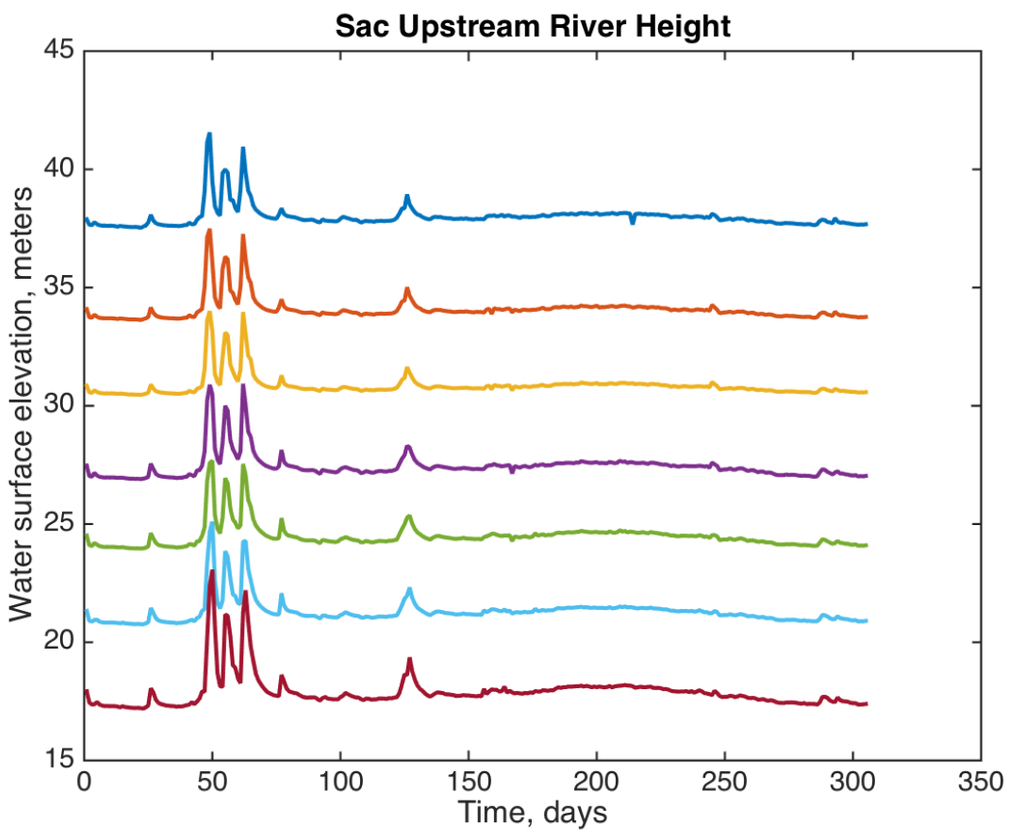
AirSWOT for Discharge Algorithm Validation: Sacramento & Willamette Flights, March 2015

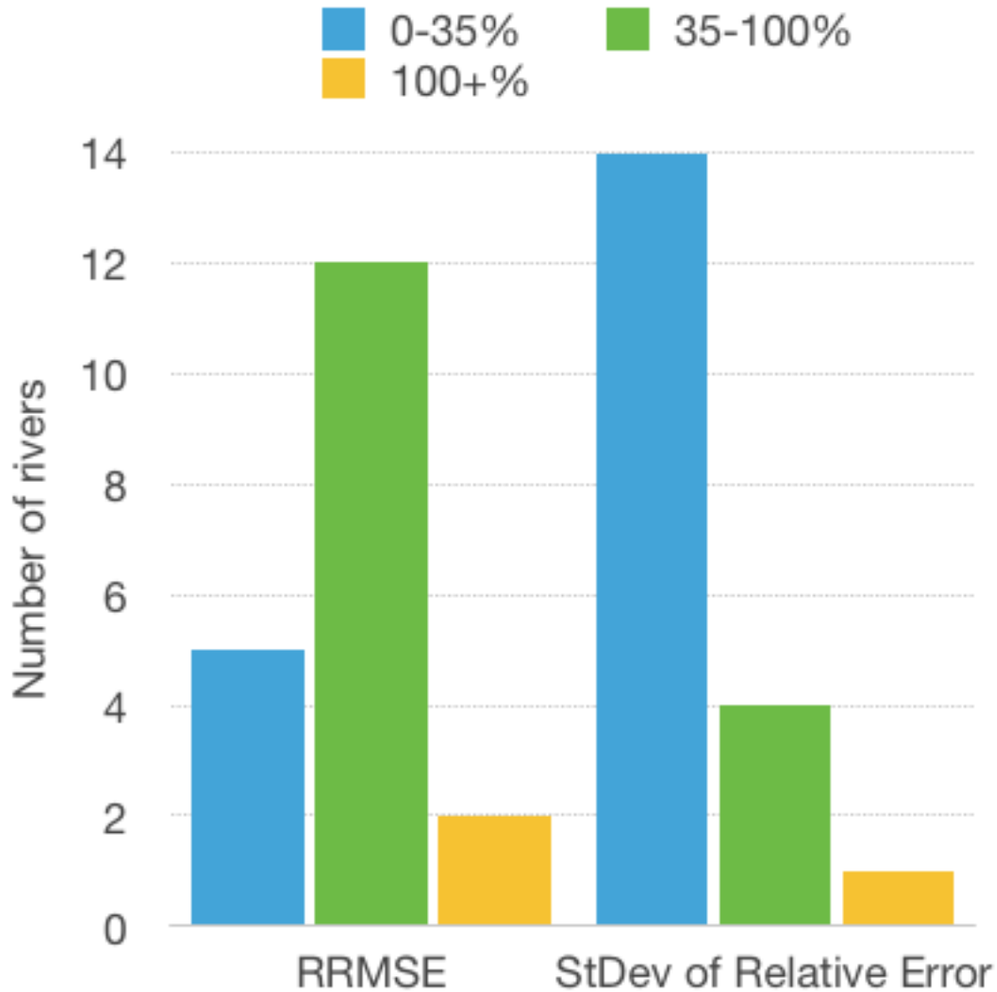
A group effort, presented by M. Durand

AirSWOT data needed to test discharge algorithms

- The discharge algorithm working group needs real data to test algorithms: tests thus far utilized model data

- Algorithms utilize timeseries of height, width, and slope measurements: goal was to capture an event





Five algorithms run for 19 rivers using model-simulated data. Algorithms capture relative discharge variations well, but absolute discharge less well.

Experiment was designed to make a series of six flights over both Sacramento and Willamette Rivers, which also afforded flights over Piute Ponds

Piute Ponds

Sacramento River

Willamette River

California

Sierra Nevada Mountains

Klamath Mountains

Oregon

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Image Landsat
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97 km

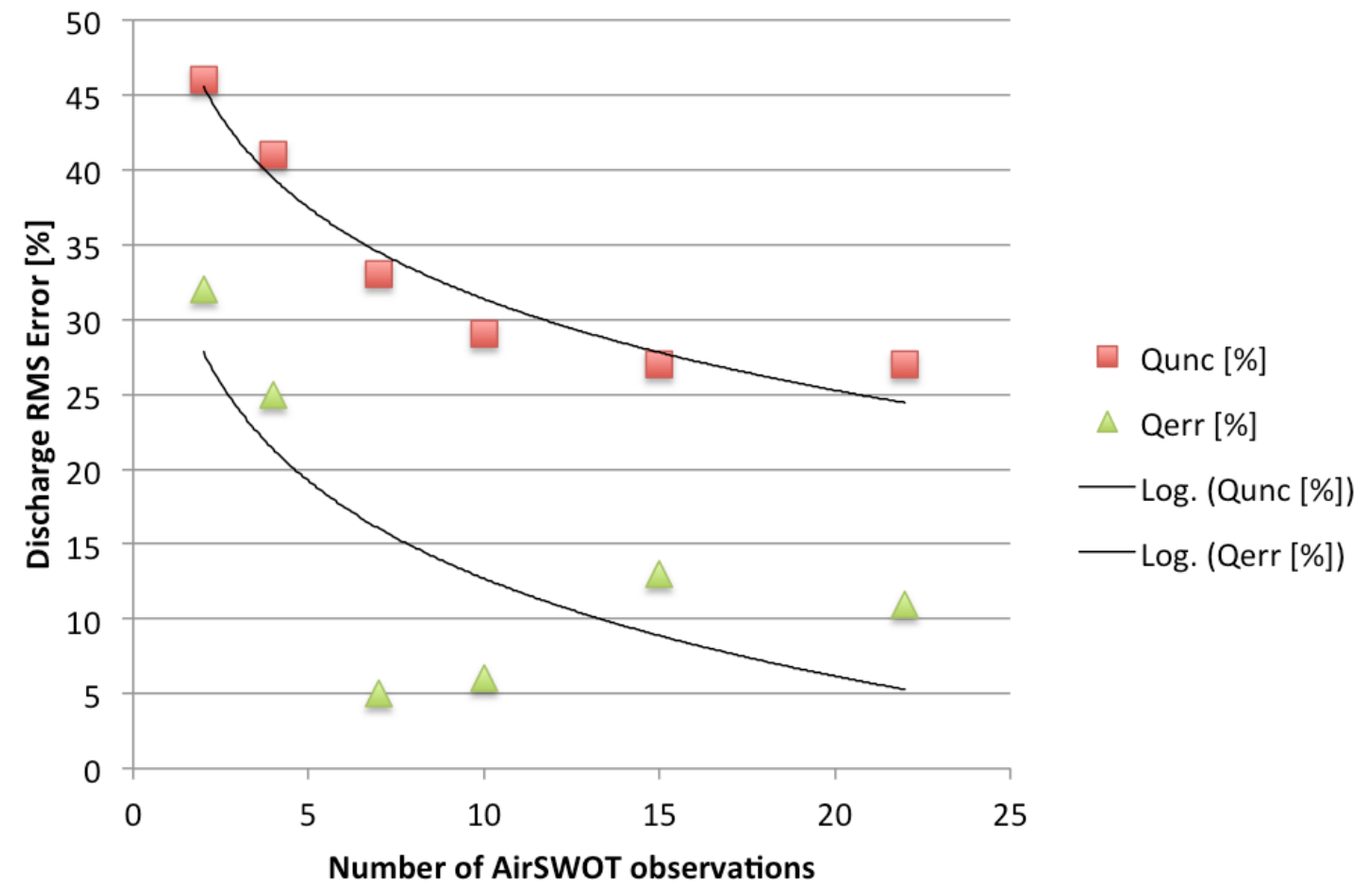
Tour Guide

Imagery Date: 4/10/2013 lat 43.031965° lon -120.592651° elev 1645 m eye alt 389.40 km

Experiment Design: AirSWOT synthetic data study

- Six measurements was deemed to be the minimum needed to infer discharge from observables

- Note: no hydraulic model was available with which to design the Willamette study



Synthetic study on Sacramento River

December Experiment Design AirSWOT experiment design

- Sacramento River
    - ✤ Well understood: hydraulic model and previous AirSWOT experience
    - ✤ Relatively flatter river: **2-45 cm/km**
    - More chance of having a low-flow year
- Willamette River
    - ✤ Low chance of having a low-flow year: snow is usually melting in March
    - ✤ Relatively steeper river: **30-125 cm/km**
    - Less well understood: no hydraulic model available
- Each outing allowed measurement of both rivers, twice: outbound and inbound
- Scheduled two AirSWOT flights with better ground validation: March 24 and 25 March. Four remaining flights: wait for an event, then schedule AirSWOT flights to catch it.

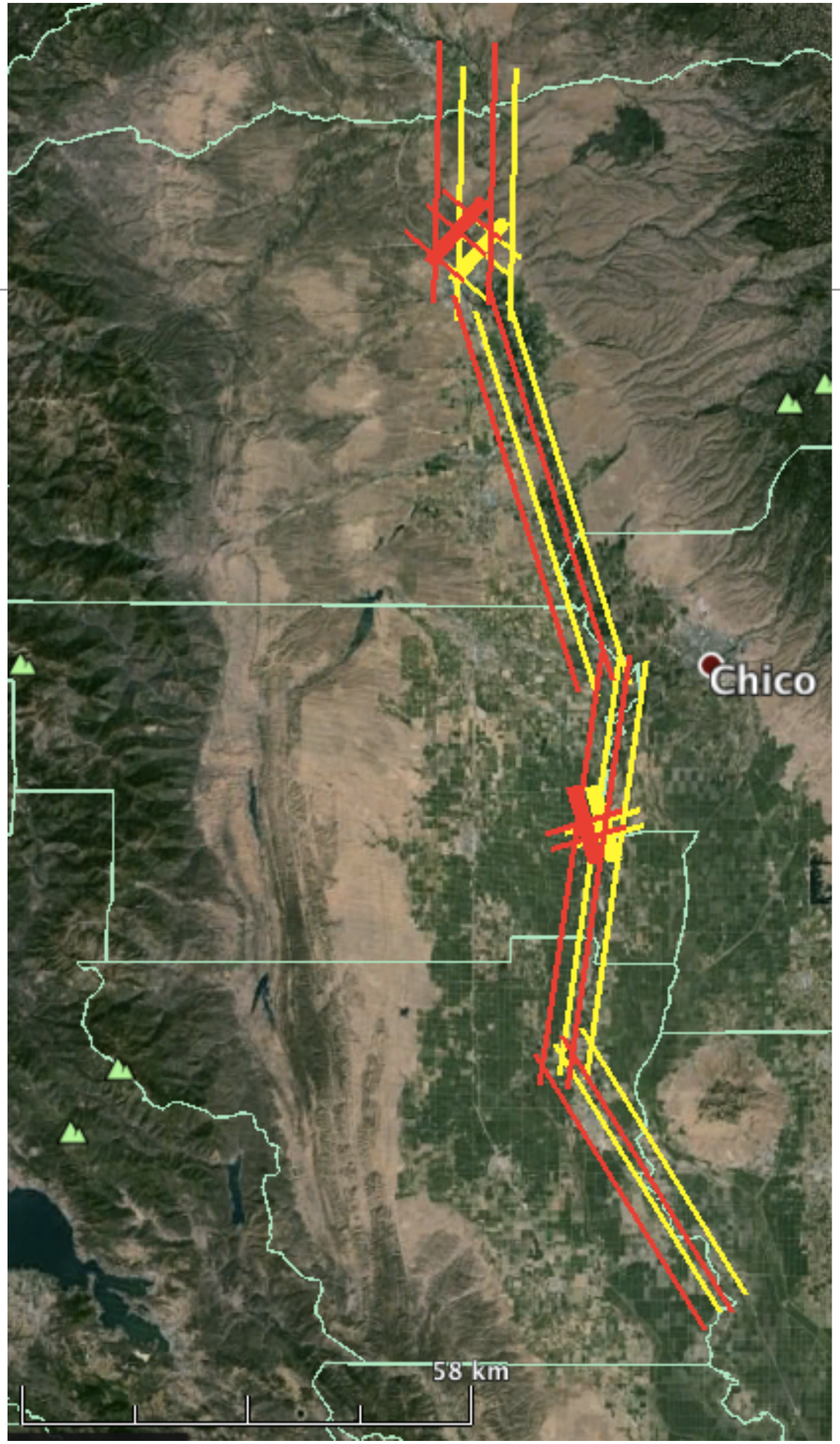
Components and people

- AirSWOT measurements of water surface elevation, and optical imagery (Greg Sadowy)

- In situ measurements of long profiles via boat and drifter provided spatially-complete water elevation measurements, and ADCP for discharge. In situ water level loggers provided temporally-complete elevation measurements at discrete locations

  - Sacramento: UCLA (L. Smith, L. Pitcher, V. Chu, C. Gleason); UNC (T. Pavelsky); USGS (T. Minear)

  - Willamette: U of Oregon (M. Fonstad); U of Wyoming (B. Overstreet); USGS Oregon WSC (R. Wallick & J. Mangano)


Chico
58 km

March 2015: Weather did not initially cooperate

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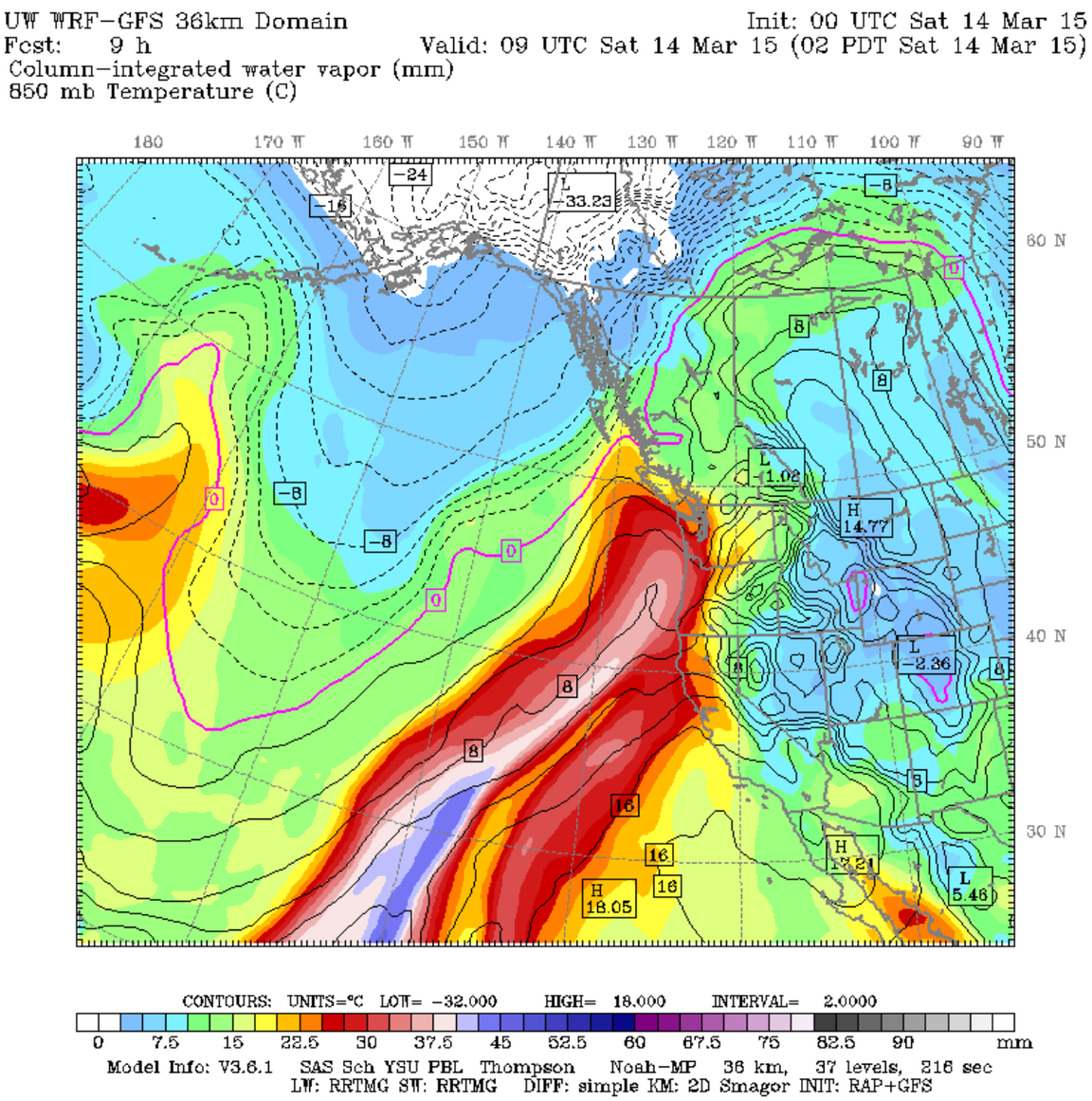
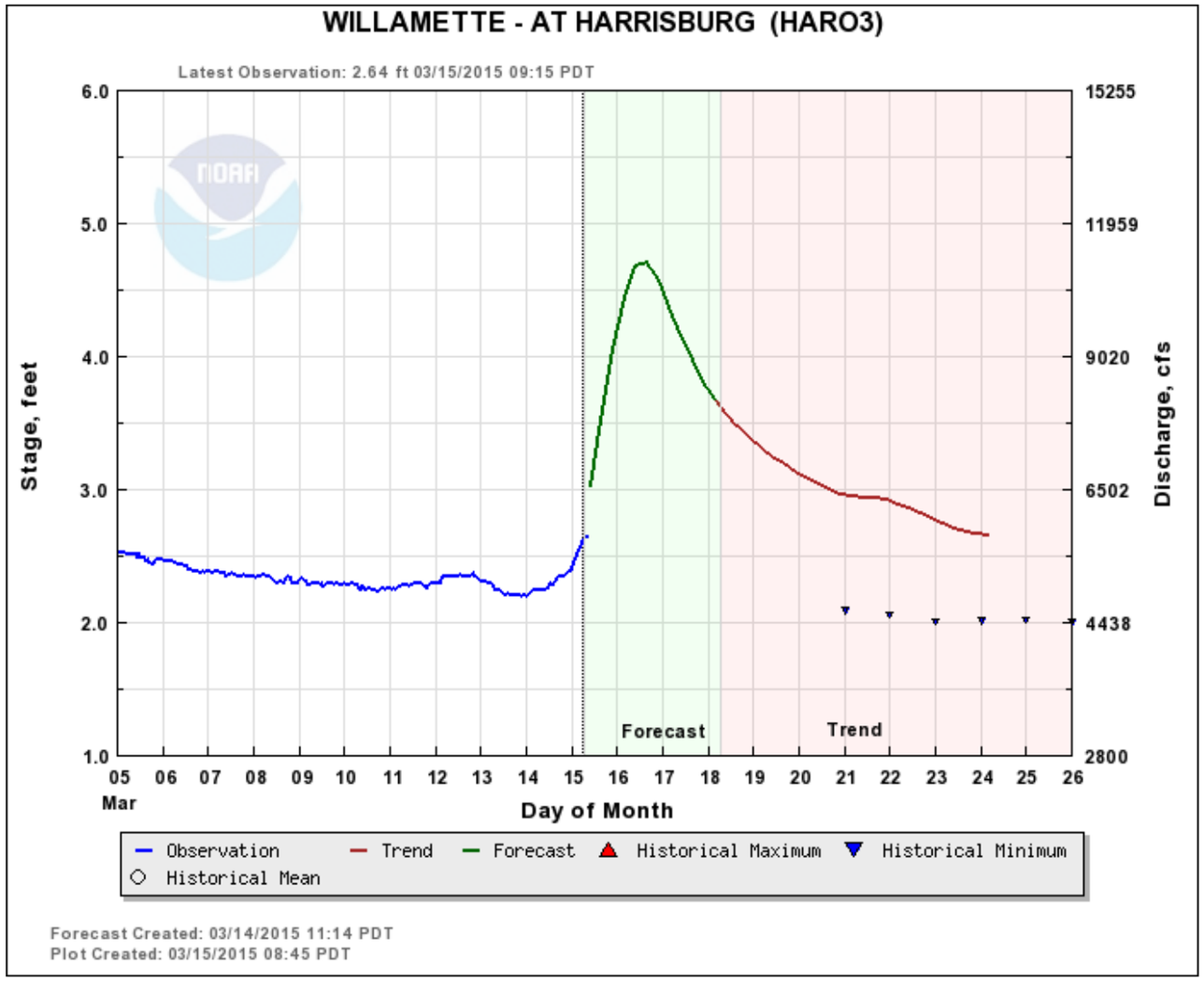
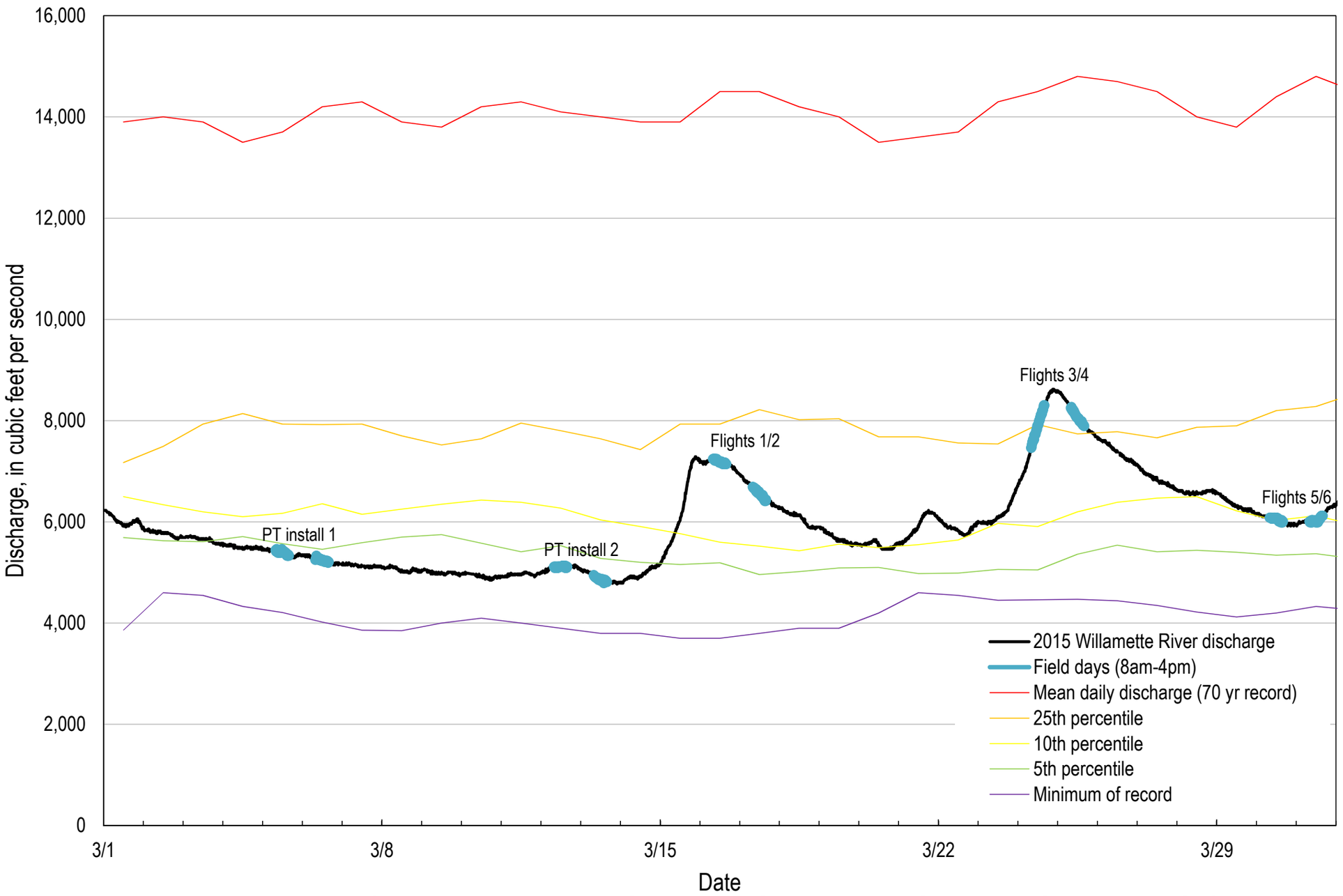
Our event arrived, headed for the Willamette River





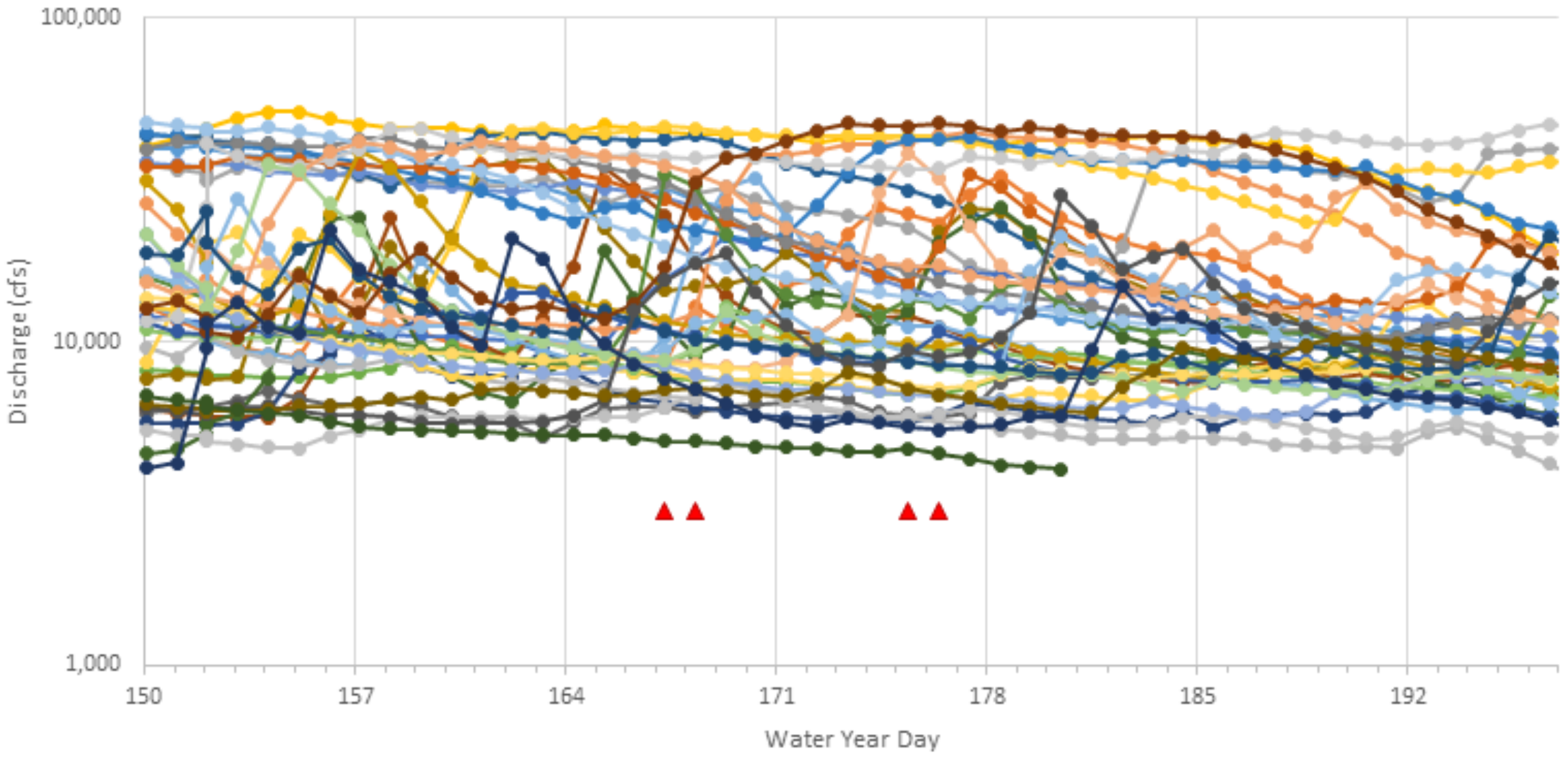
Worked with USACE (M. K. Scullion) re: forecasts river forecasts. Refreshed to get latest forecast obsessively.

Willamette Flow dynamics: six different flows observed

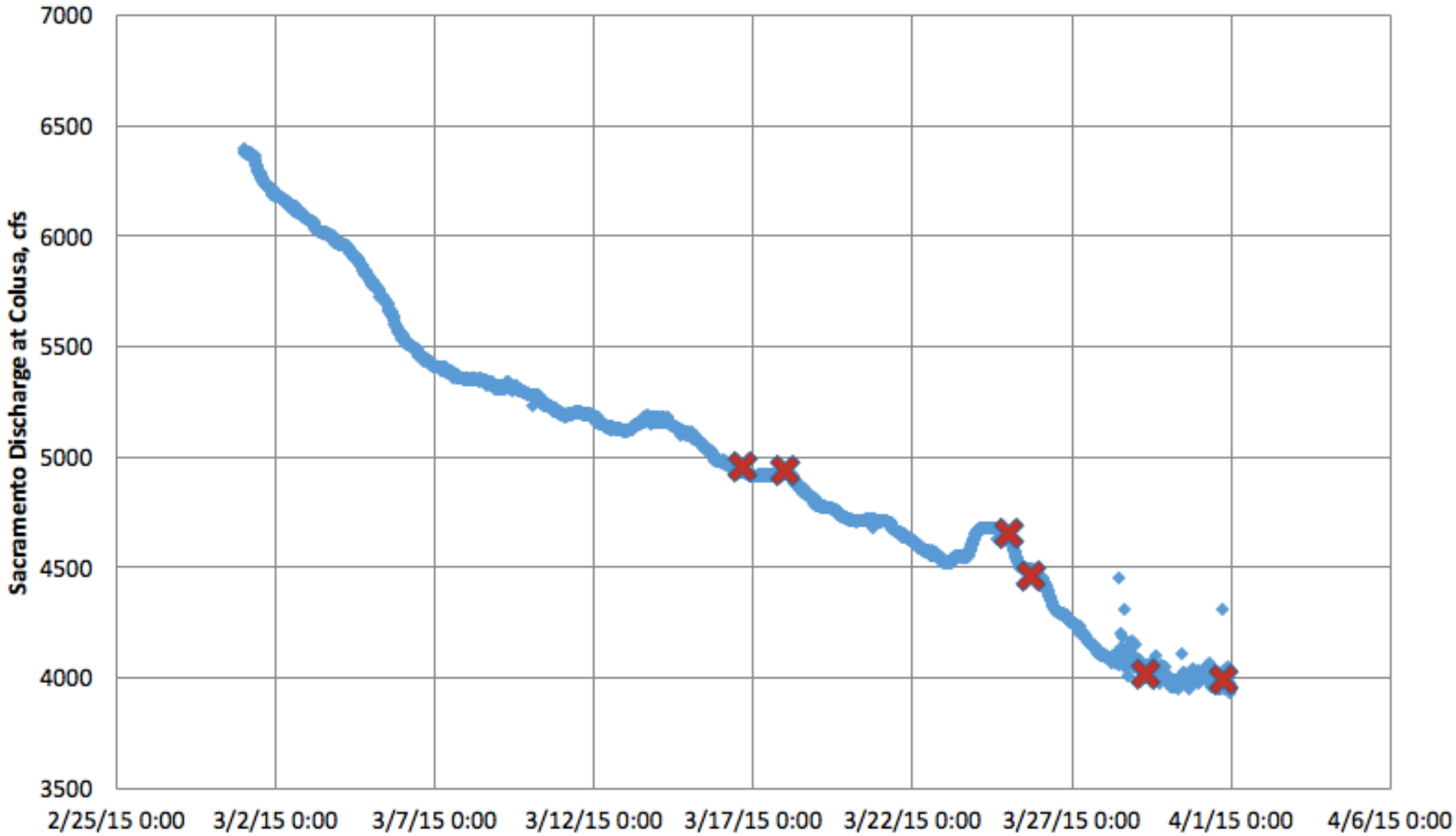


Flows were all relatively low, but dynamics should have been observed!

Flow was dropping on the Sacramento at this time…

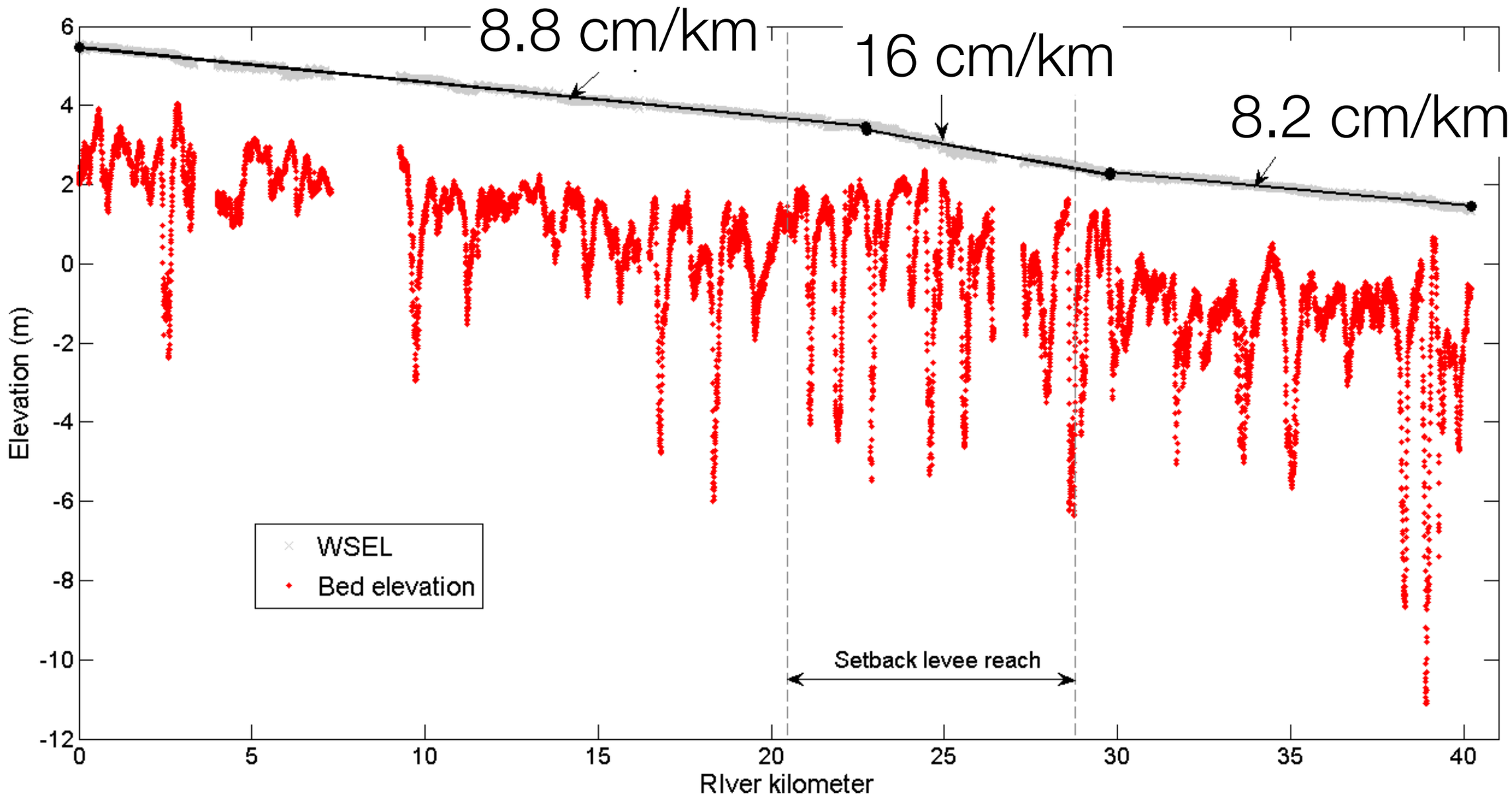


Sacramento Flow Variations



These changes may allow testing discharge algorithms…

Sacramento data are expected to advance reach-averaging theory



Preliminary data from Toby Minear (USGS)

Overall

- Flights occurred for both Sacramento and Willamette on March 16, 17, 24, 25, 30, and 31.

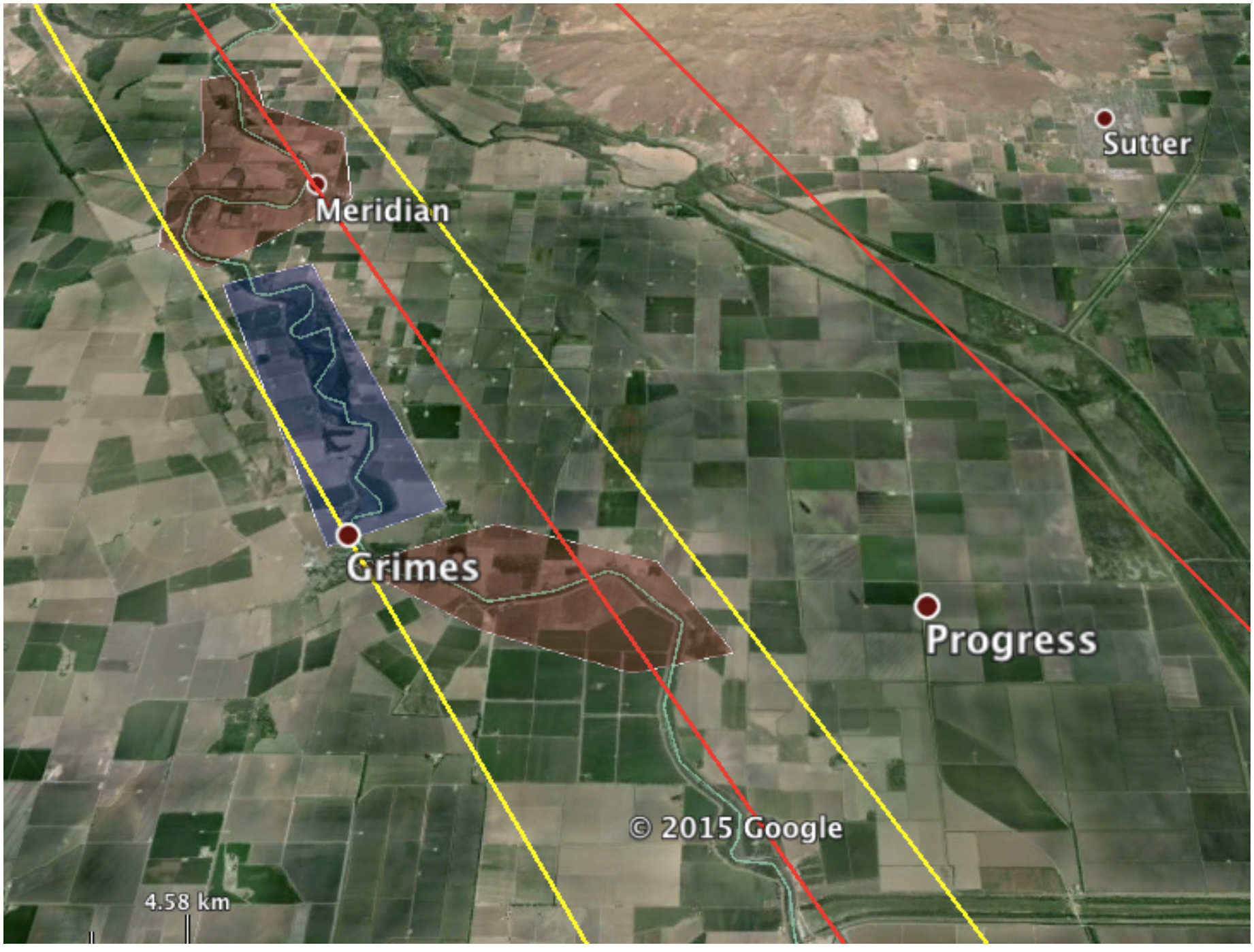
- Camera data were acquired: some may have been obscured by cloud for the Willamette

- In situ collection of height width and slope is expected to be successful

- Discharge dynamics occurred on both rivers

- These data should advance discharge algorithms and reach-average science

Extra



Setback levee reach in blue