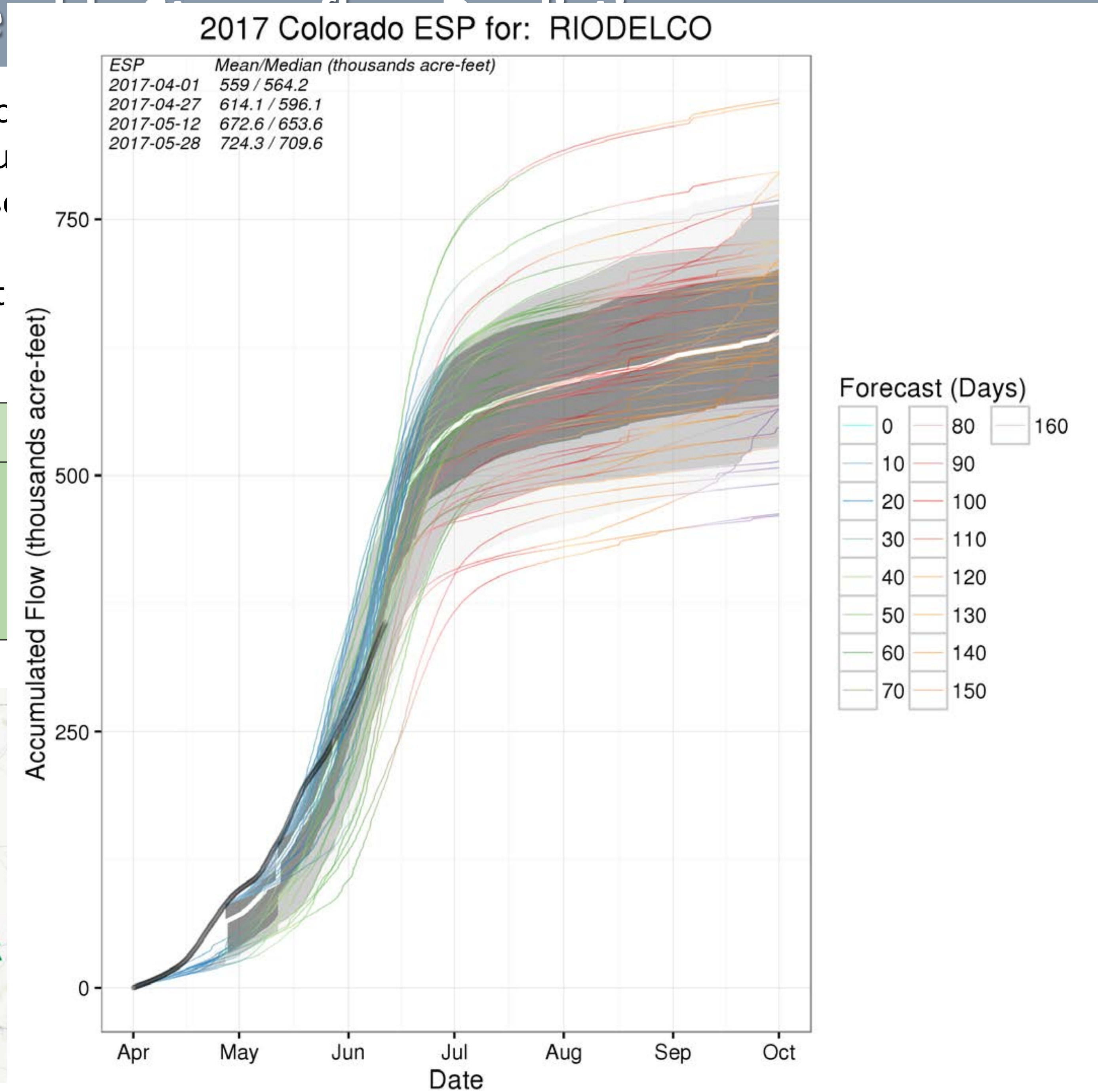


Colorado Ense

- Real-Time Workflc
  - Python execu
  - Each process
    functions.
  - R continues t
    accumulated

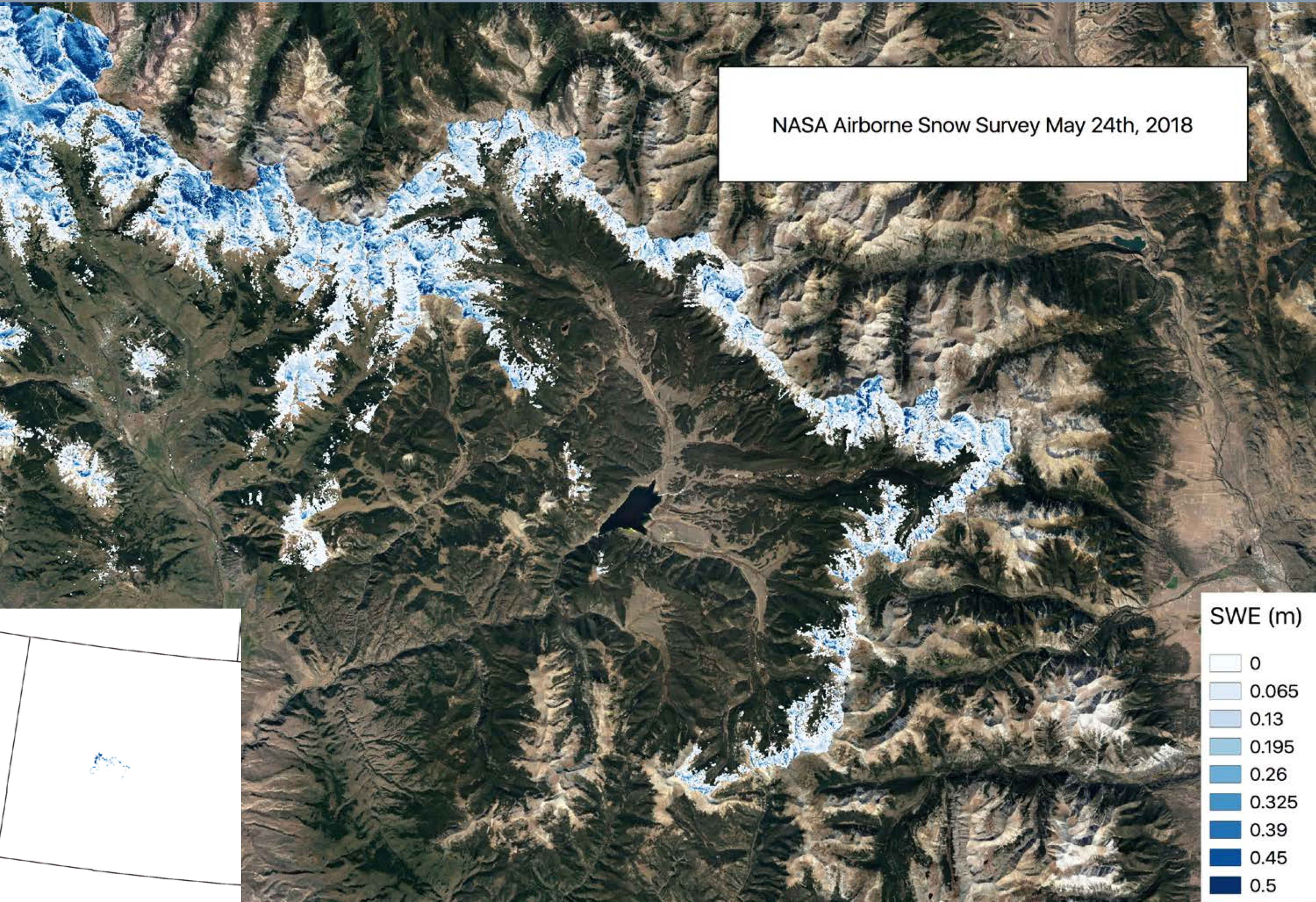




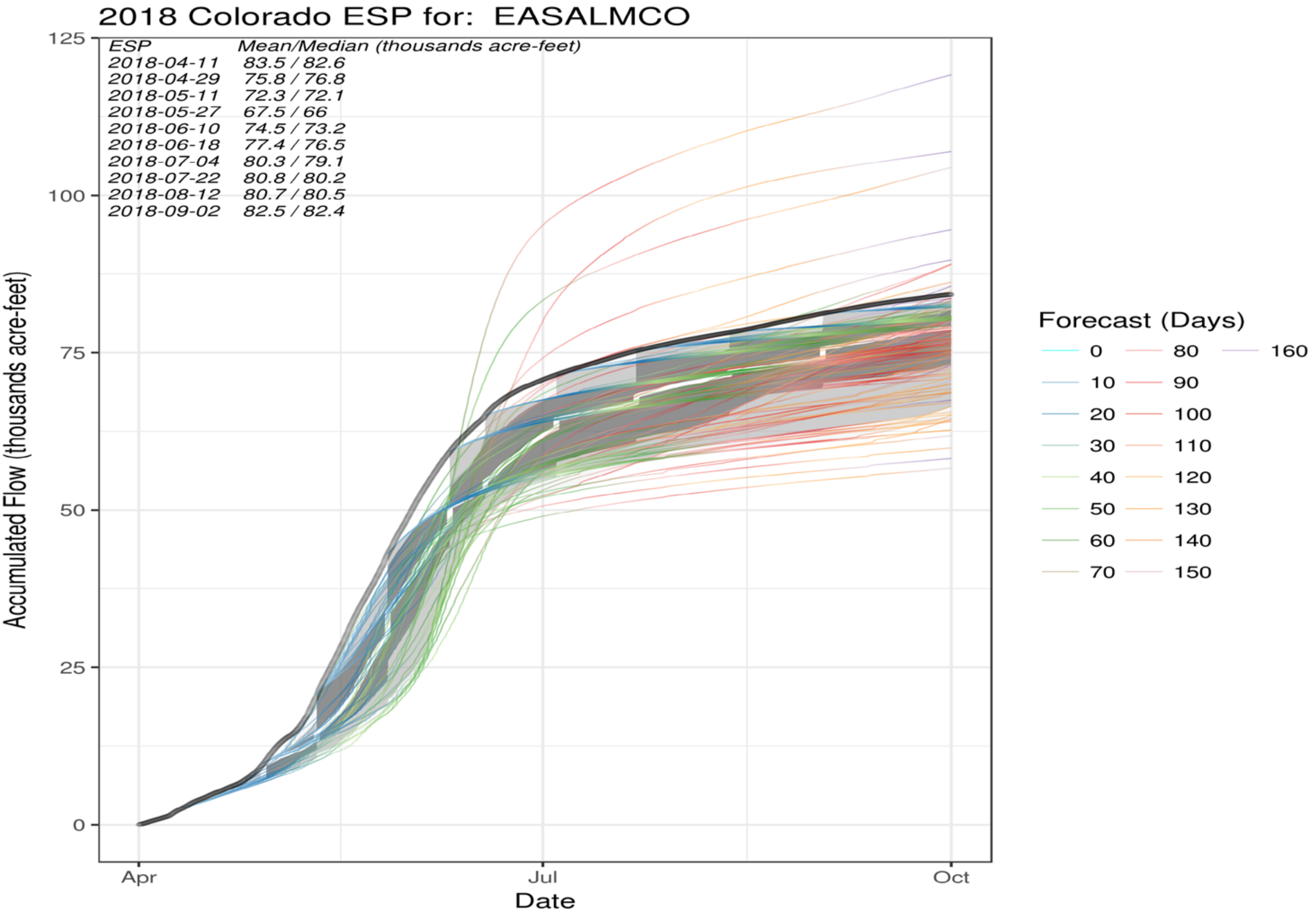


NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

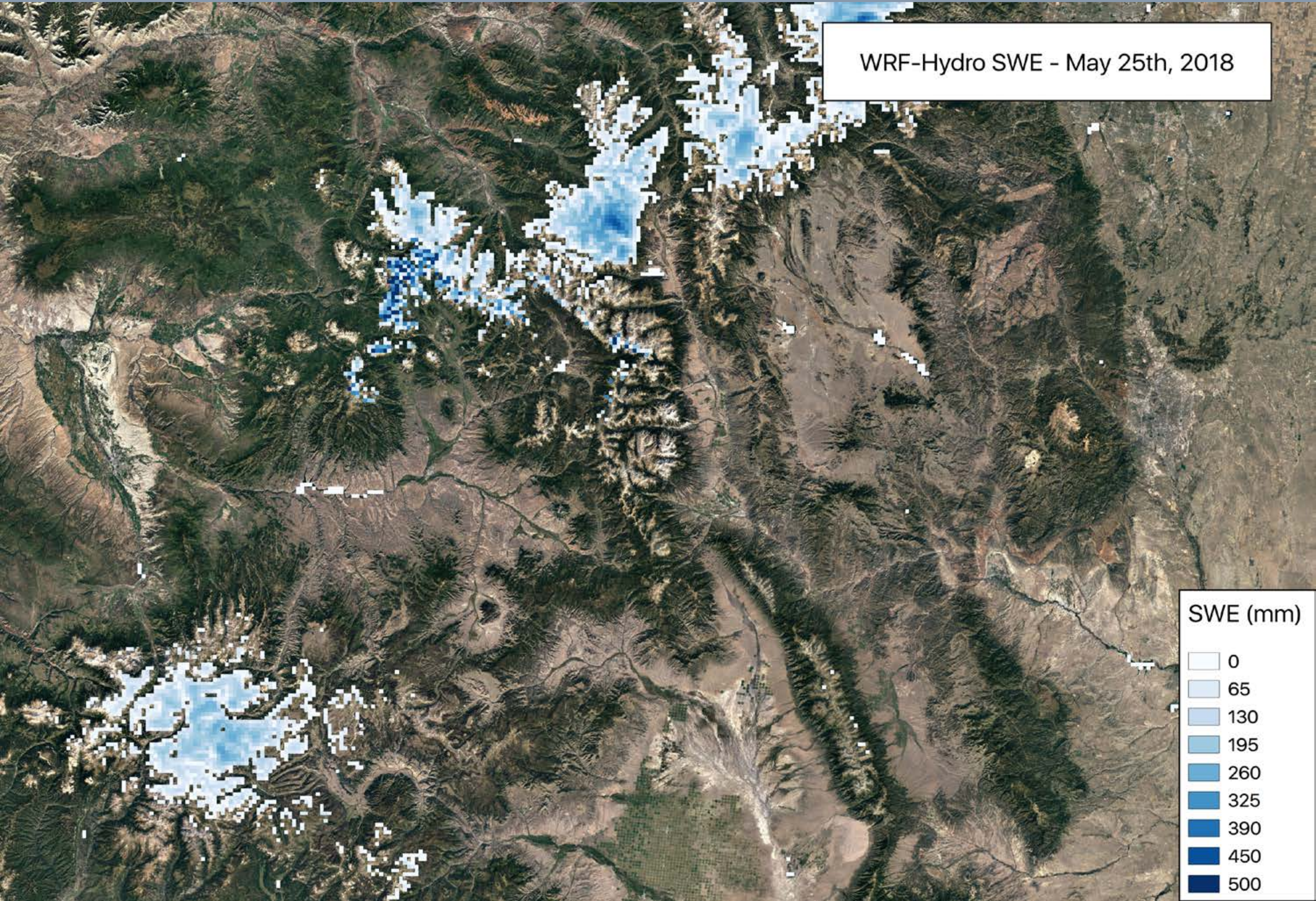
2018 Airborne Survey Observations



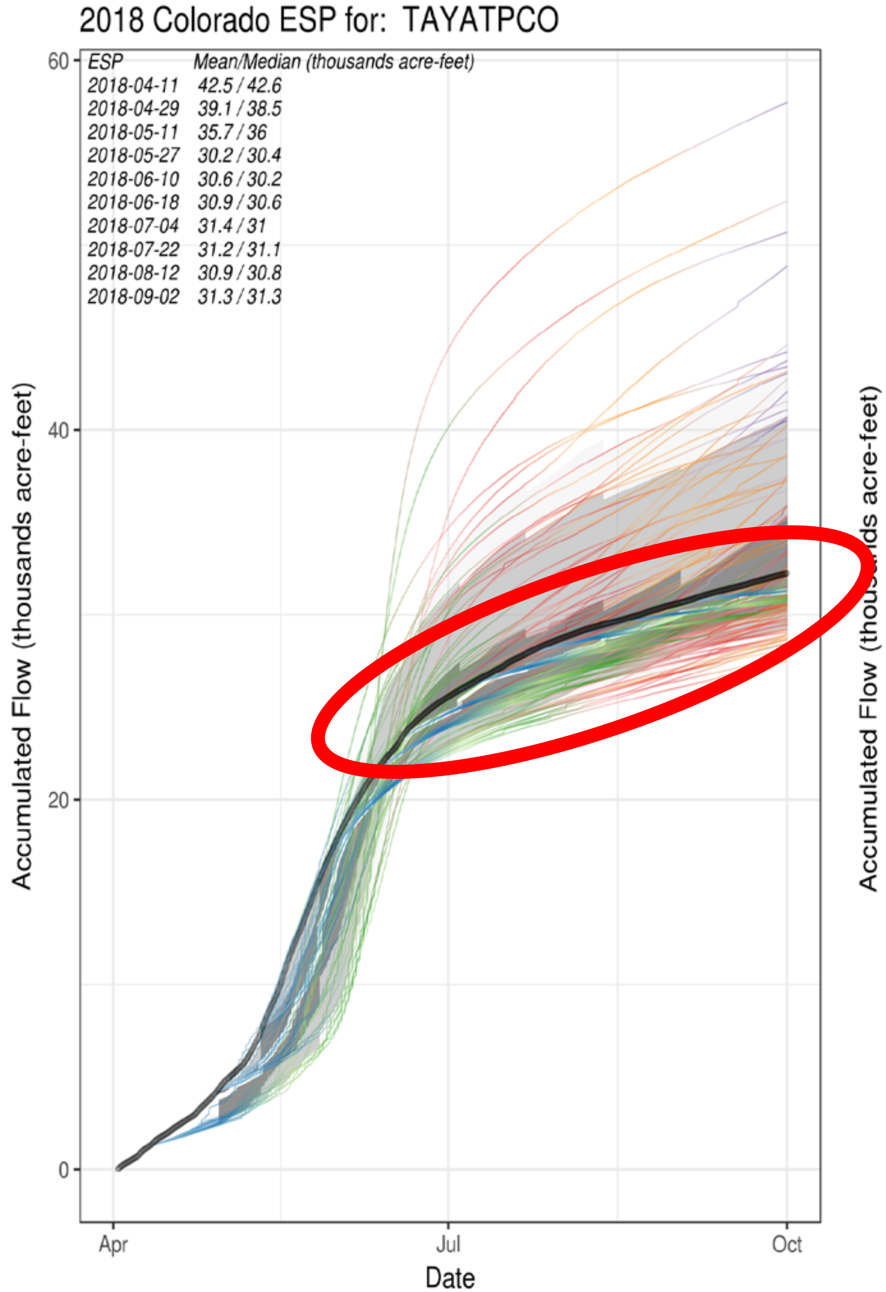
2018 Ensemble Predictions

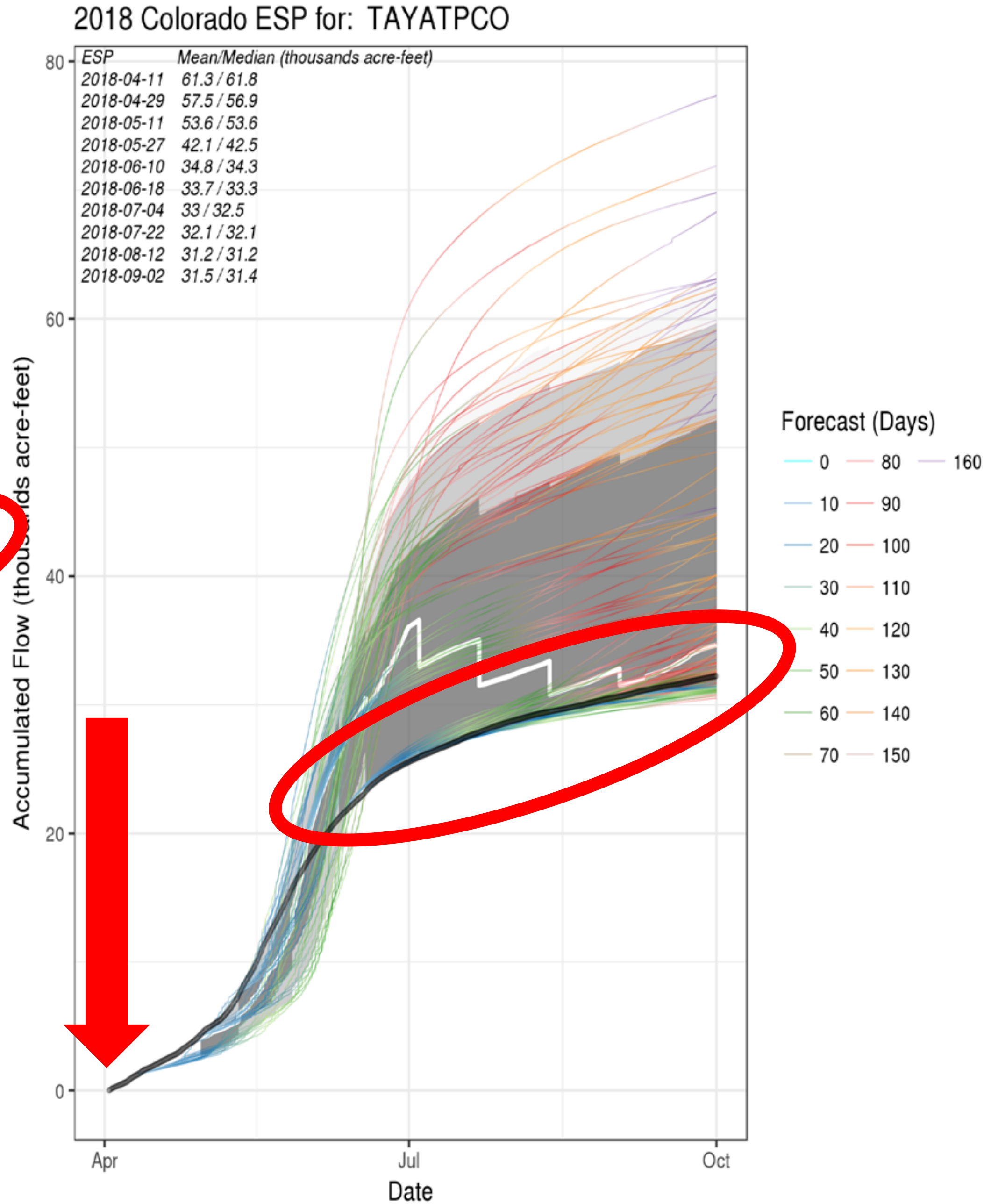


ASO Direct Insertion

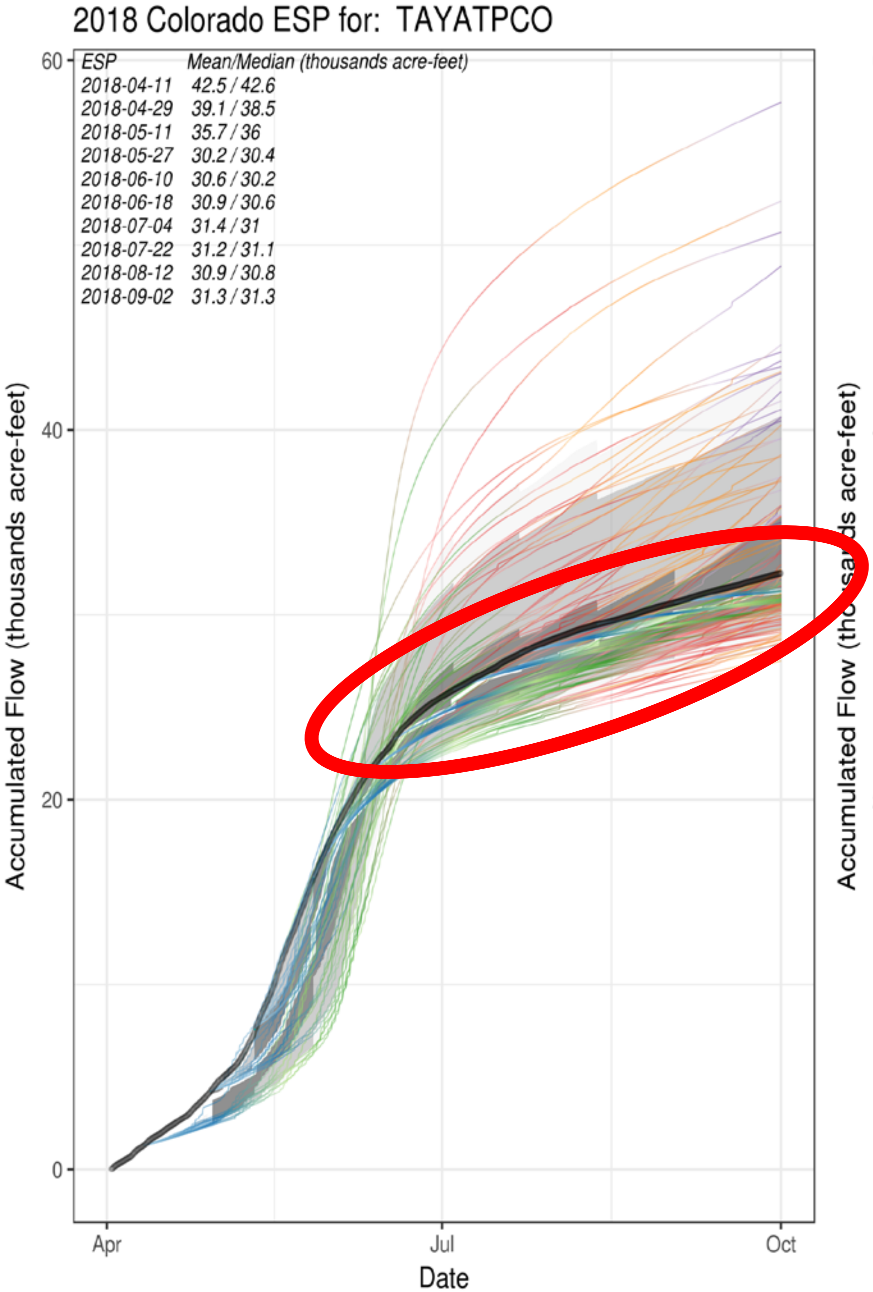


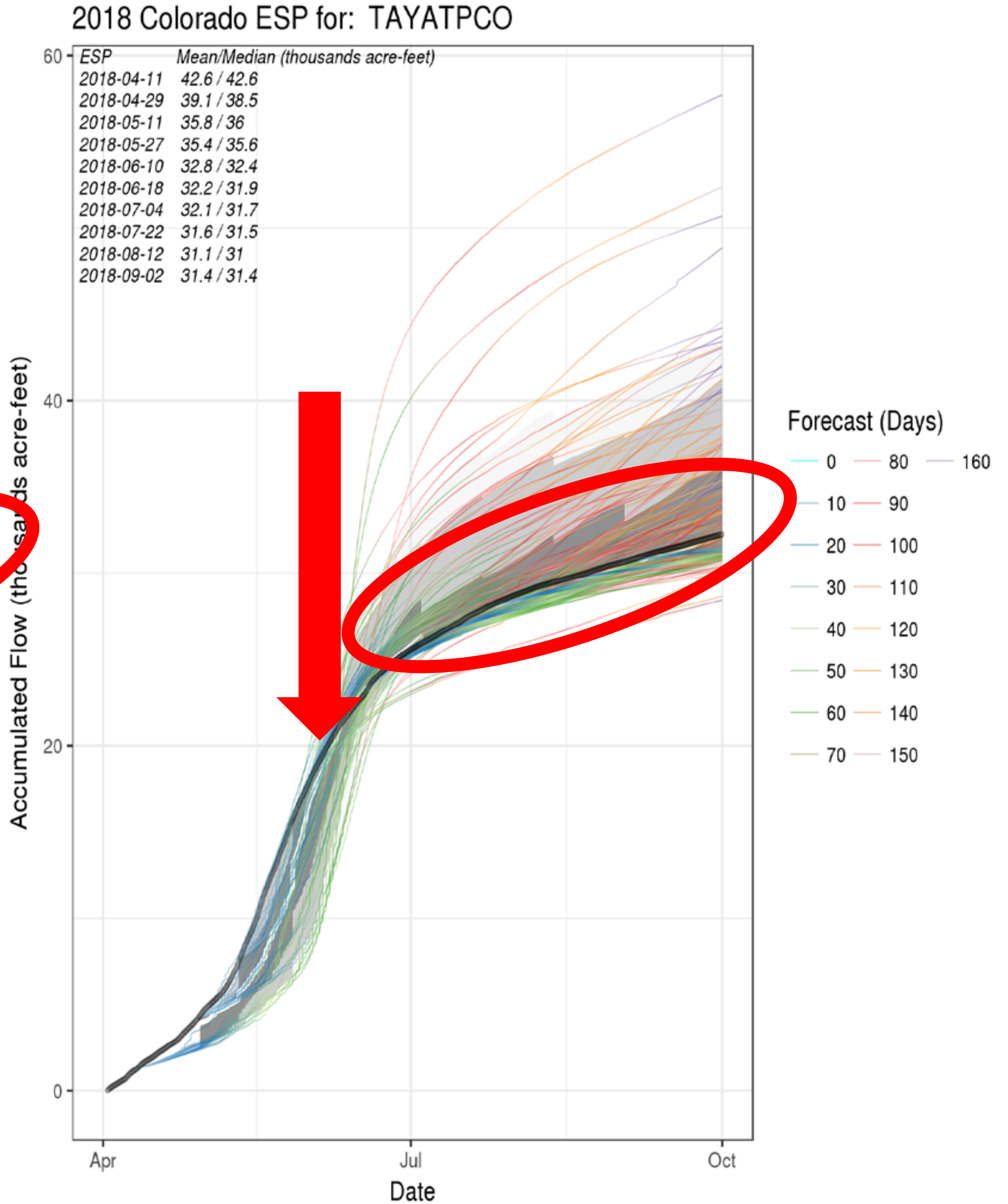
ASO Direct Insertion – Taylor Park March Assimilation



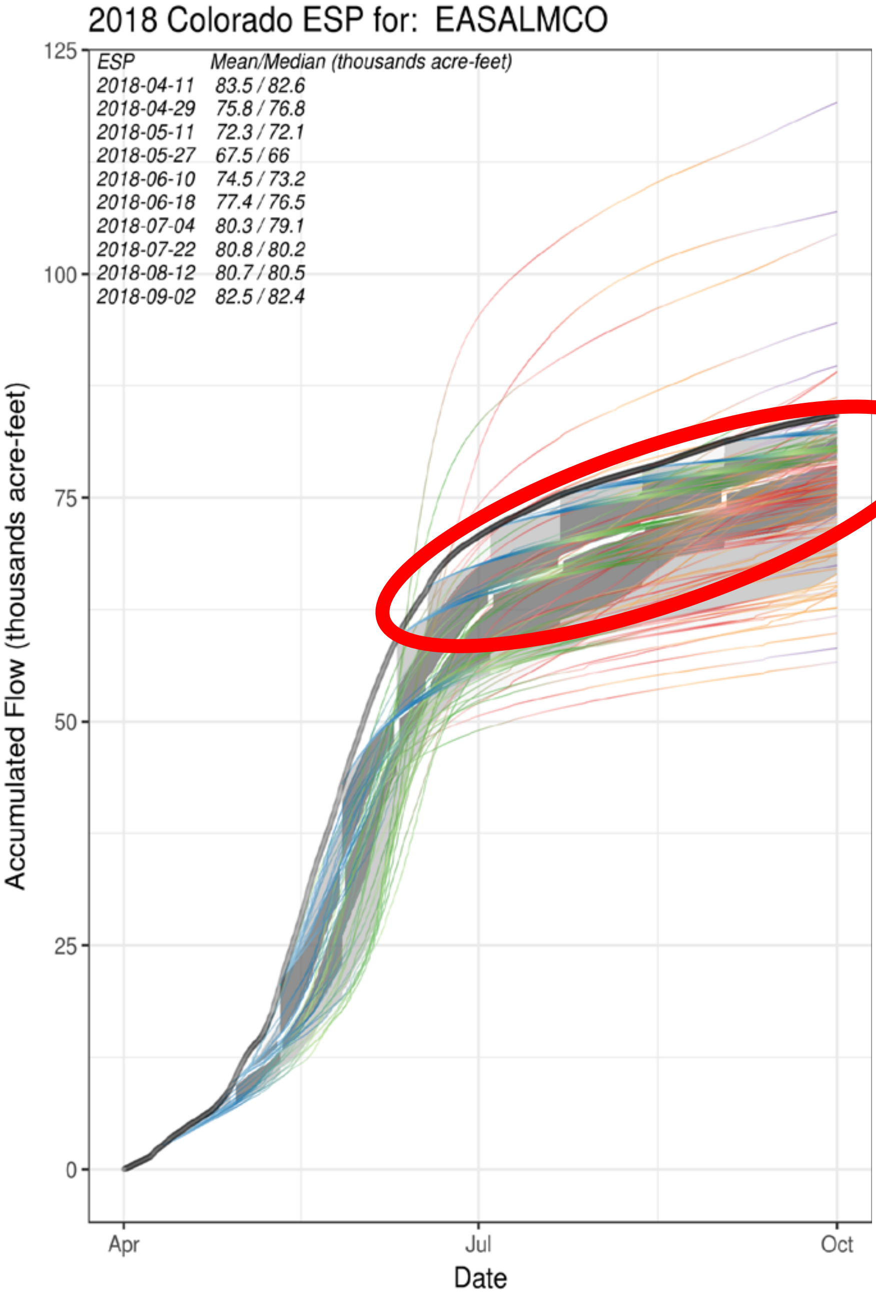


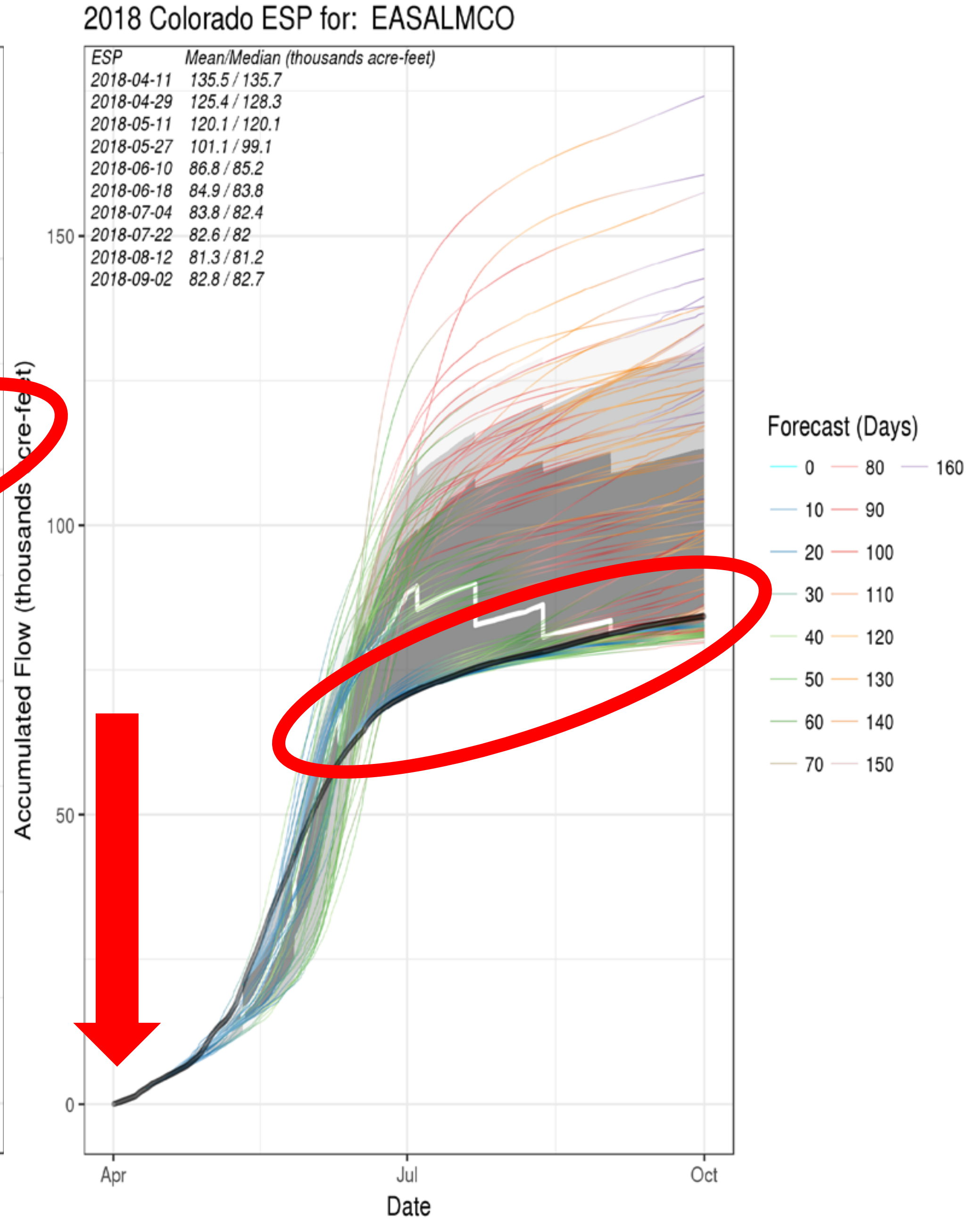
ASO Direct Insertion – Taylor Park May Assimilation



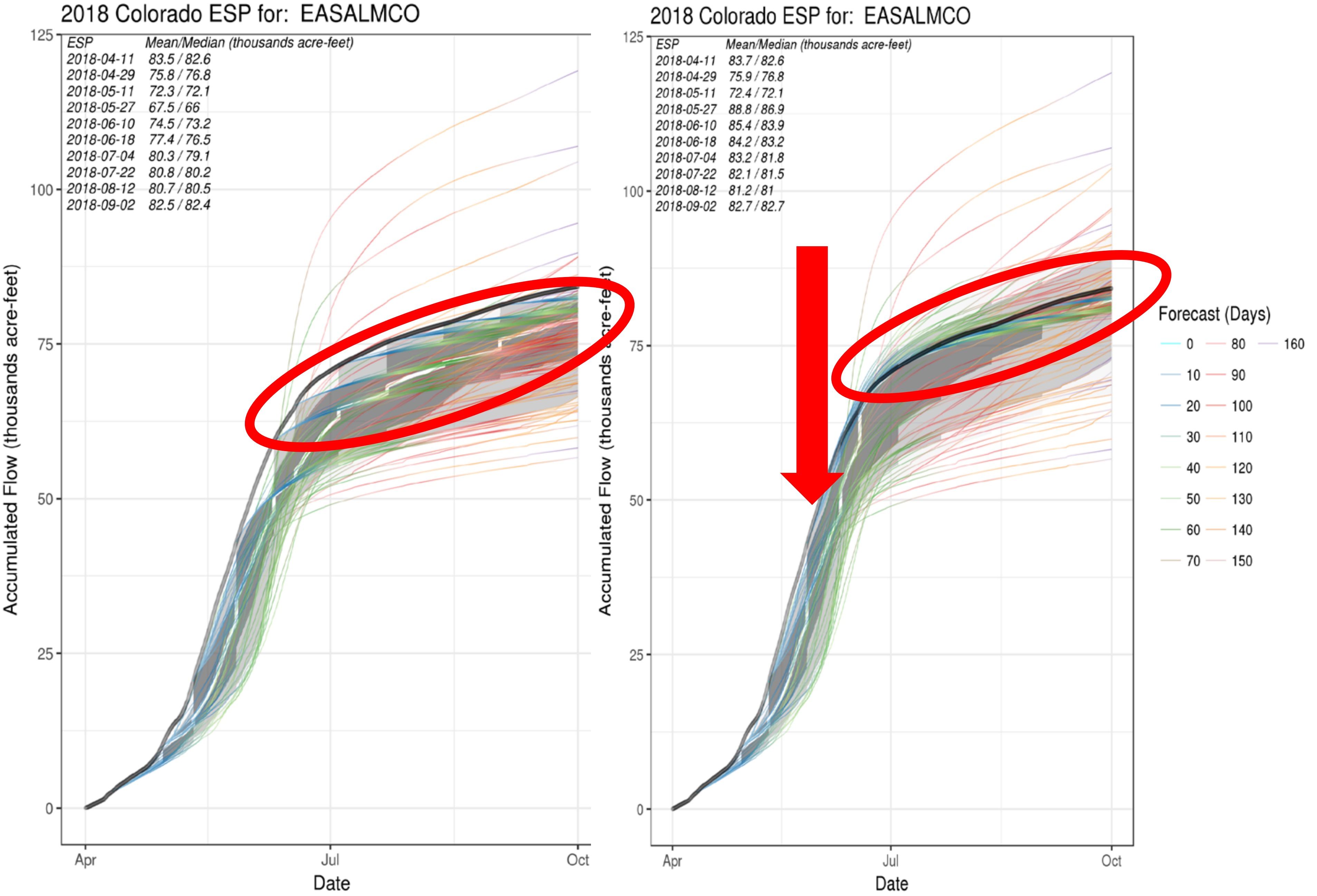


ASO Direct Insertion – East River March Assimilation

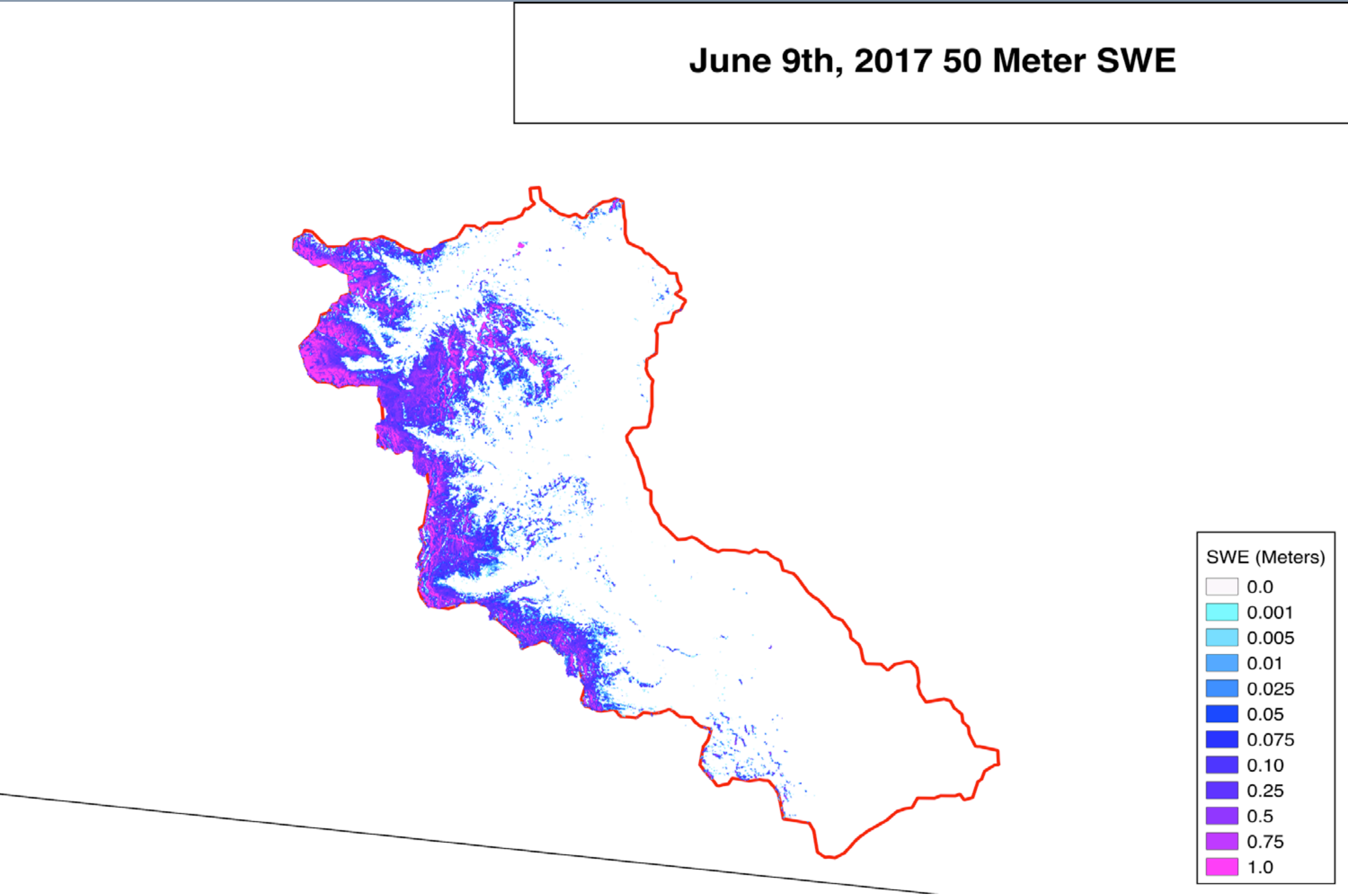




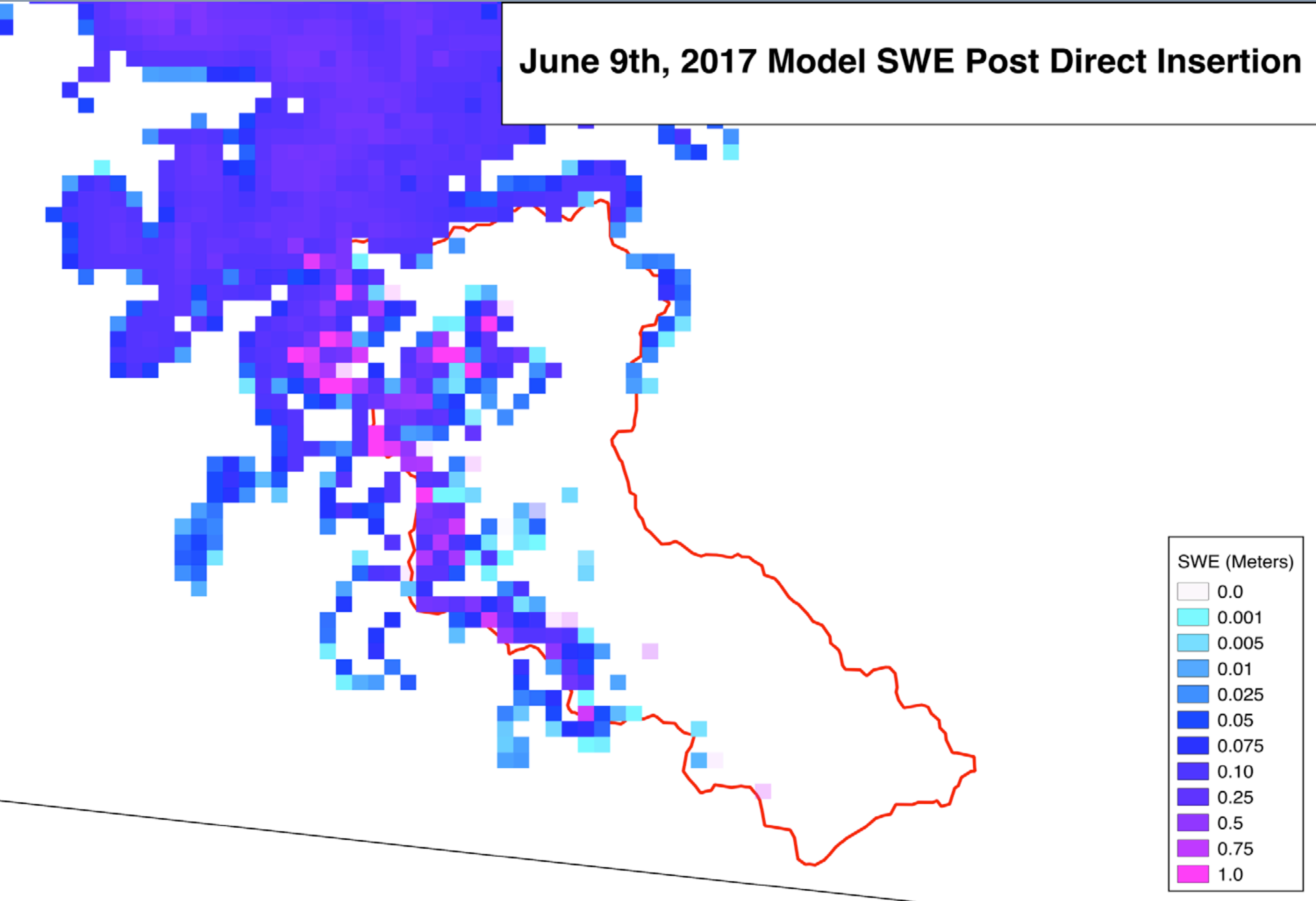
ASO Direct Insertion – East River May Assimilation



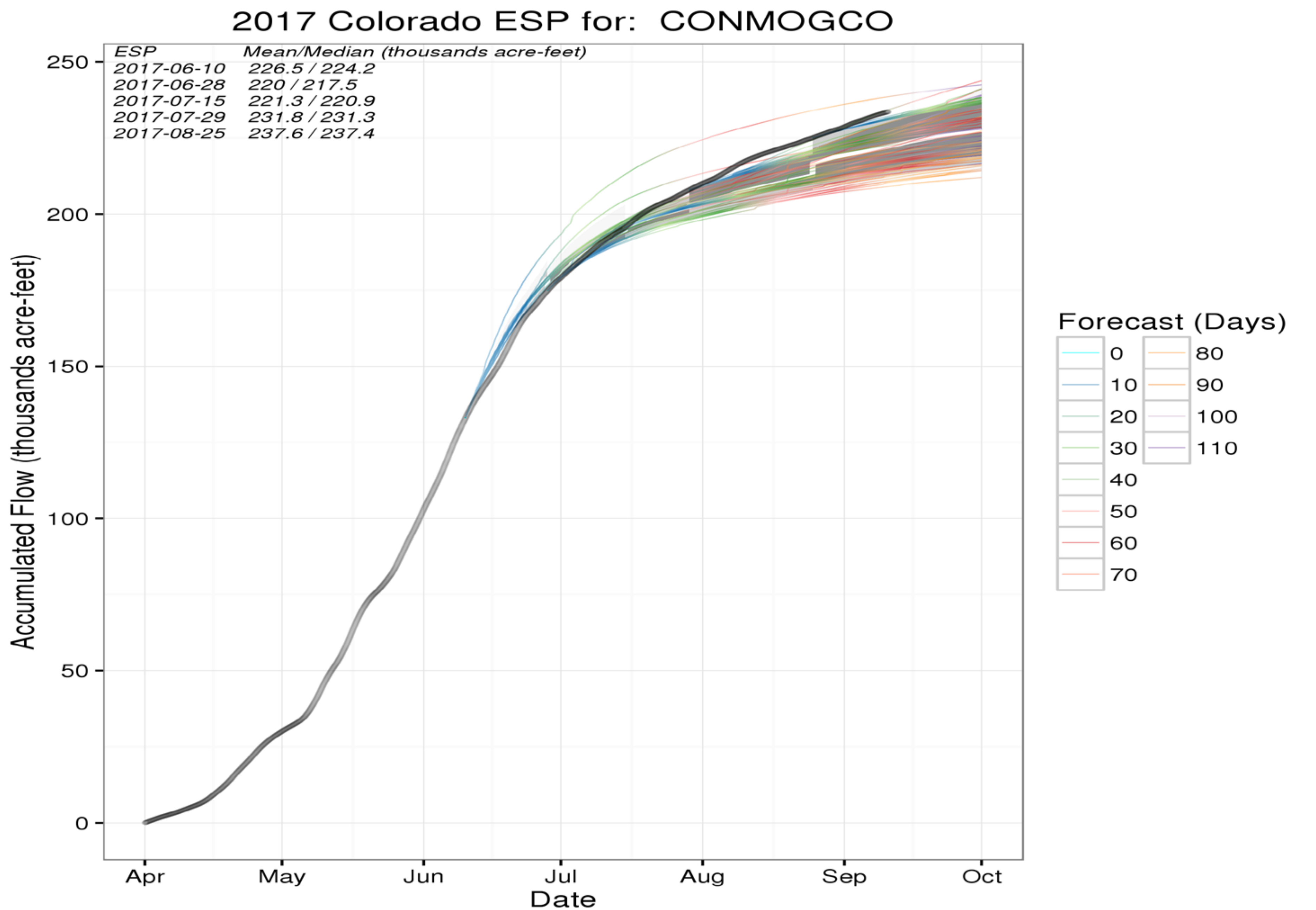
ASO Direct Insertion – Conejos Basin



ASO Direct Insertion – Conejos Basin



ASO Direct Insertion – Conejos Basin



Next Steps

- Continue incorporating additional remote sensing products into analysis and assimilation frameworks
- Continue exploring snow data assimilation methods within the modeling framework
- Explore the use of remotely sensed snow observations for use in calibration of snow-related parameters in model

NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Questions?

- Community WRF-Hydro page (Including links to code, training materials) - https://ral.ucar.edu/projects/wrf_hydro/overview
- karsten@ucar.edu