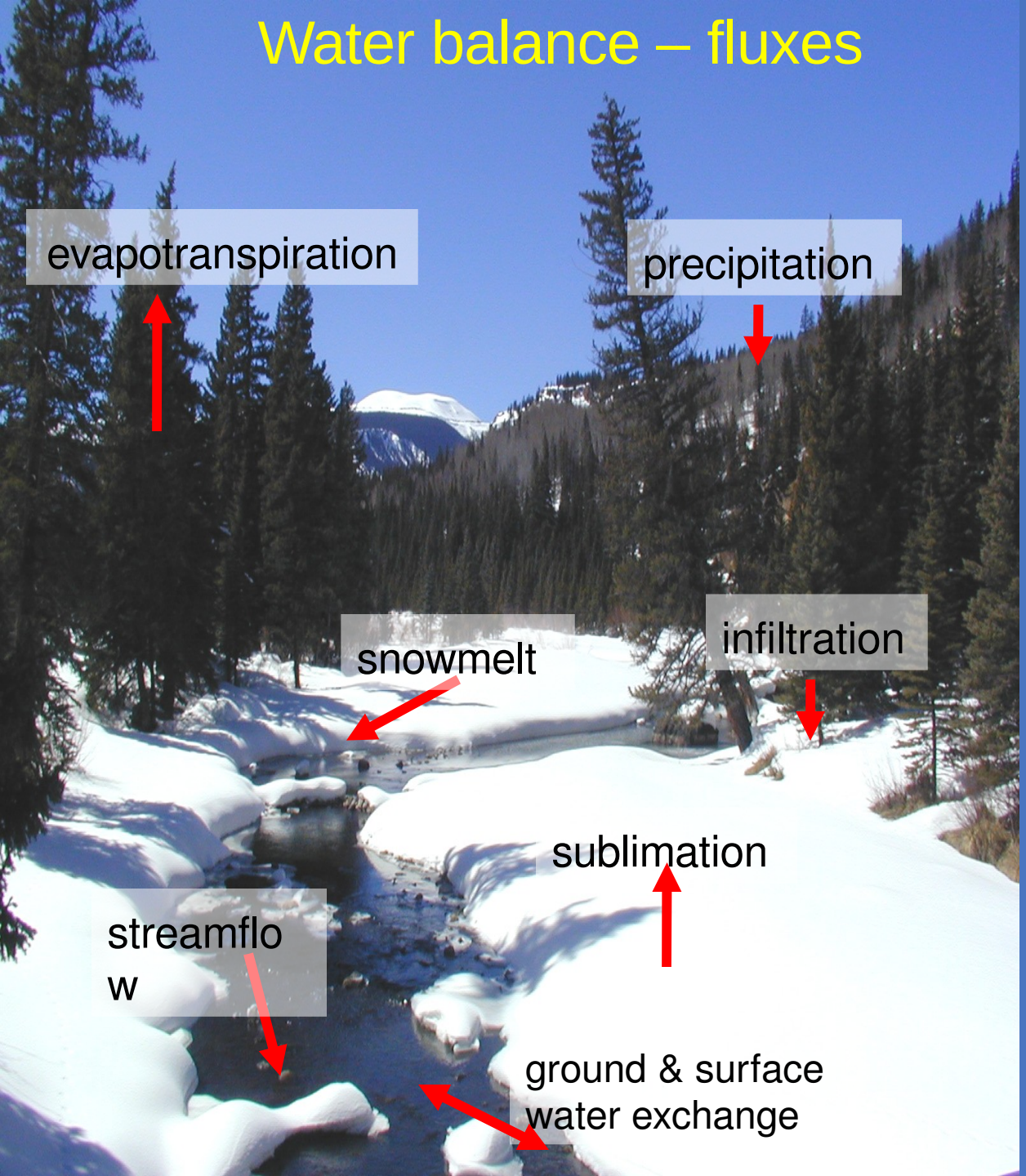
Sierra Nevada Research Institute

Roger Bales, UC Merced

Water balance – fluxes



Reservoirs:
Snowpack storage
Soil-water storage

The basis for process understanding is new measurements

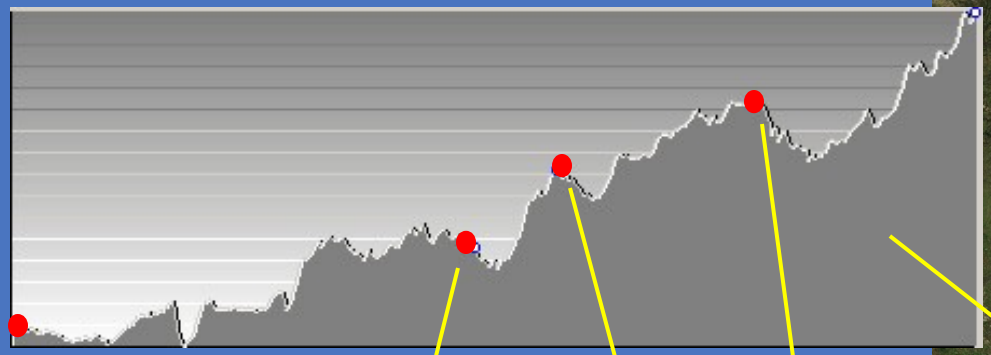
Processes are coupled & best studied together

National CZO Program

Southern Sierra CZO

Elev., m

E-W transect of flux towers



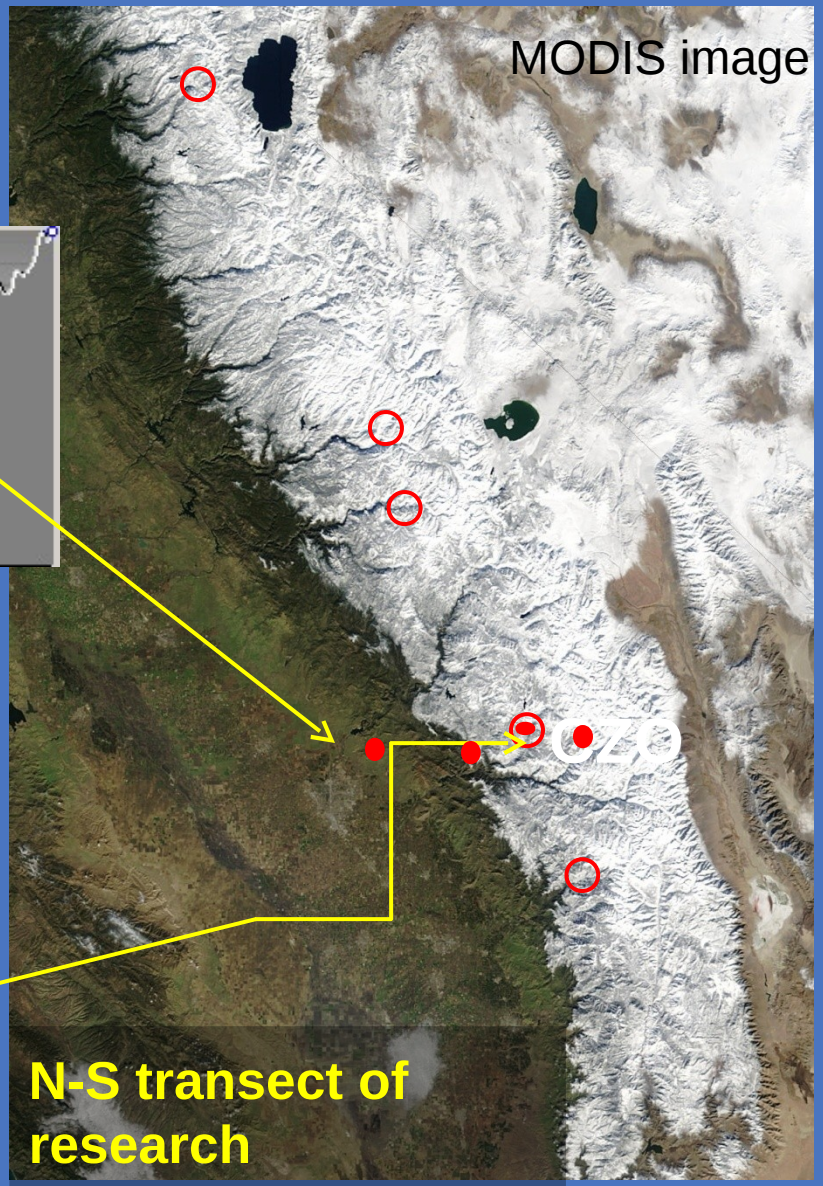
San Joaquin Experimental Range 400 m

Soaproot Saddle 1100 m

CZO P301 2000 m

Shorthair Creek 2700 m

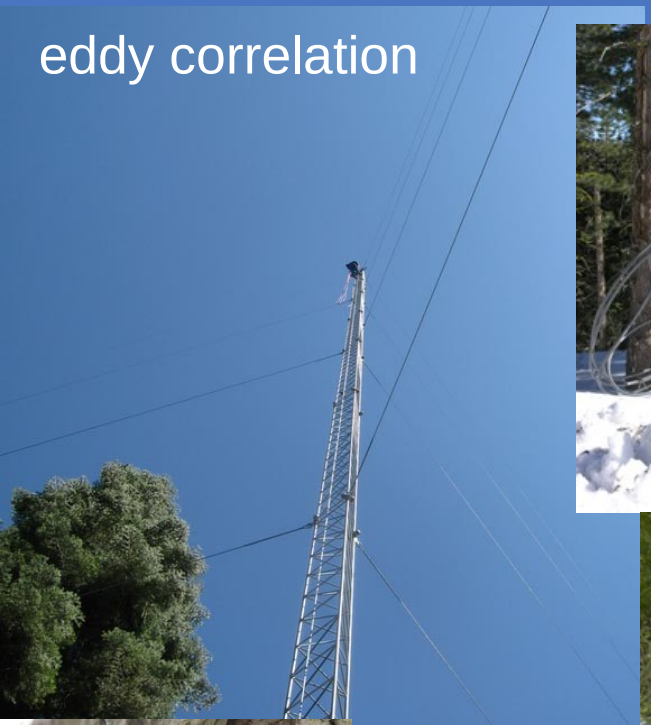
Main CZO site

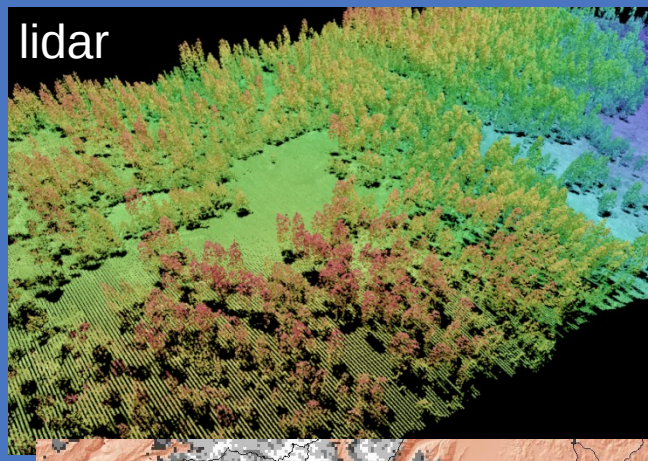


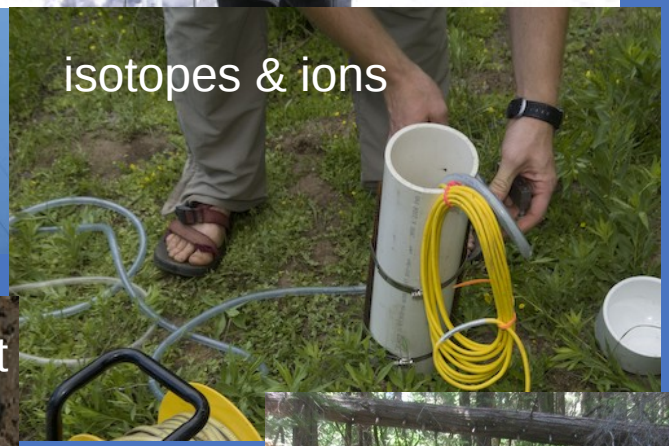
N-S transect of research catchments

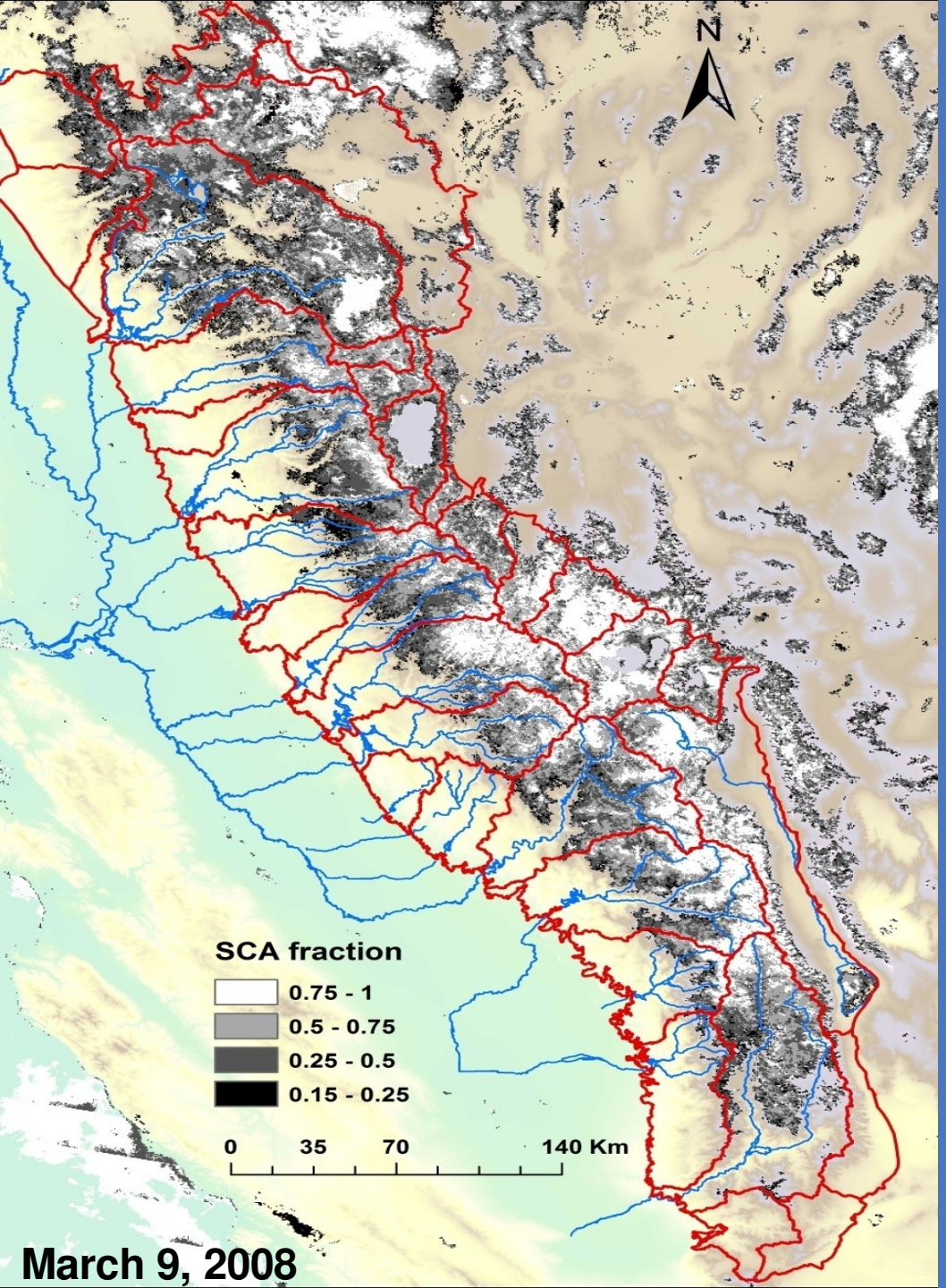
NEON to follow same E-W transect

CZOs: a new generation of integrated measurements



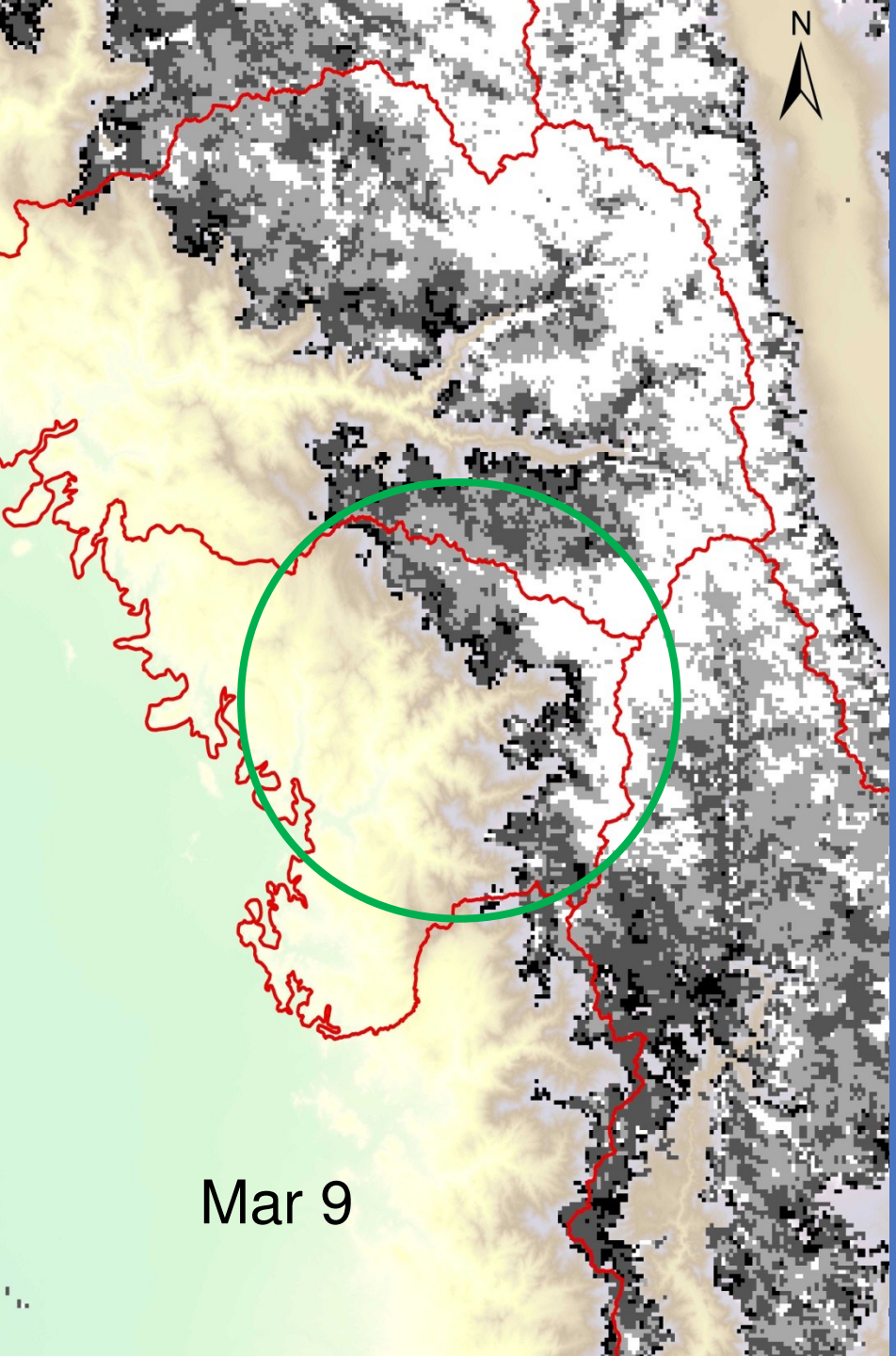


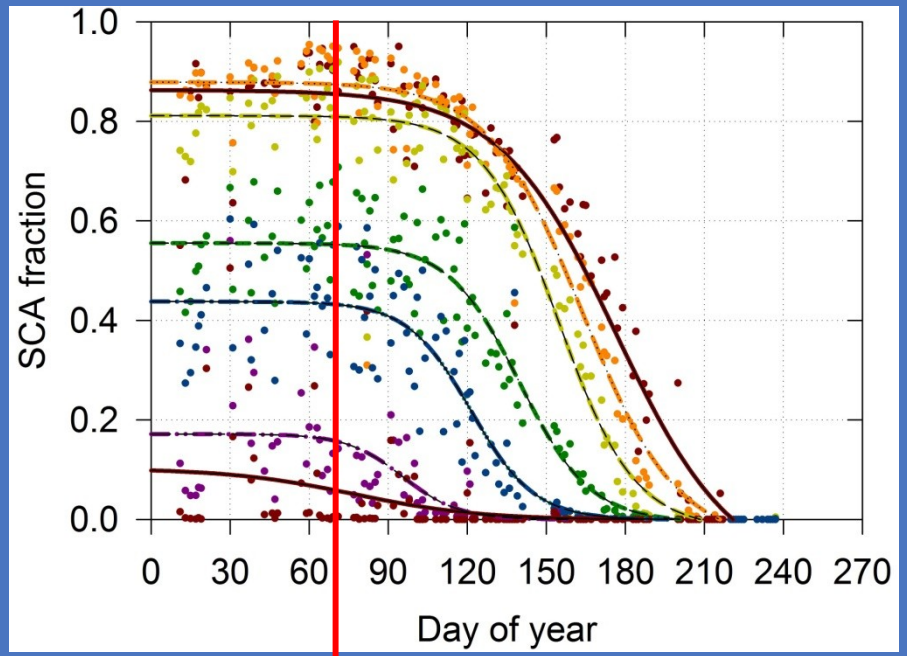


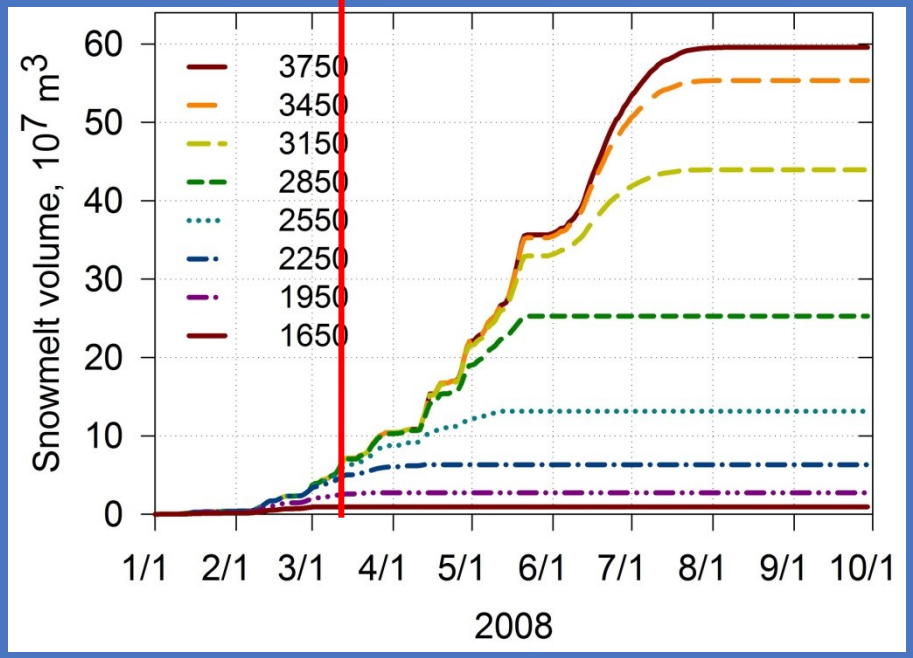


Sierra Nevada fractional snow covered area (SCA) from MODIS

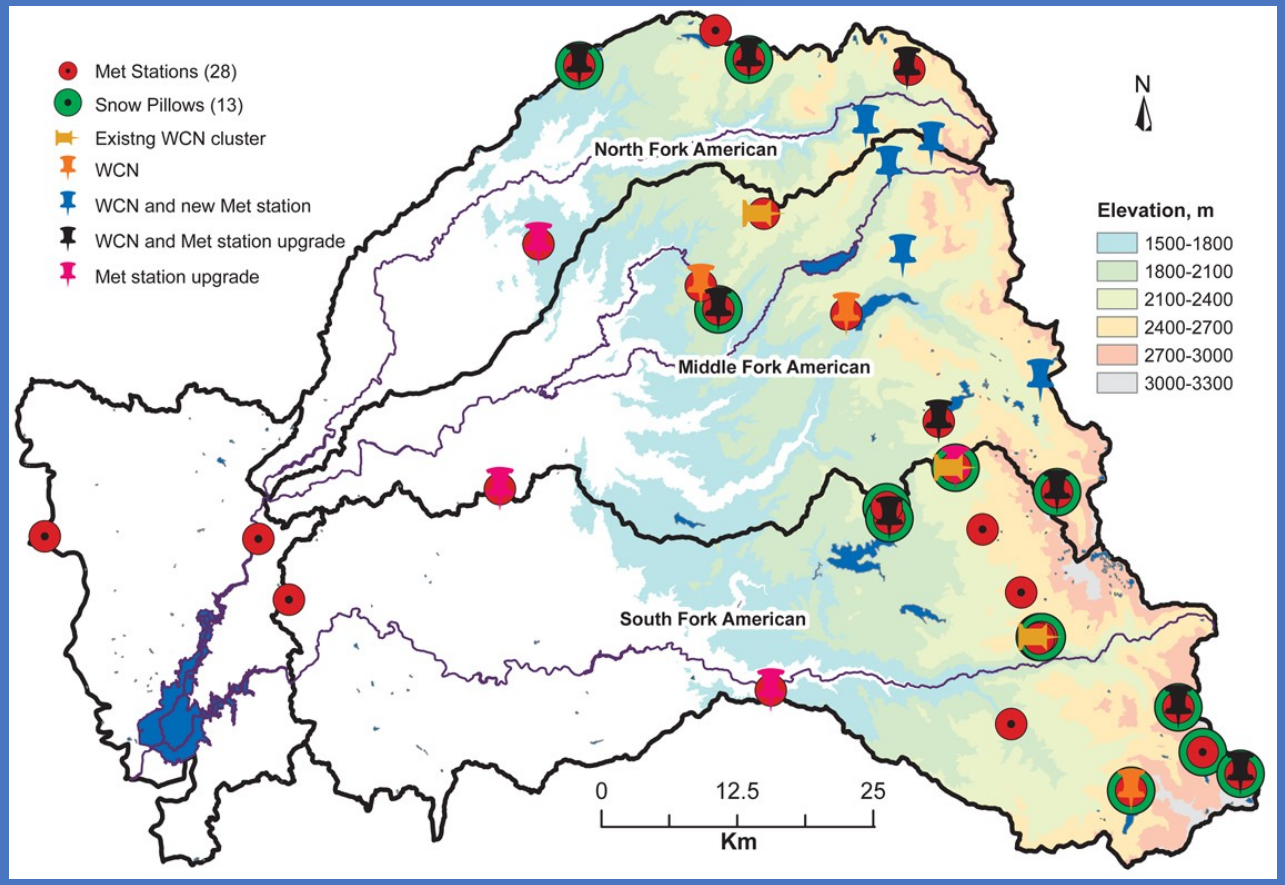
SCA is binned into 4 classes for ease of viewing pixel size 500 m


N
Mar 9


SCA fraction
1.0
0.8
0.6
0.4
0.2
0.0
0
30
60
90
120
150
180
210
240
270
Day of year


Snowmelt volume, 10^7 m^3
60
50
40
30
20
10
0
3750
3450
3150
2850
2550
2250
1950
1650
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
10/1
2008

Basin-wide deployment of hydrologic instrument clusters – American R. basin



Strategically place low-cost sensors to get spatial estimates of snowcover, soil moisture & other water-balance components

Network & integrate these sensors into a single spatial instrument for water-balance measurements.

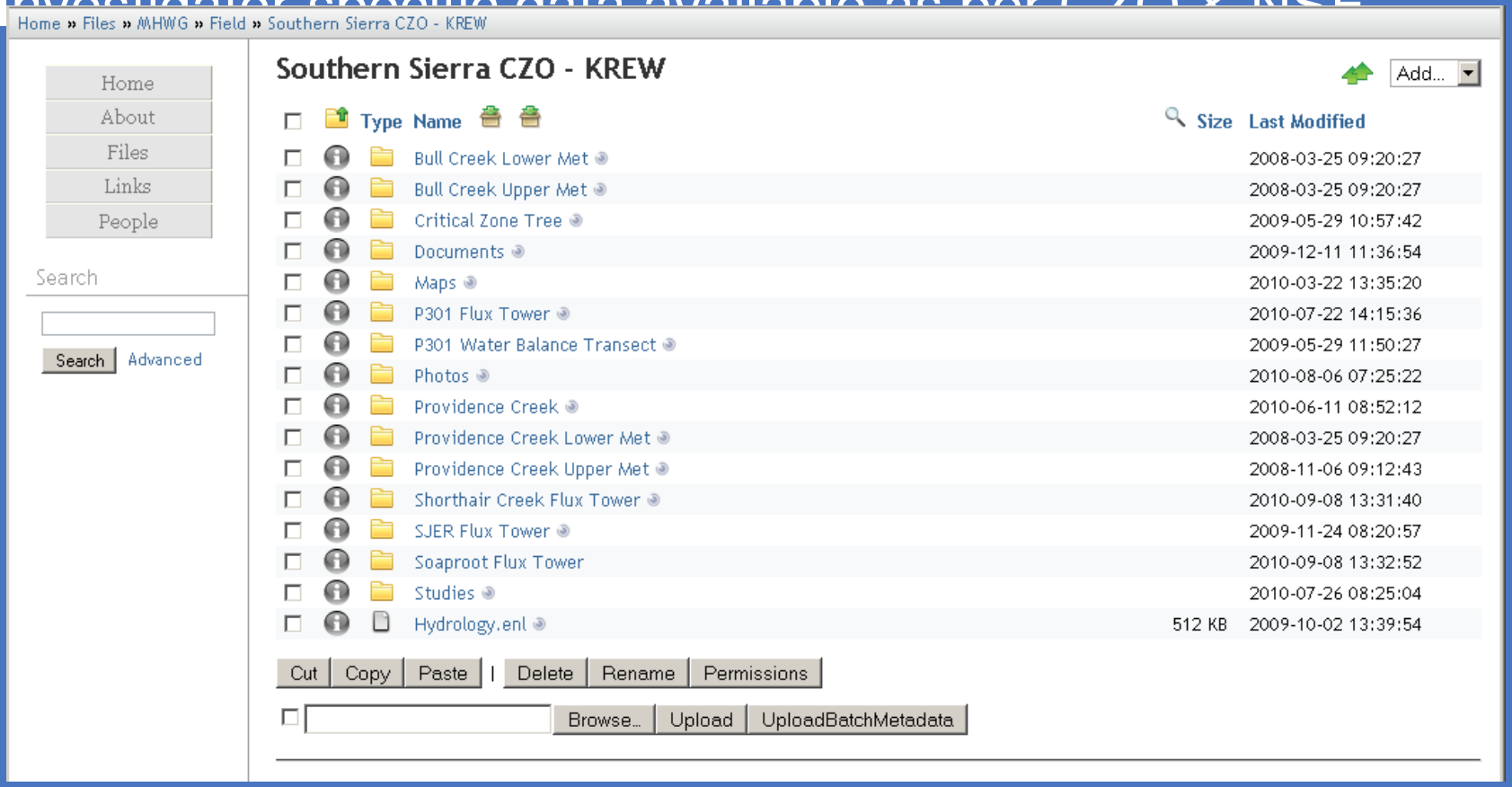
in progress

Data availability through digital library

Level 2 data from core field measurements made available by water year: snow, soil moisture, temperatures, flux tower

Current-year level 1 data available by request

Investigator specific data available as per CZO & NSF



Southern Sierra Critical Zone Observatory

Data Catalog

Snow Depth (also air temperature)

- Providence Creek Lower:
  - North Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
  - South Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
- Providence Creek Upper:
  - Flat Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
  - North Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
  - South Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
- P301 Water Balance Transect (contact data manager)
- Wolverton: site 1 || site 2 || site 3 || site 4 (WY 2007, 2008, 2009, 2010; all level 1)

Soil moisture and temperature (also matric potential)

- Providence Creek Lower:
  - North Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
  - South Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
- Providence Creek Upper:
  - Flat Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
  - North Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
  - South Cluster: level 2 (WY 2008 & 2009, 30-min, hourly & daily)
- P301 Water Balance Transect (contact data manager)
- CZT-1: level 1
- Wolverton: site 1 || site 2 || site 3 || site 4 (WY 2007, 2008, 2009, 2010; all level 1)

Meteorological stations

- Providence Creek Lower: level 2 (WY 2003, 2004, 2005, 2005, 2007; hourly & daily) (2008, 2009; 15-min, hourly & daily)
- Providence Creek Upper: level 2 (WY 2003, 2004, 2005, 2005, 2007; hourly & daily) (2008, 2009; 15-min, hourly & daily
- Bull Creek Lower: level 2 (WY 2004, 2005, 2005, 2007; hourly & daily) (2008, 2009; 15-min, hourly & daily
- Bull Creek Upper: level 2 (WY 2004, 2005, 2005, 2007; hourly & daily) (2008, 2009; 15-min, hourly & daily
- Wolverton met: level 1 (WY 2006, 2007, 2008, 2009, 2010)
- Panther met: level 1 (WY 2006, 2007, 2008, 2009, 2010)

Flux tower:

- P301 tower: level 2 (WY 2009, 2010 partial)
- Shorthair Creek tower: level 2 (WY 2009, partial)
- SJER tower: level 2 (WY 2009, partial)
- Soaproot Saddle tower: level 2 (WY 2009, partial)

Groundwater

P301 meadow: contact data manager

- Long meadow (Wolverton): level 1 (WY 2007, 2008)

Streamflow

- Providence Creek:
  - Providence & Bull: daily (USFS database, WY 2004-2007; release of hourly by USFS pending)
  - P301, P303, P304, D102 for WY 2009: level 2
- Wolverton (several locations, level 1)

Geochemistry (release by USFS pending; contact data manager)

Spatial data

- CZO watershed boundaries: Arc GIS 9 zip file || same for Bull
- KREW area: 10-m DEM || Arc GIS 10
- KREW stream gauges: Arc GIS 10
- KREW met stations: Arc GIS 10
- Roads: Arc GIS 10
- Soils: Arc GIS 10
- Streams: Arc GIS 10
- Wireless sensor network: Arc GIS 10
- LiDAR topography: ARCGIS format (Providence, SJER, Soaproot, Shorthair, Teakettle/Bull, Wolverton)
- Sierra National Forest 2007 data dictionary
- Kings River Project 2003 data dictionary
- Satellite snowcover

Data-catalog link to digital library

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