

Sierra Nevada & California's water

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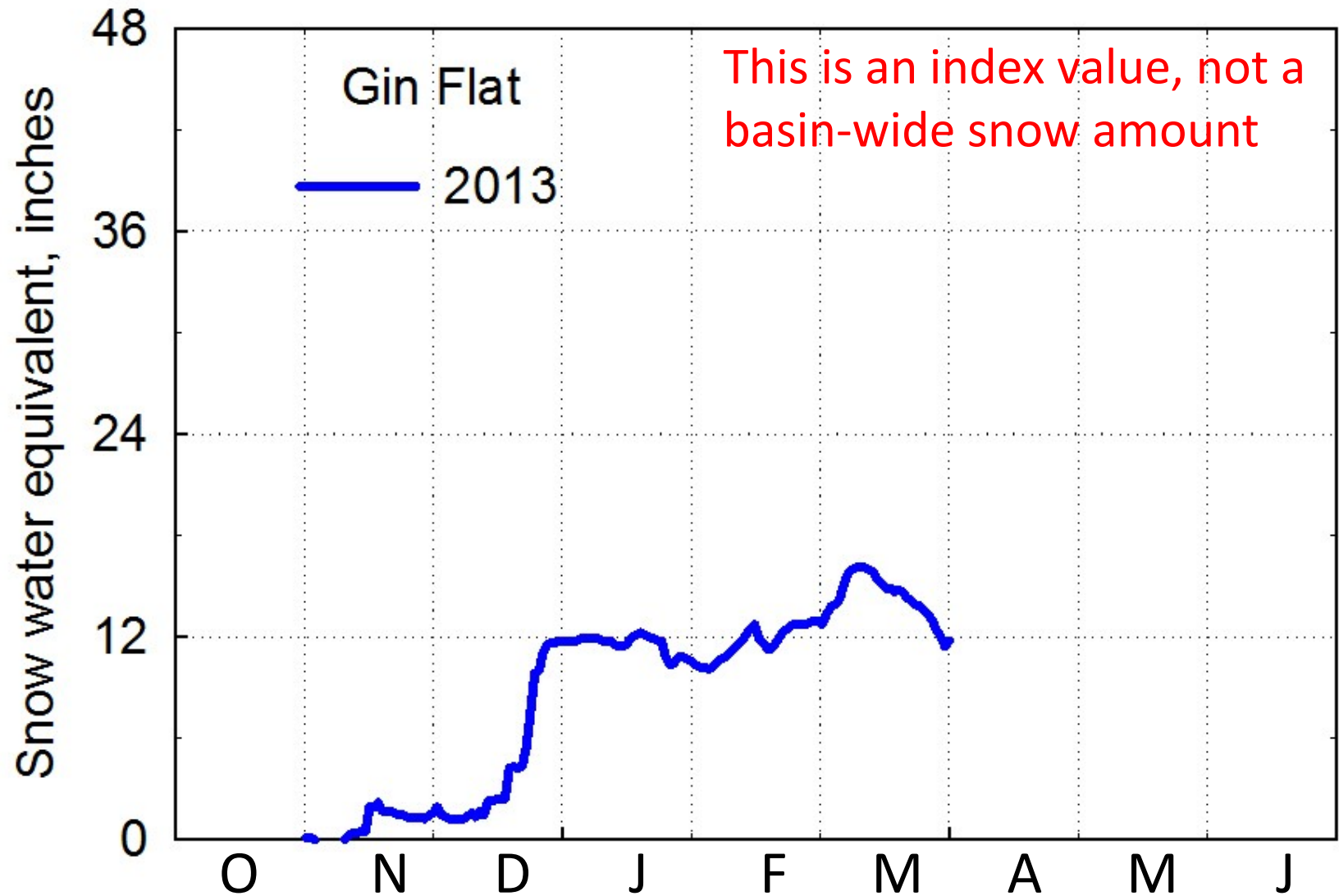
NASA-MODIS
satellite image

Fast facts (estimates)

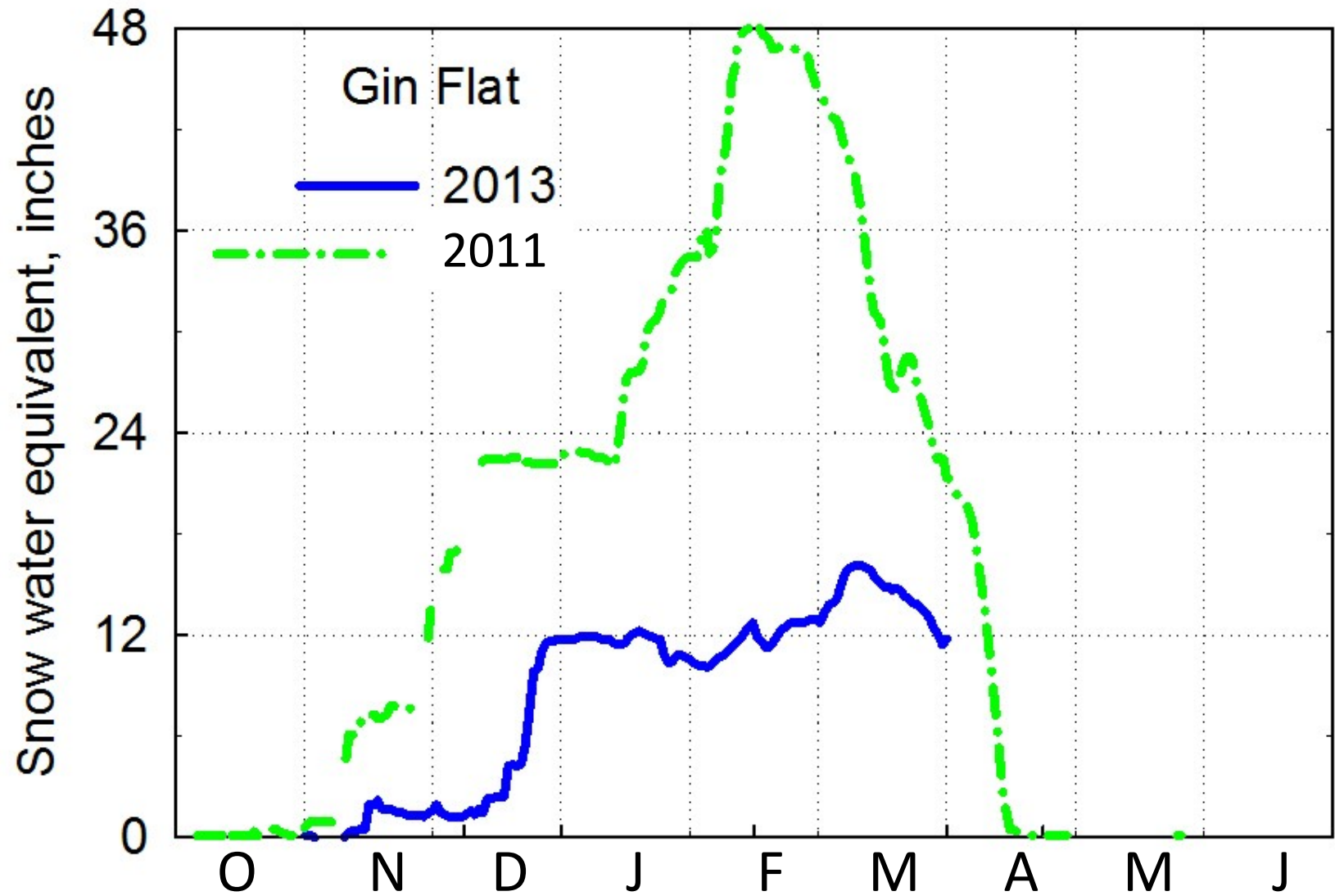


- About 2/3 of the precipitation that falls on the Sierra Nevada is evaporated/transpired by vegetation & 1/3 runs out in rivers
- In an average year, the Sierra Nevada receives 27% of the state's annual precipitation & provides more than 60% of the state's consumptive use of water

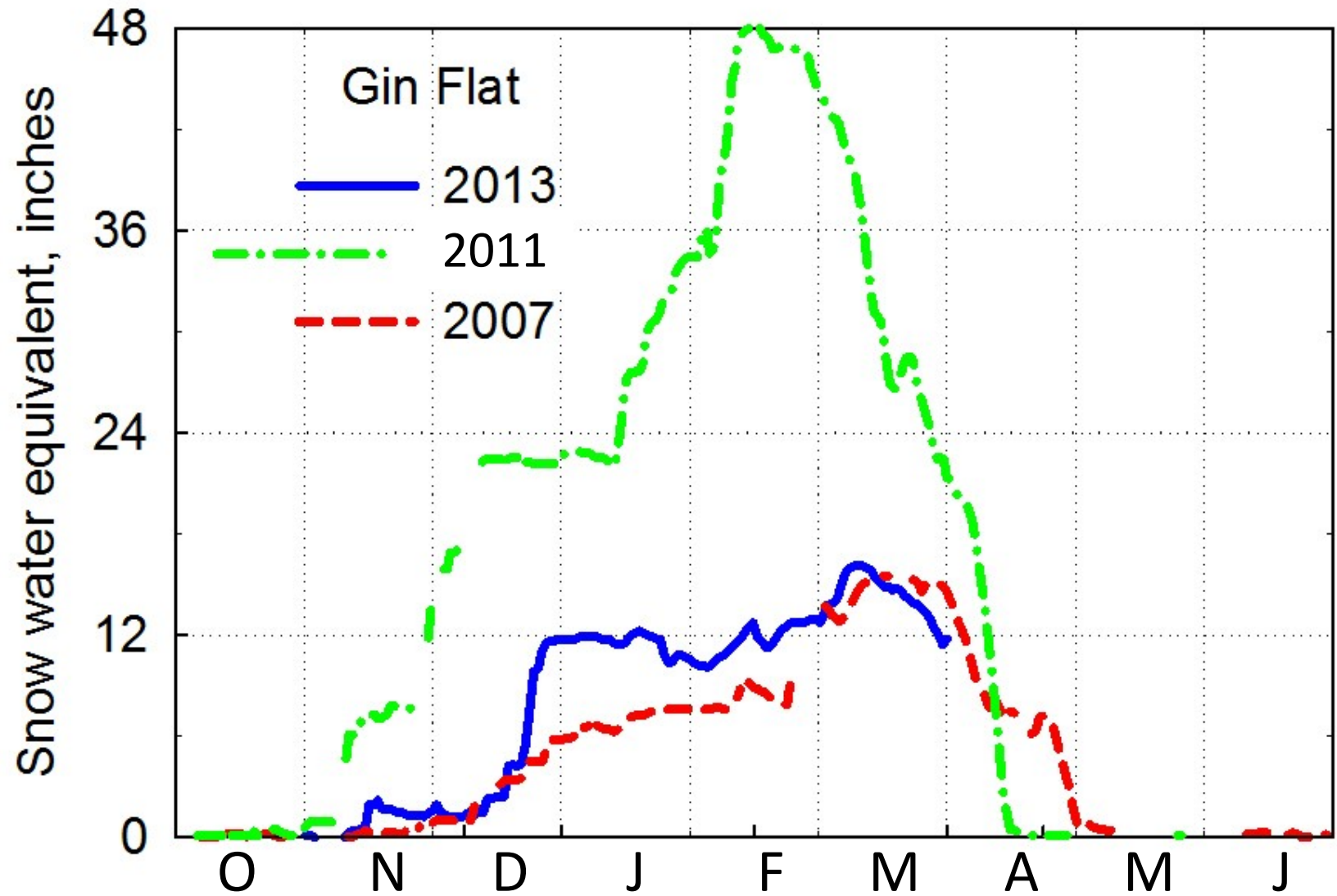
Merced River basin snowpack



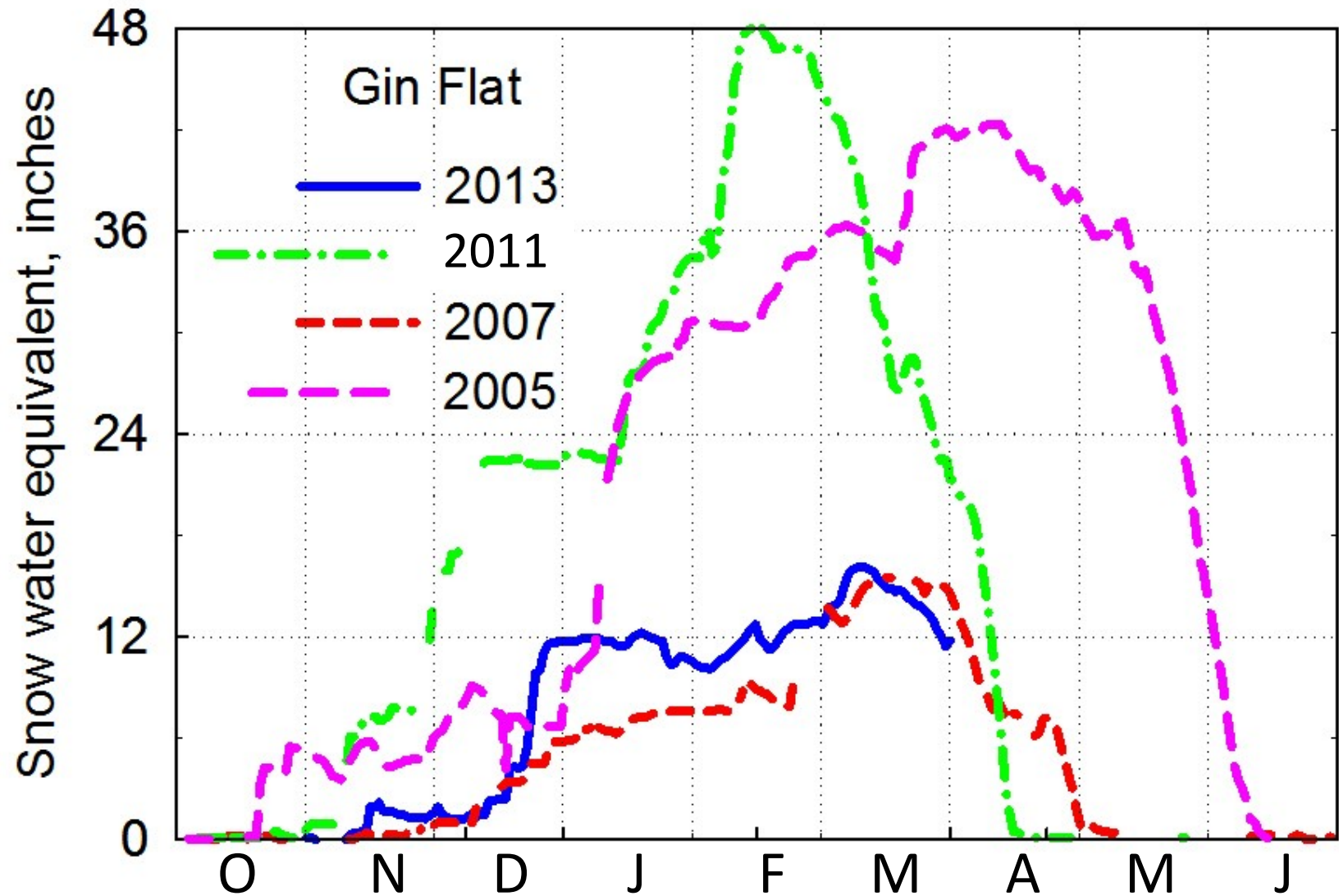
Merced River basin snowpack



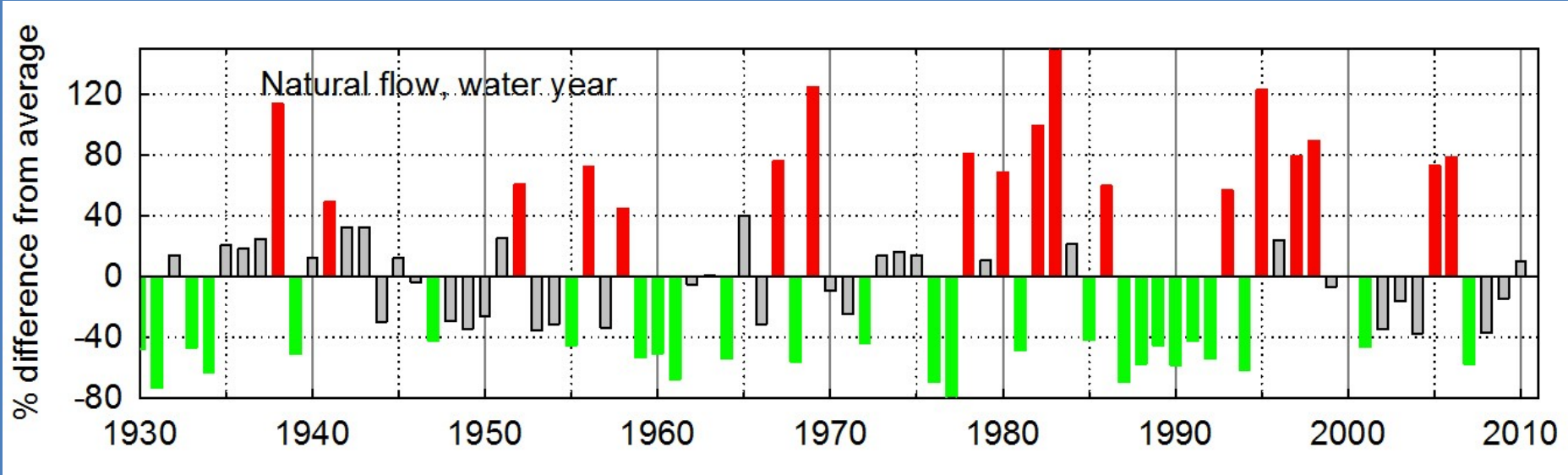
Merced River basin snowpack



Merced River basin snowpack



Merced River streamflow



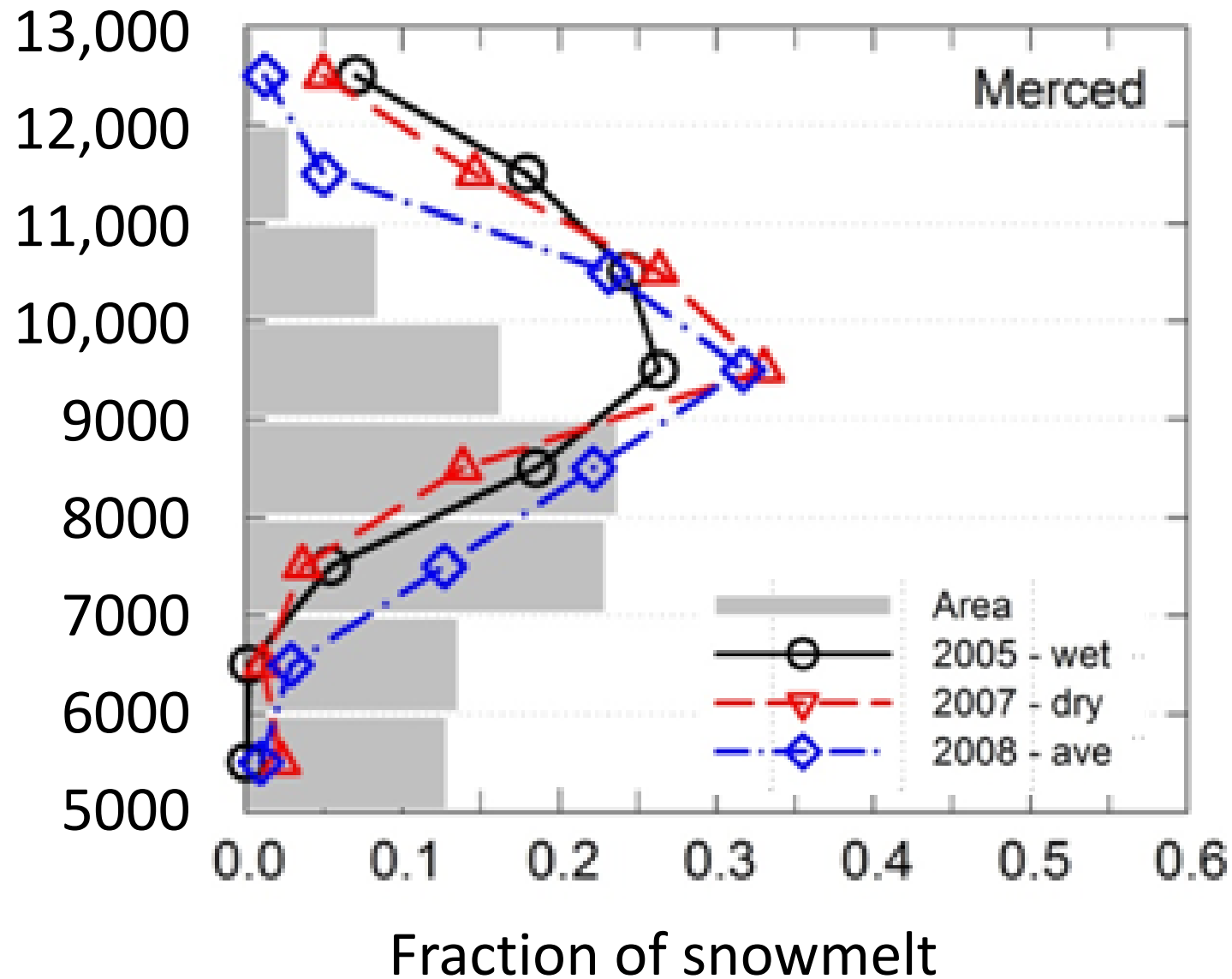
Note that there is considerable interannual variability

Dry years tend to be over-forecast

Wet years tend to be under-forecast

About 75% of the forecasts are within $\pm 20\%$ of observed

What elevations provide the most snowmelt?



Making a water-secure world – the three I's

INFRASTRUCTURE
to store, transport
& treat water

HARD

Stronger & more-
adaptable
INSTITUTIONS

SOFT

Better & more-
accessible
INFORMATION

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graph TD; I[INFRASTRUCTURE  
to store, transport  
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Water security: the reliable availability of an acceptable quantity & quality of water for health, livelihoods & production, coupled w/ an acceptable level of water-related risks

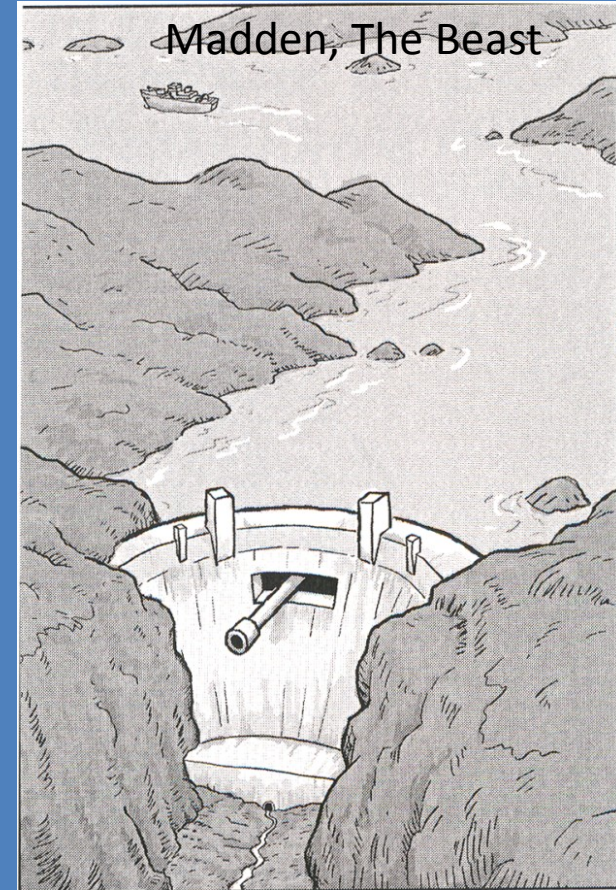
Water security lies at the heart of adaptation to climate change

Includes both:

- ‘hard’ options to capture & control water
- ‘soft’ tools to manage demand as well as increase supply, e.g. water allocation, conservation, efficiency & land-use planning

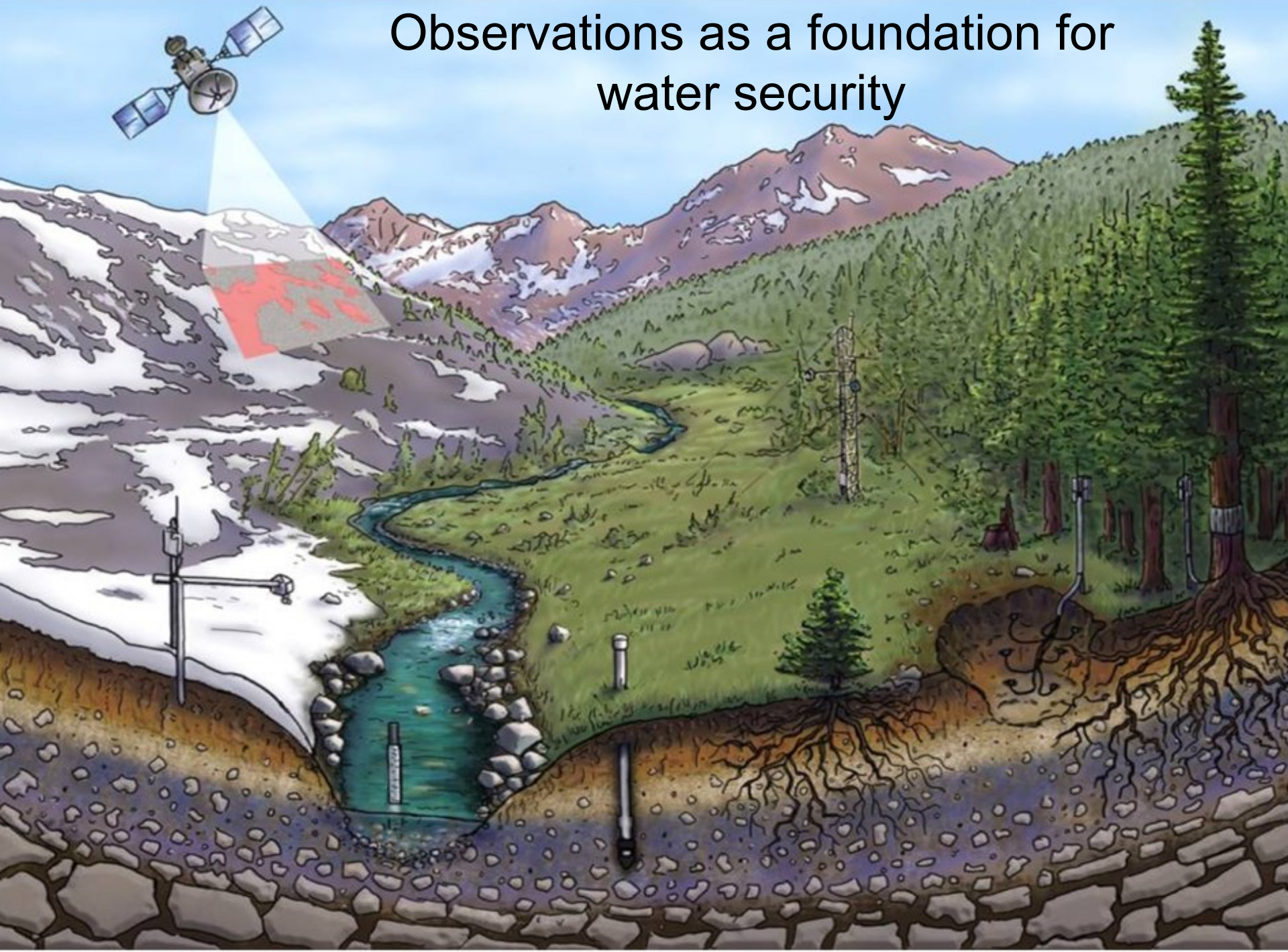
General feeling in the water community that soft opportunities will be insufficient

SNRI is addressing knowledge gaps around water security & sustainability



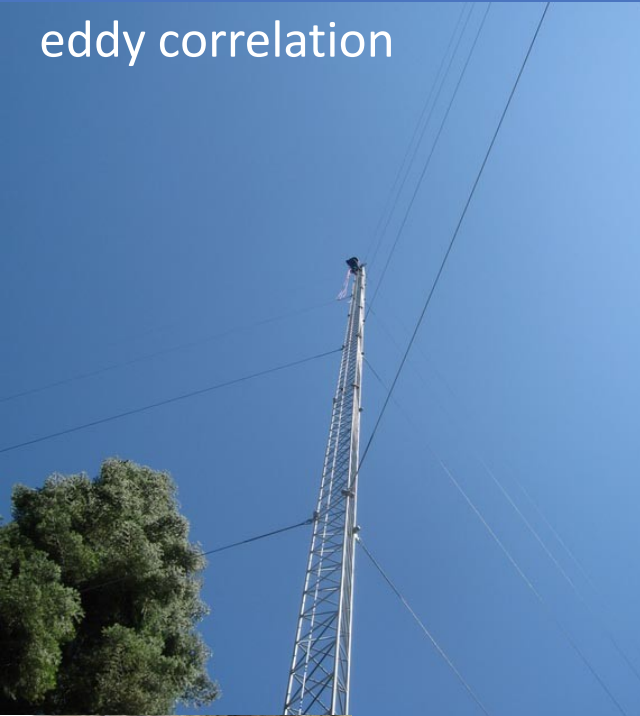
IN THE FUTURE,
WARS WILL BE FOUGHT
OVER WATER

Observations as a foundation for water security



A new generation of integrated measurements

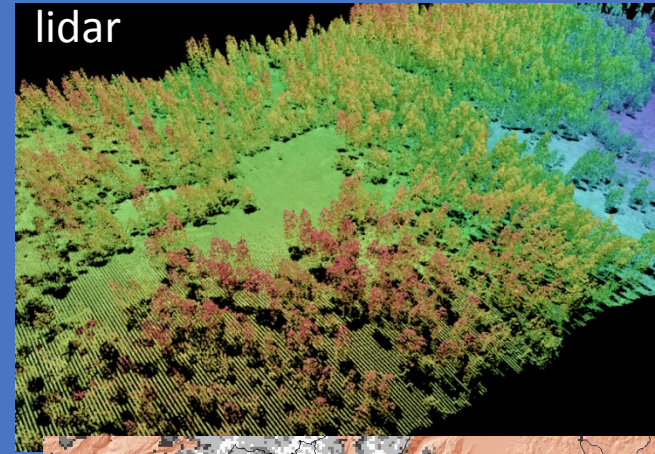
eddy correlation



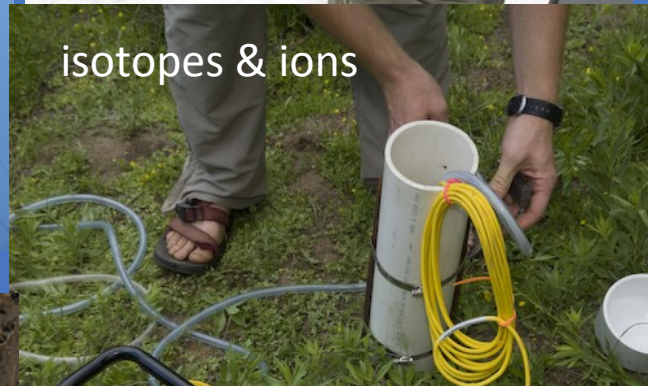
embedded
sensor
networks



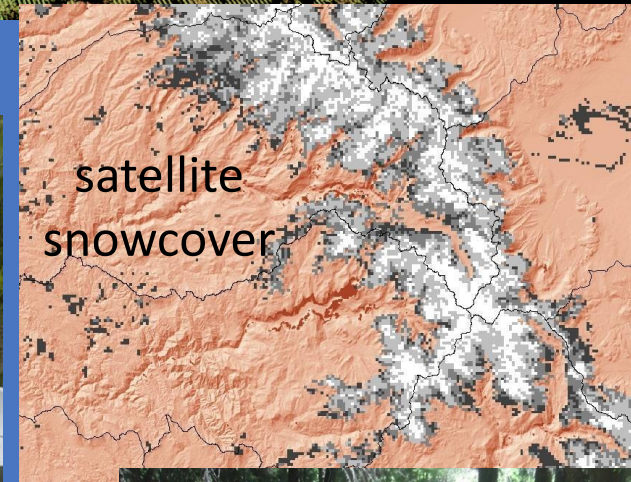
lidar



isotopes & ions



satellite
snowcover



low-cost
sensors



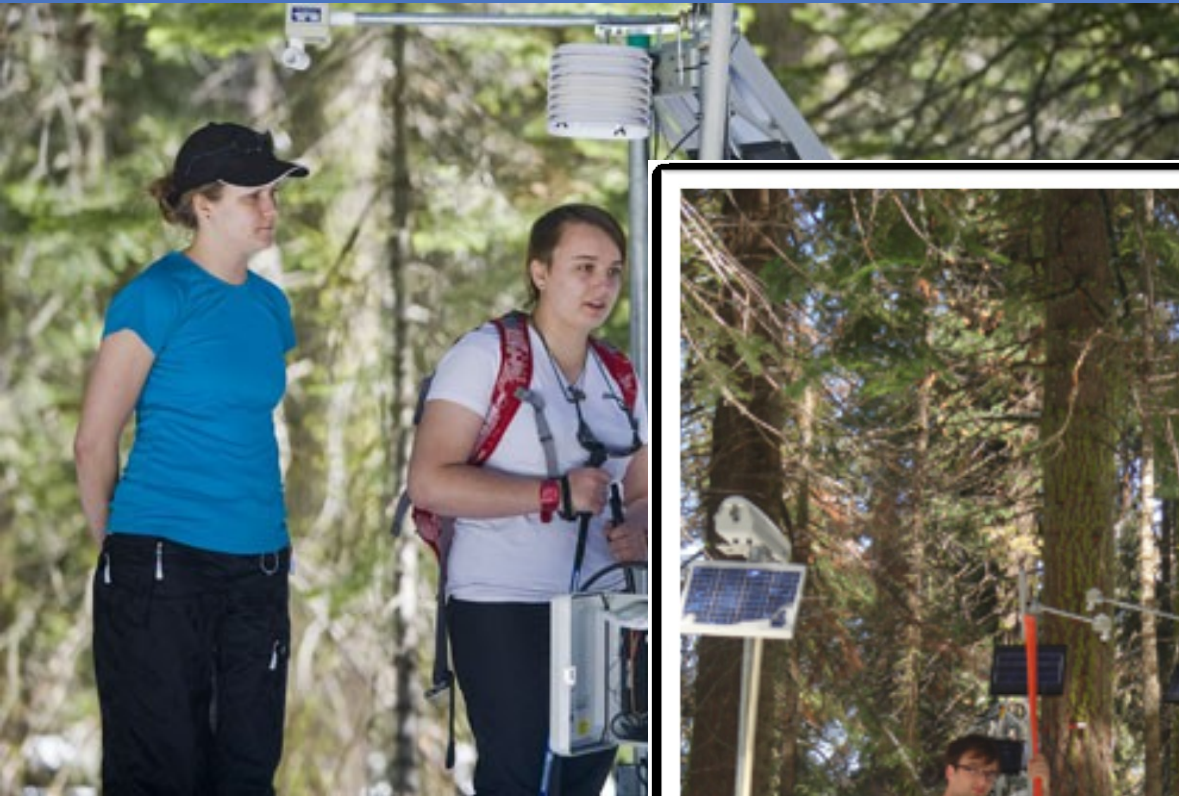
sap flow



sediment



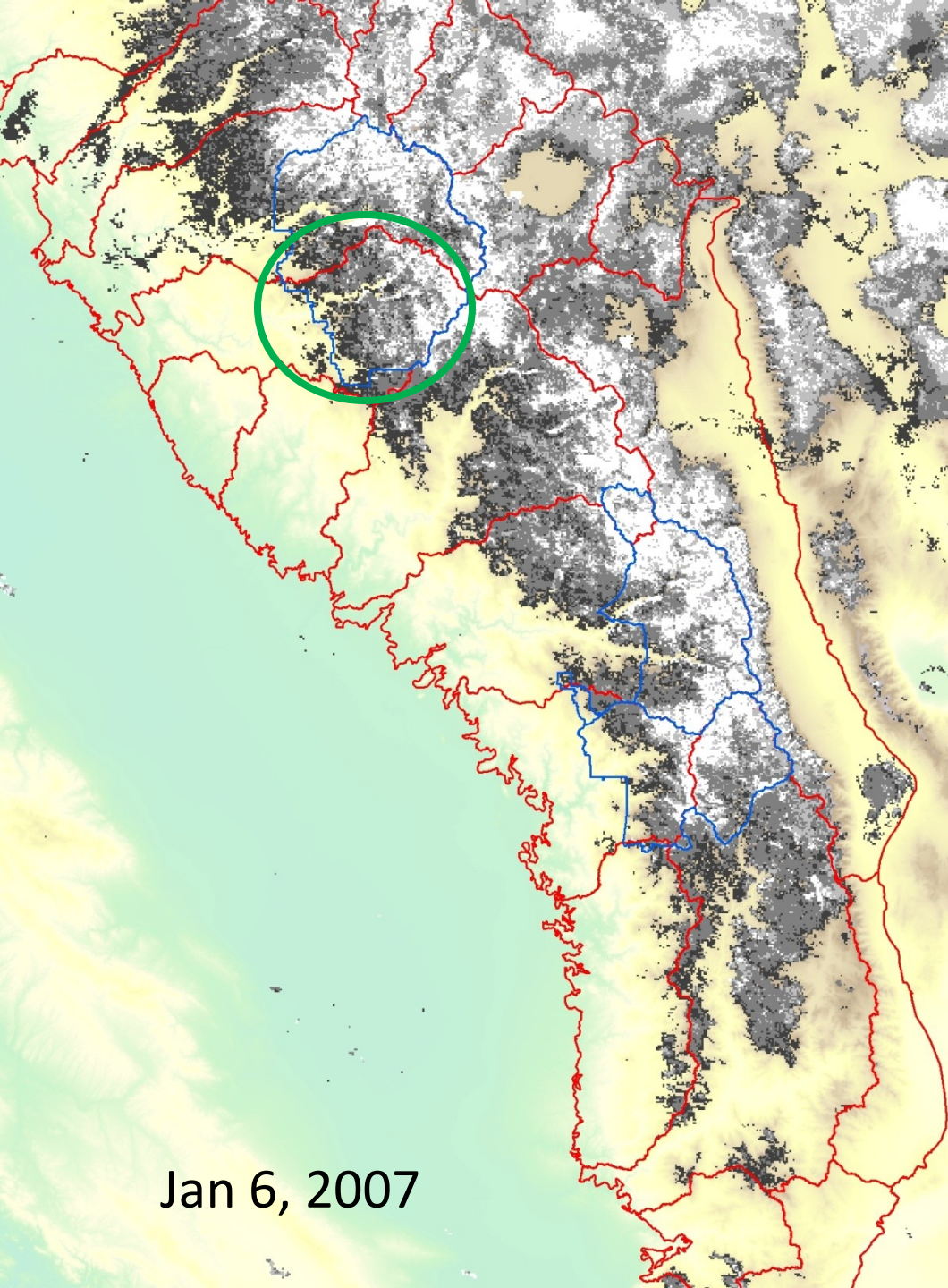
Wireless embedded sensor network nodes



Sensor node



Hopper node



Sierra Nevada fractional snow covered area (SCA) from MODIS satellite

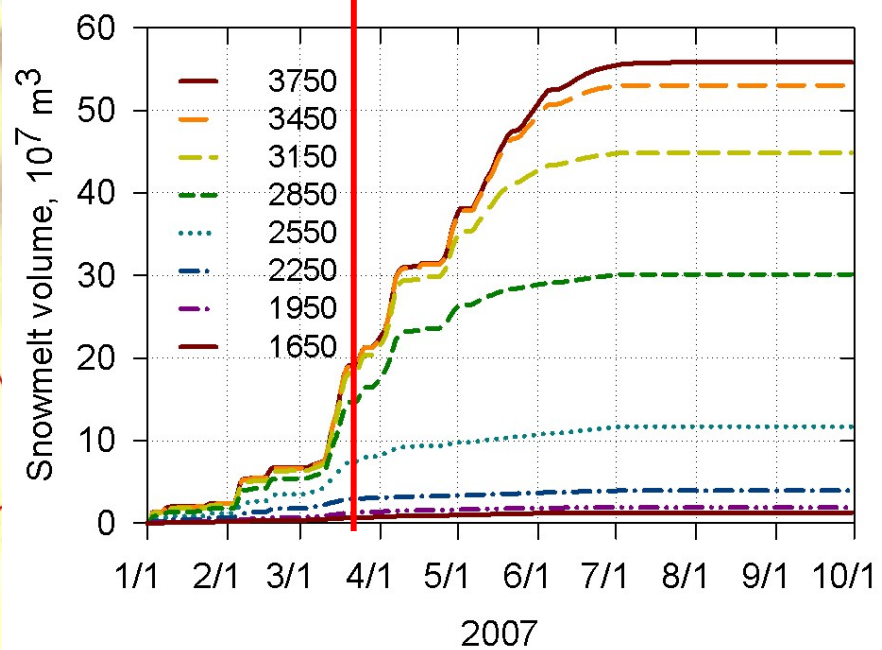
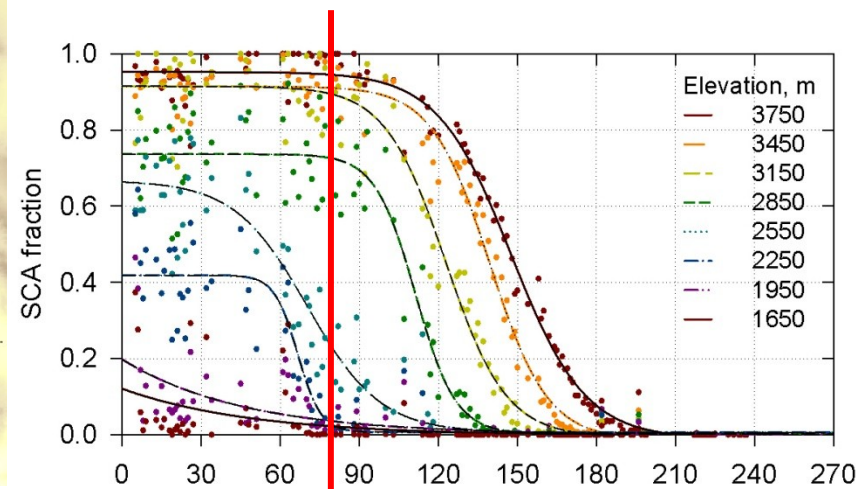
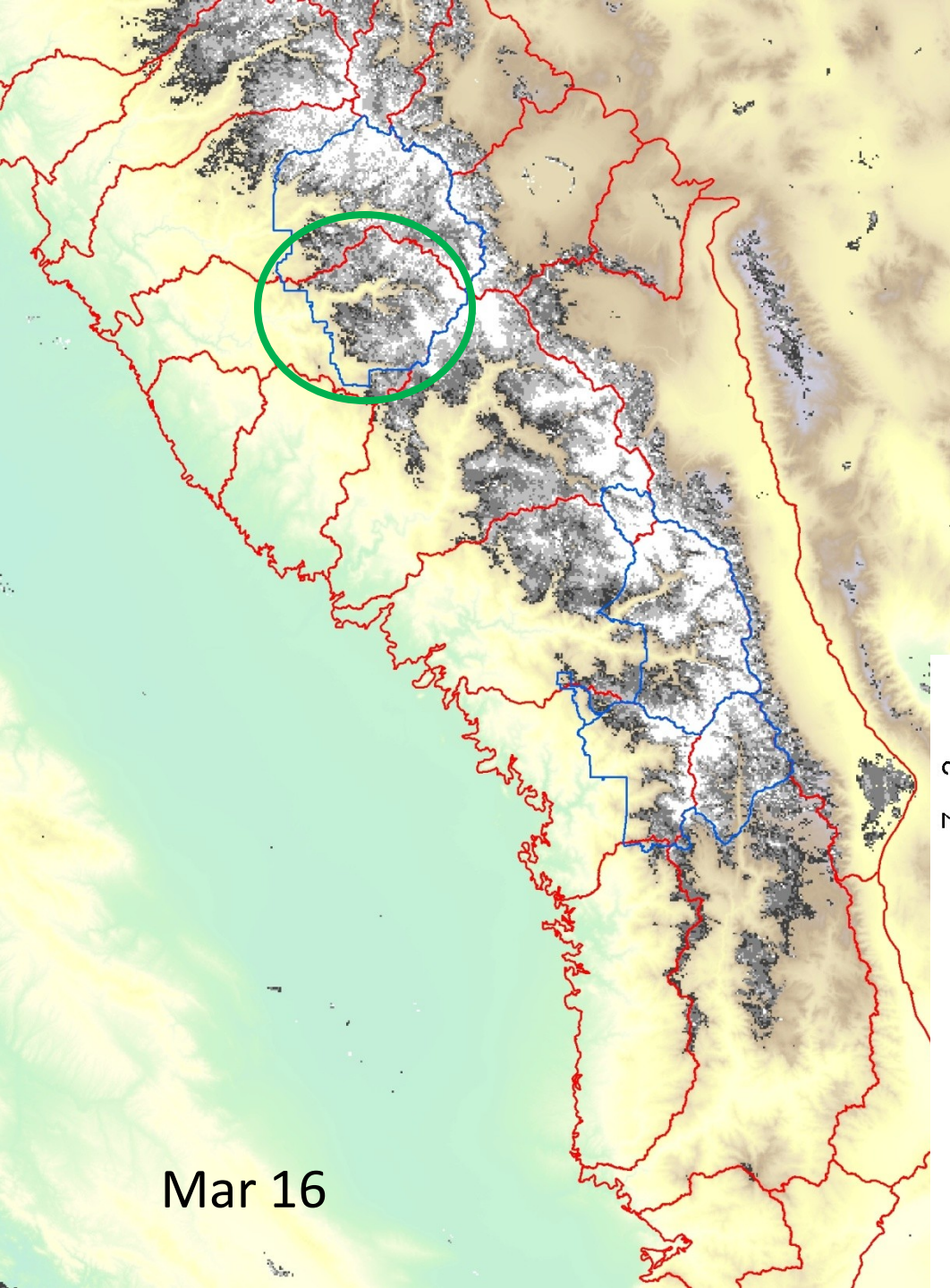
SCA is binned into 4 classes for ease of viewing

Pixel size: 500 m

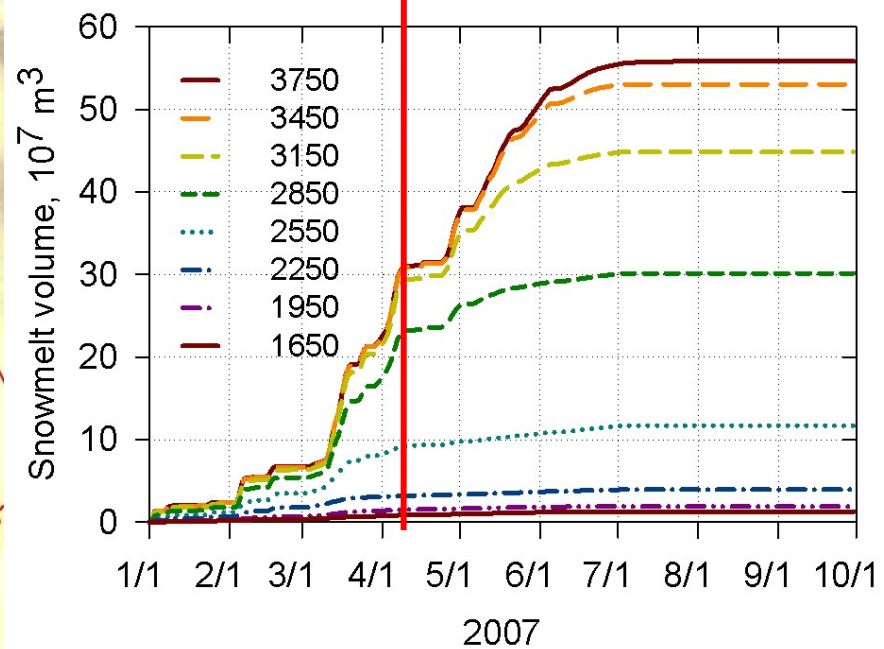
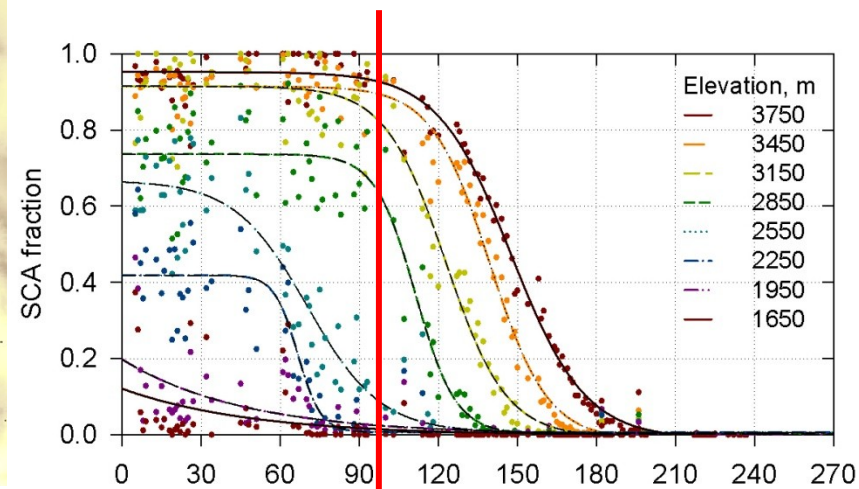
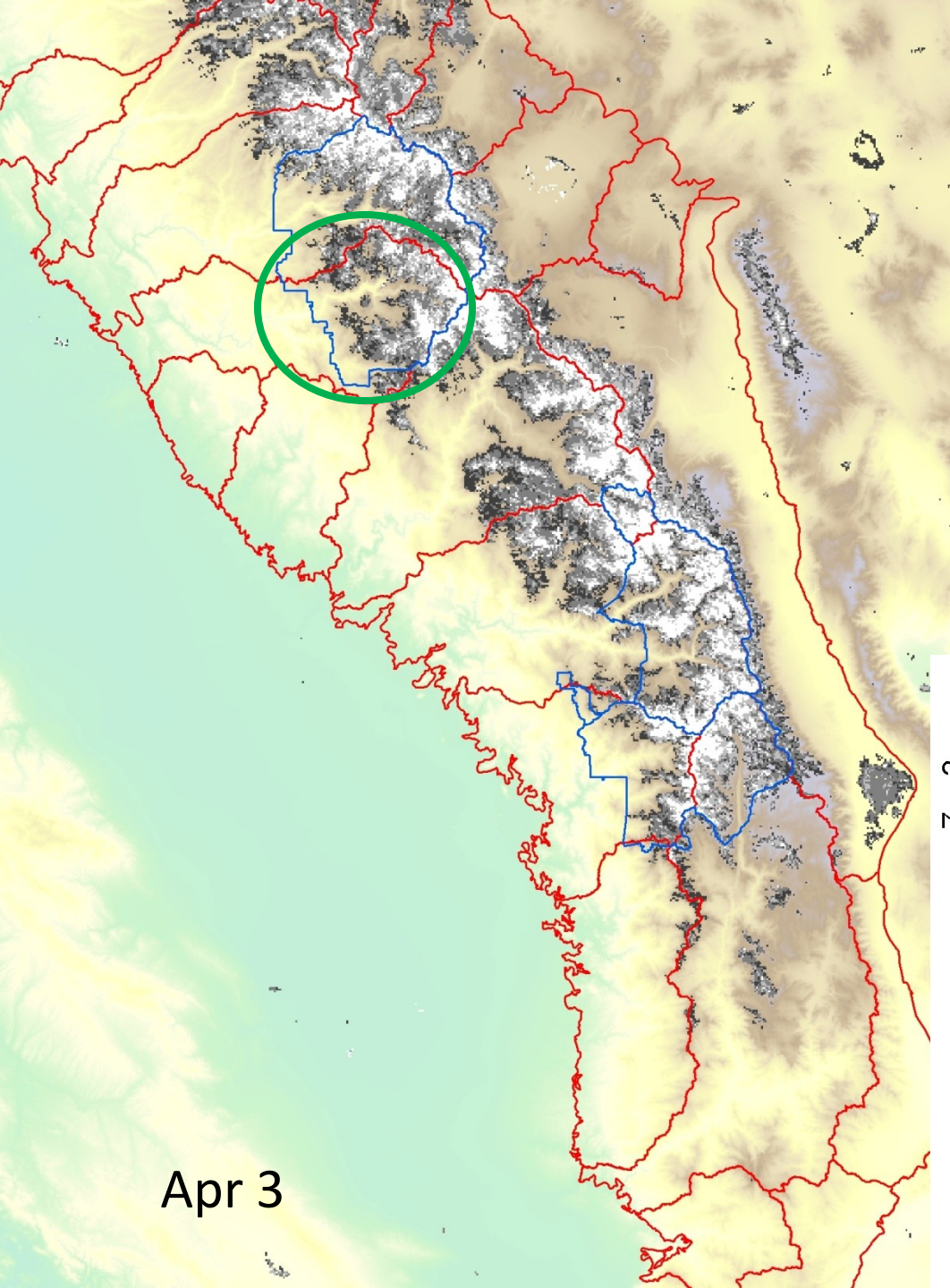
Data available for 2000-present, continuing in future



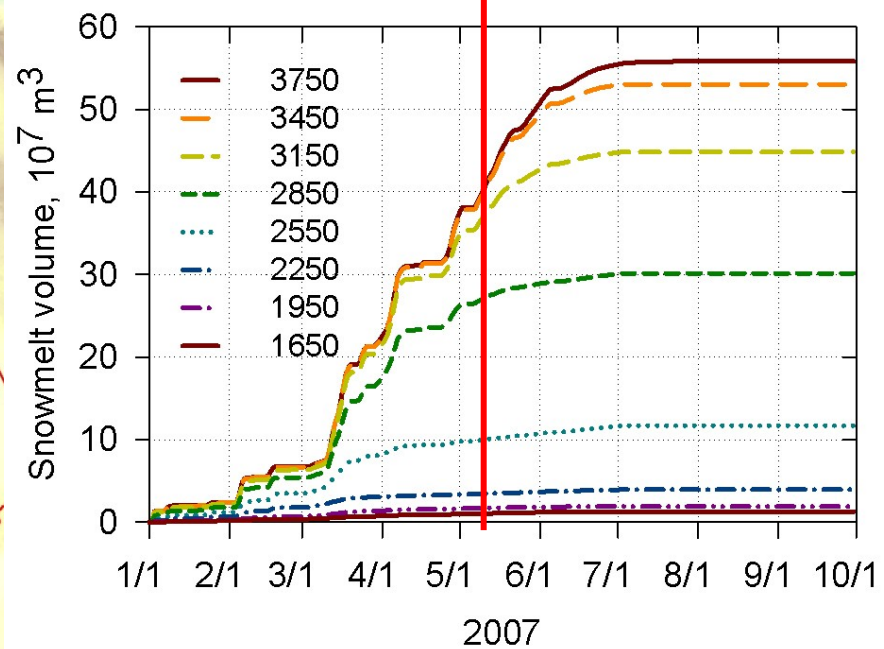
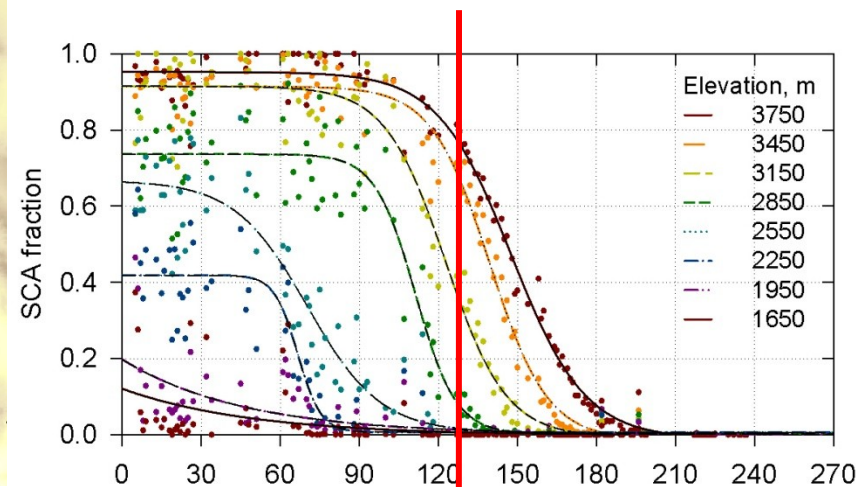
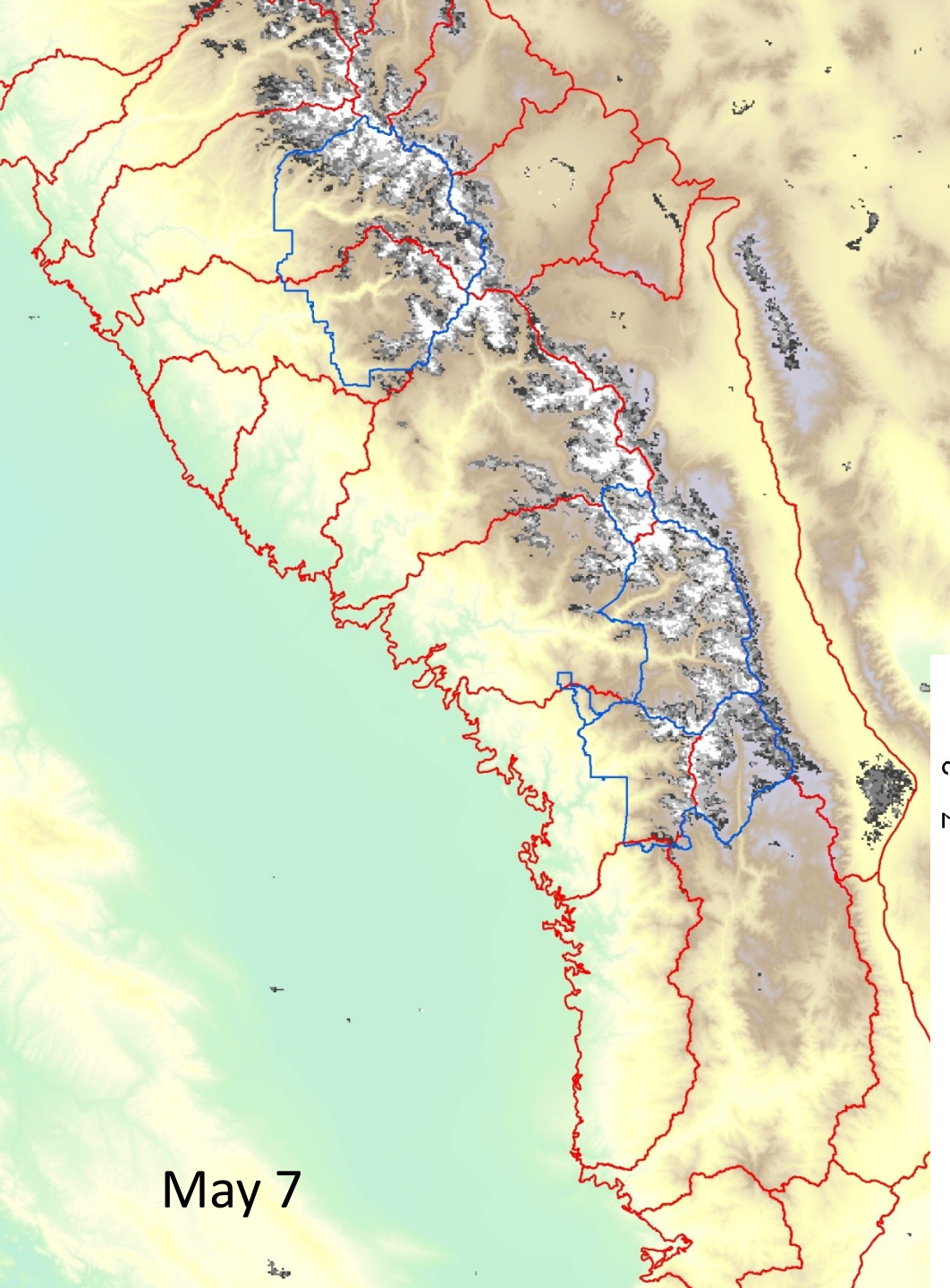
Merced basin SCA & snowmelt volume – 2007



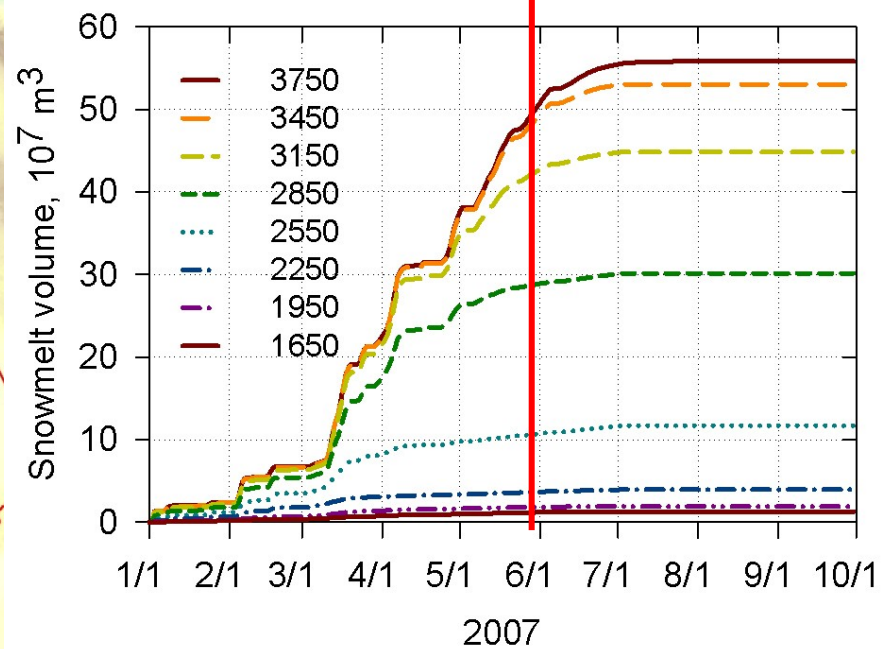
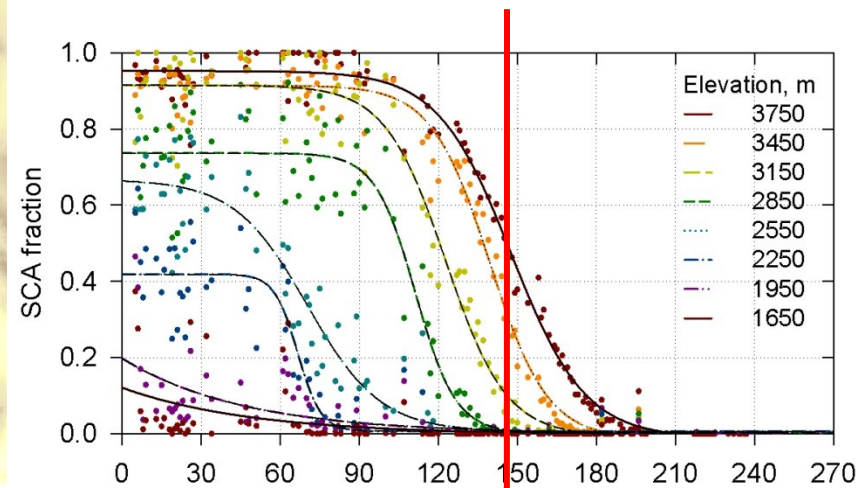
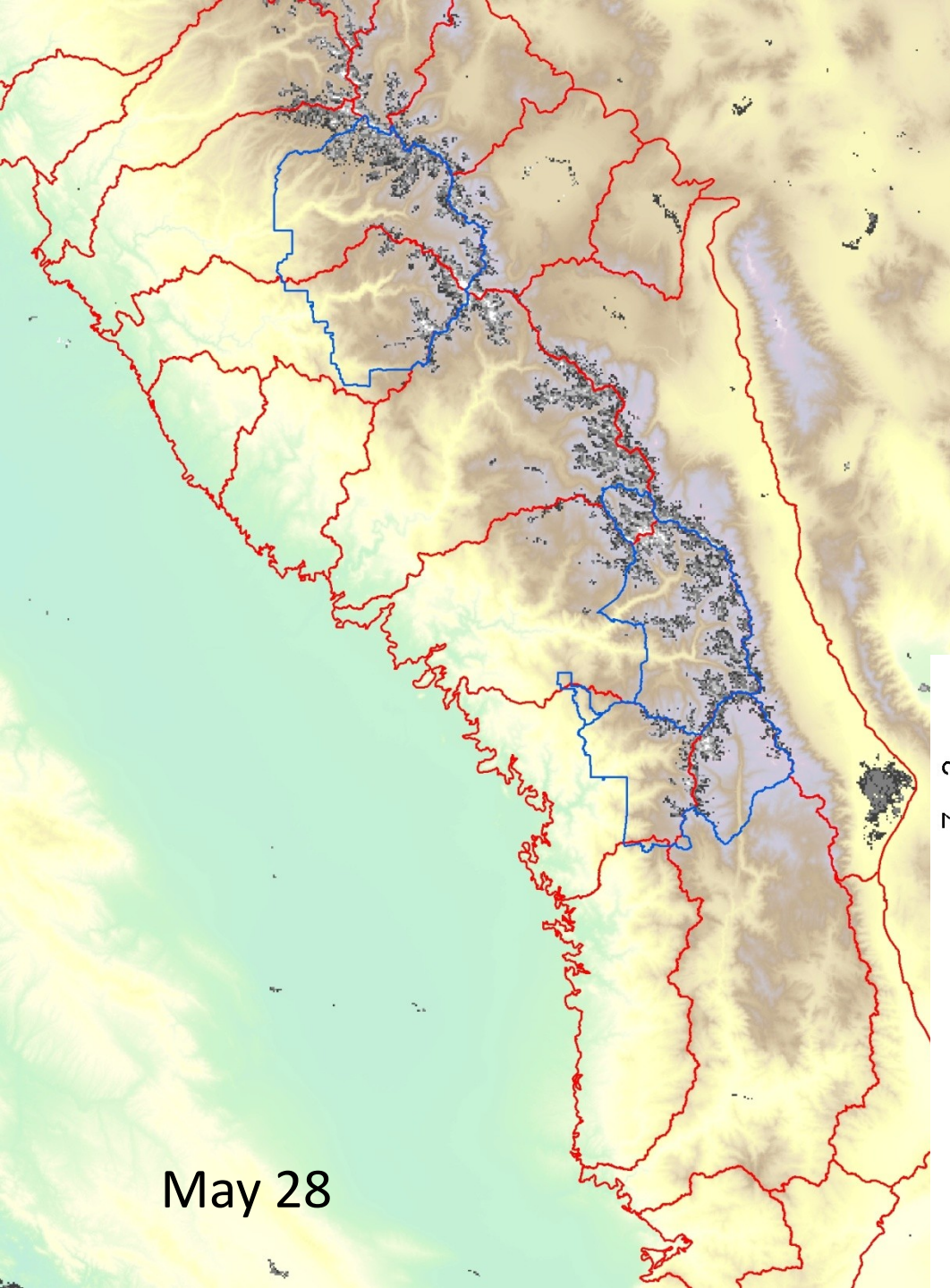
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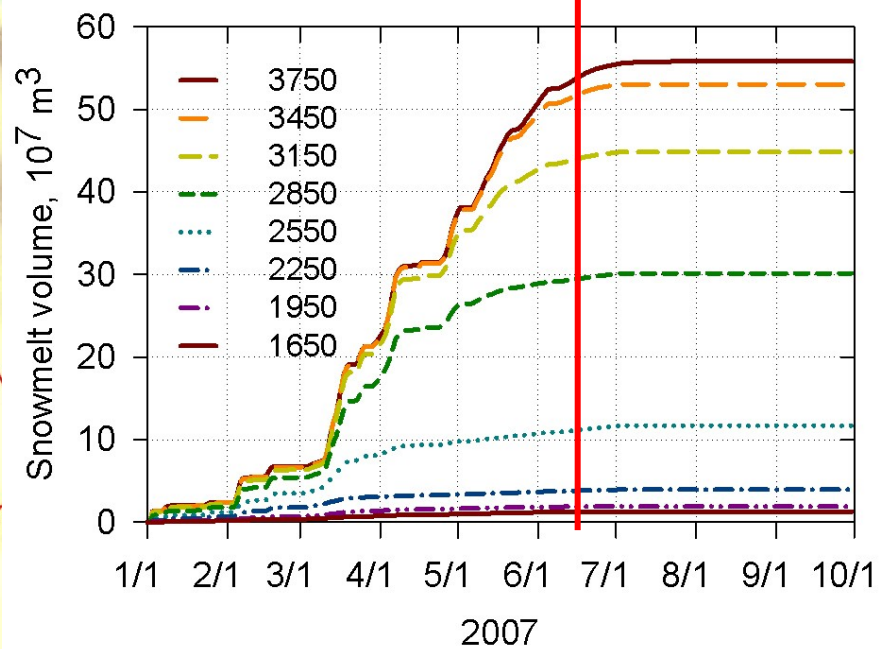
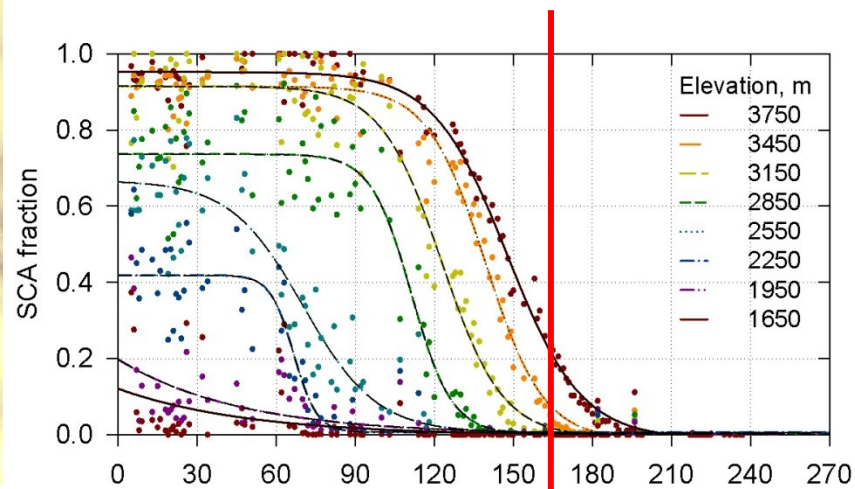
Merced basin SCA & snowmelt volume – 2007



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Merced basin SCA & snowmelt volume – 2007



Envisioning a new water information system for California

