



National Aeronautics and  
Space Administration  
  
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California Institute of Technology  
Pasadena, California



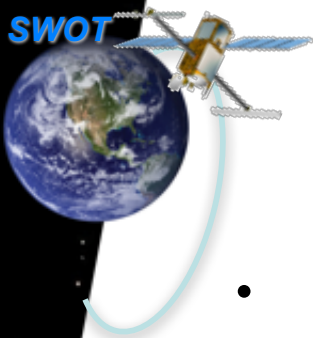
# Surface Water and Ocean Topography (SWOT) Mission

<http://swot.jpl.nasa.gov>

June 26-29, 2018

Current Pre-launch and Post-  
launch Hydrology Cal/Val Plans  
Led by U.S.

J. Toby Minear, T. Pavelsky



# Outline



- Release of Cal/Val Study Plan (Jan 2018)
- Overview of Cal/Val sites
- Planned pre-launch studies
- Pre- and post-launch plan



# Overview of Hydrology Cal/Val Sites (1/4)



- **Tier 1 sites** – ‘gold standard’
  - Numerous measurements at each site but relatively few sites
    - ♦ Existing data: Streamgages, aerial lidar, hydraulic model
    - ♦ SWOT planned measurements: Pressure transducers, GNSS surveys of water-surface elevations, discharge measurements, pre-launch hydraulic model, SWOT simulator, IR imagery for inundation extent
  - Rivers, Lakes, Wetlands, Tidal / Estuarine
  - In-depth evaluation of SWOT algorithms and measurements is possible
- **Tier 2 sites** – more numerous, much less effort
  - Rely heavily on existing gage infrastructure
    - ♦ E.g. lake and streamgages
  - Rivers, Lakes
  - Increase geographic spread of SWOT Cal/Val
- **In discussion: Remotely-sensed Cal/Val sites?**



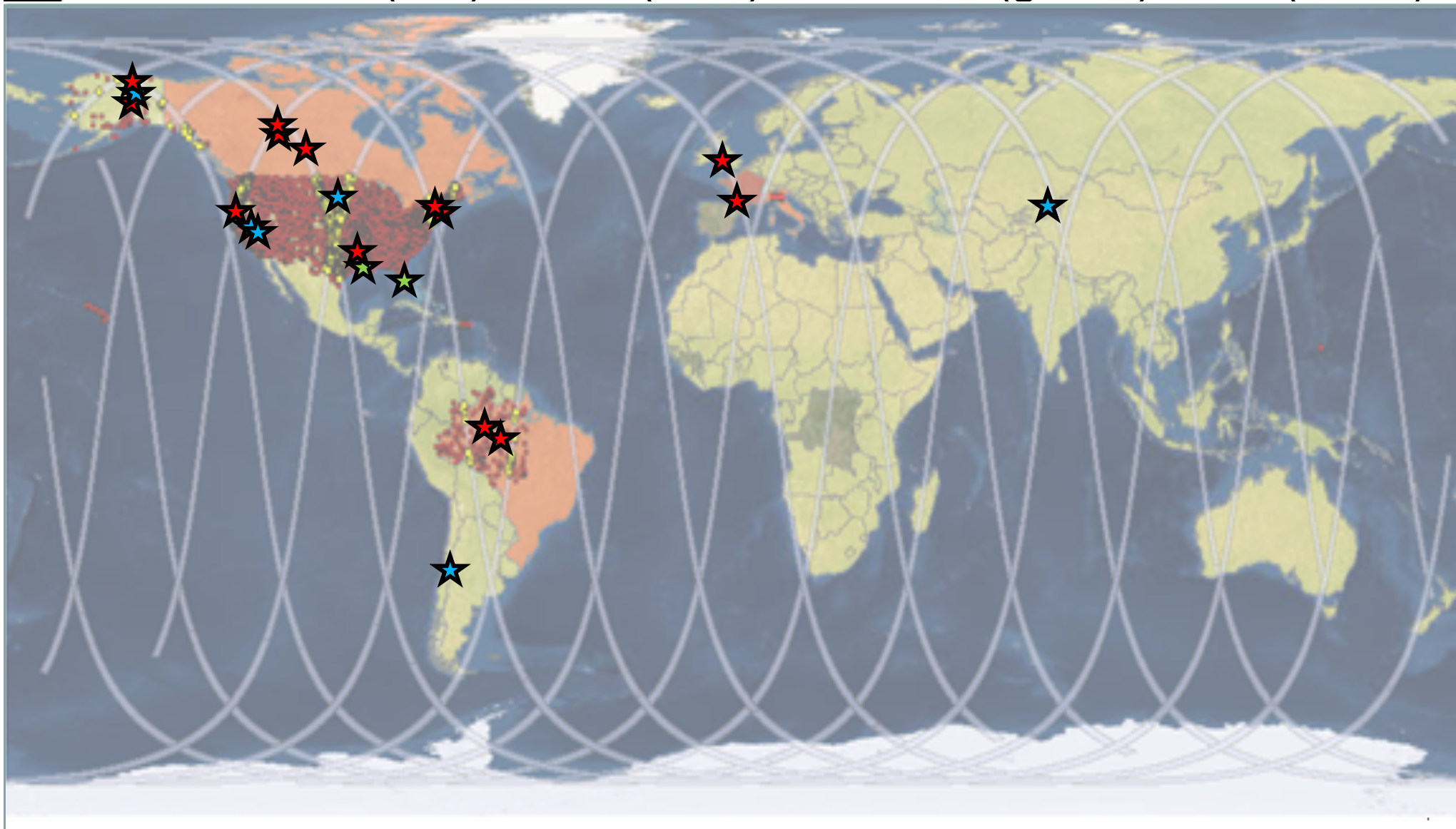


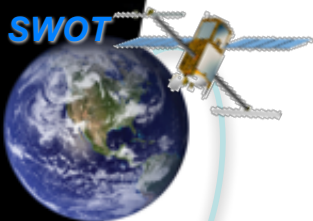
# Overview of Hydrology Cal/Val Sites (2/4)



Tier 1 sites:

- Rivers (red), lakes (blue), wetlands (green), tidal (black)



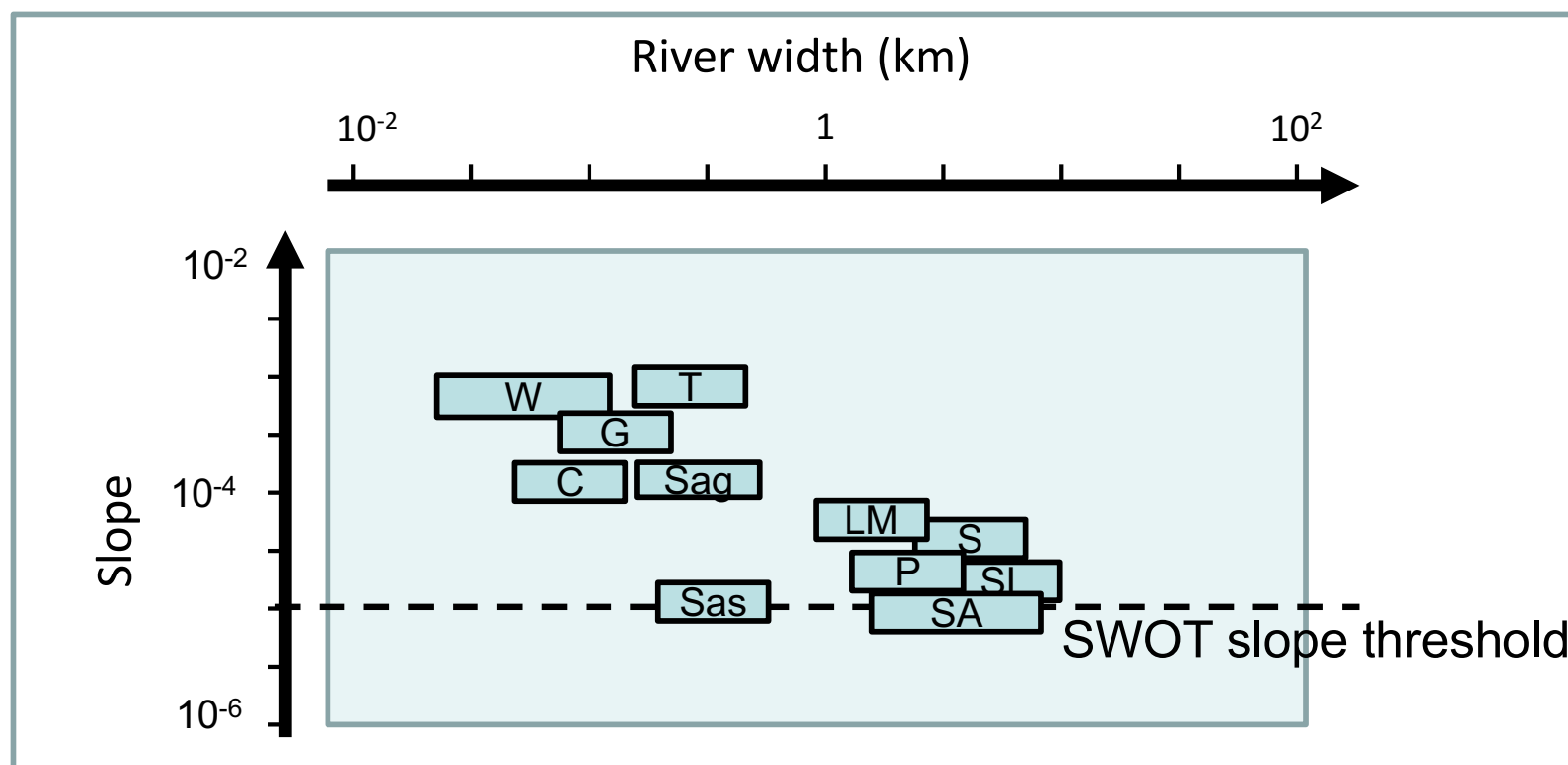


# Overview of Hydrology Cal/Val Sites (3/4)

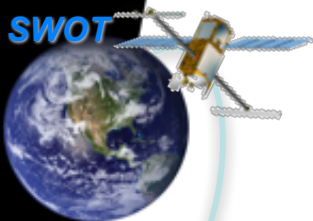


## Tier 1 River Sites:

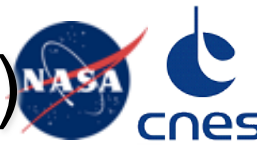
- Willamette River (US)
- Garonne River (FR)
- Lower Mississippi River (US)
- Connecticut River (US)
- Tanana River (US)
- Peace River (CAN)
- Slave River (CAN)
- Saint Lawrence River (CAN)
- Saskatchewan River (CAN)
- Sagavanirktok River (US)
- South America





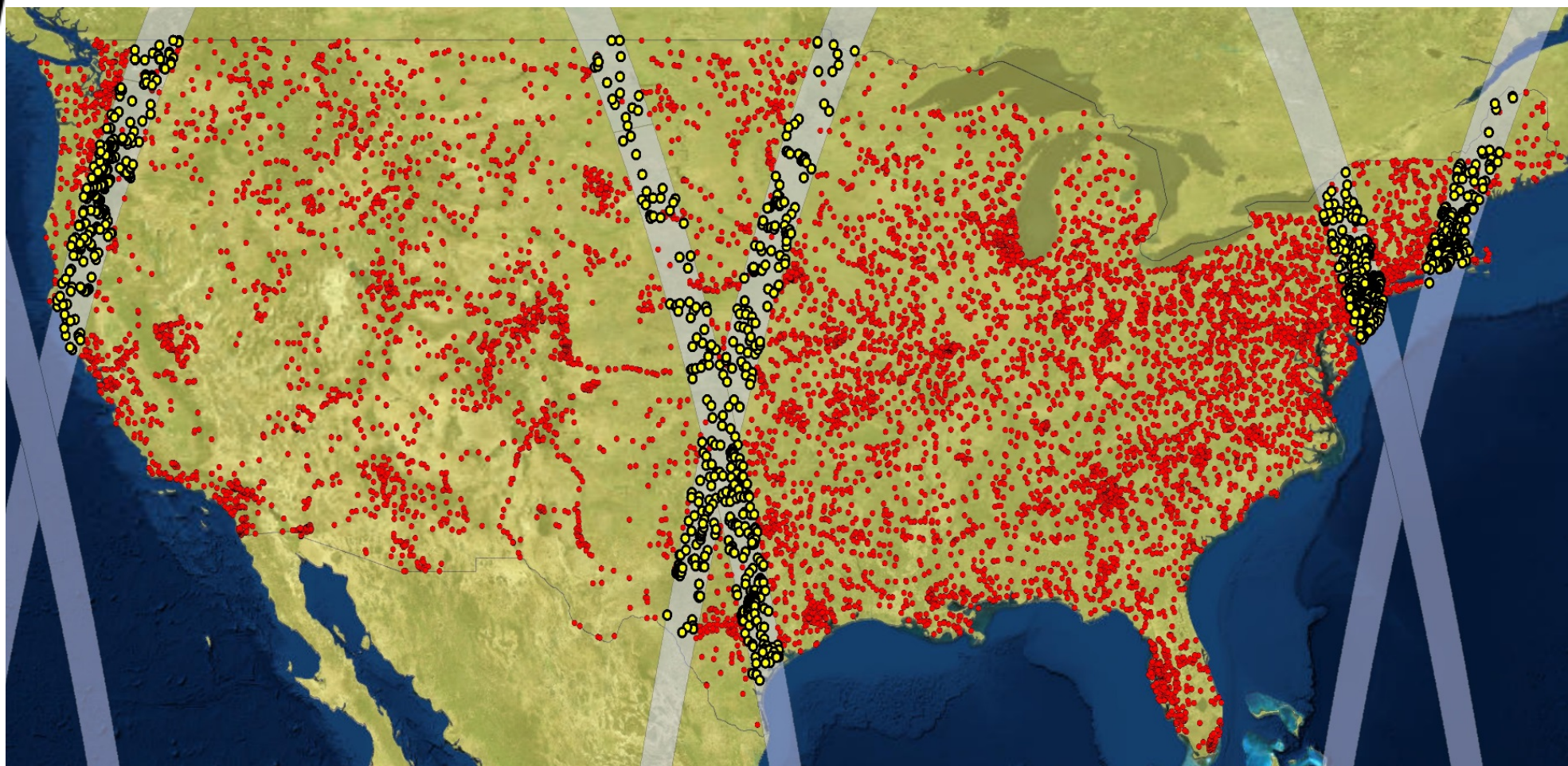


# Overview of Hydrology Cal/Val Sites (4/4)



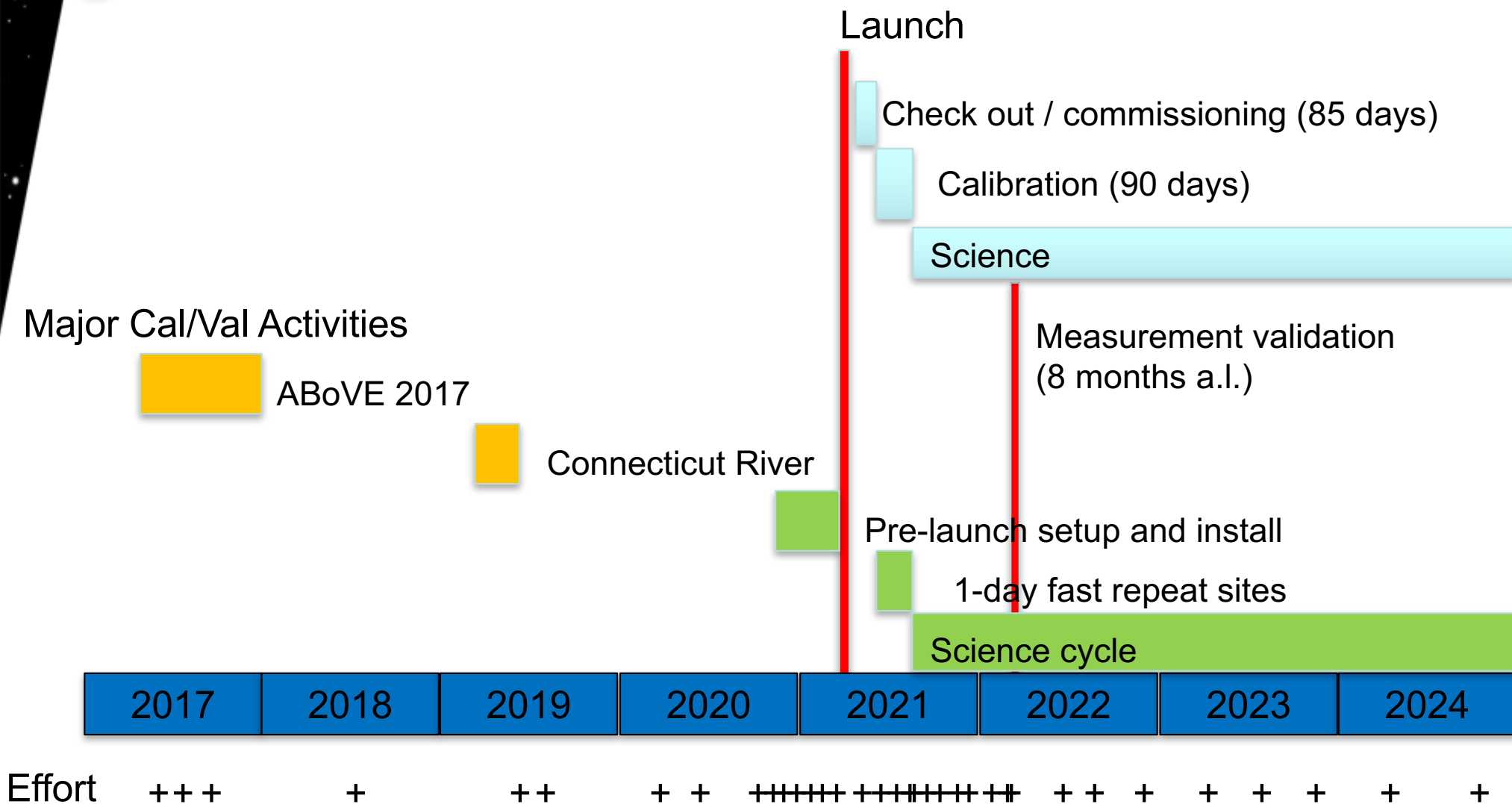
Tier 2 sites:

- US Tier 2 possible sites, 75 being selected
- All are 'Tier 3' sites



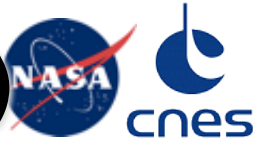


# Cal/Val Timeline





# Completed Pre-launch Activities (2017)



- Cal/Val Study Plan published (Jan 2018)
- ABoVE 2017 (more talks today)
- Prairie Potholes Tier 1 site
  - Wind setup study
- Cal/Val methods / standards tested and improved
  - Tier 1: Inundation extent (boat-based, drone)
  - Tier 1: Water surface elevations (boat-based, DEM)
  - Tier 2: Water surface elevations

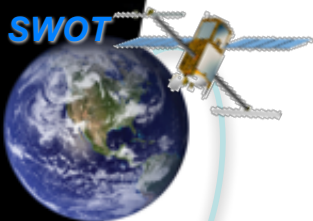




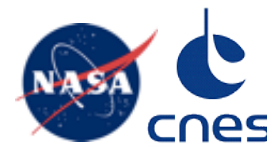
# Planned Pre-launch Studies (2018+)



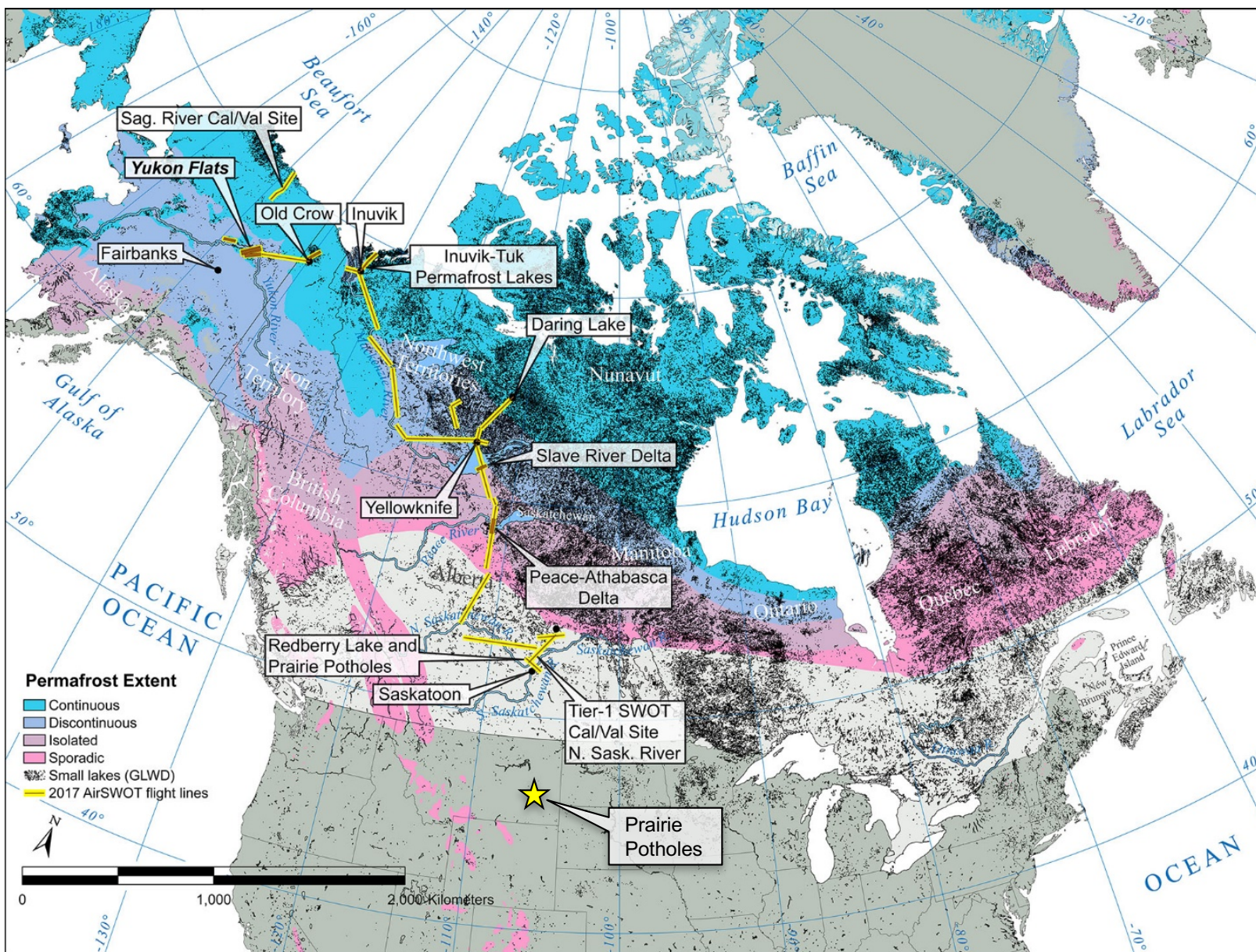
- Spatial variation in river water surface elevations (2018)
- Standards and methods for Tier 1 and Tier 2 sites (fall 2018)
- AirSWOT alternatives (2018+)
- Site selection for Tier 2 sites (2018+)
- Superelevation study (2018)
- Land cross-over site in Oklahoma (2018+)
- Tier 1 layover (2018)
  
- Vegetation phenomenology (2019)
- Connecticut River and Tidal Tier 1 study (2019)
  - River ice



# AirSWOT 2017 Flights



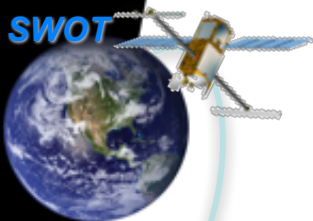
- AirSWOT flights as part of NASA ABoVE project





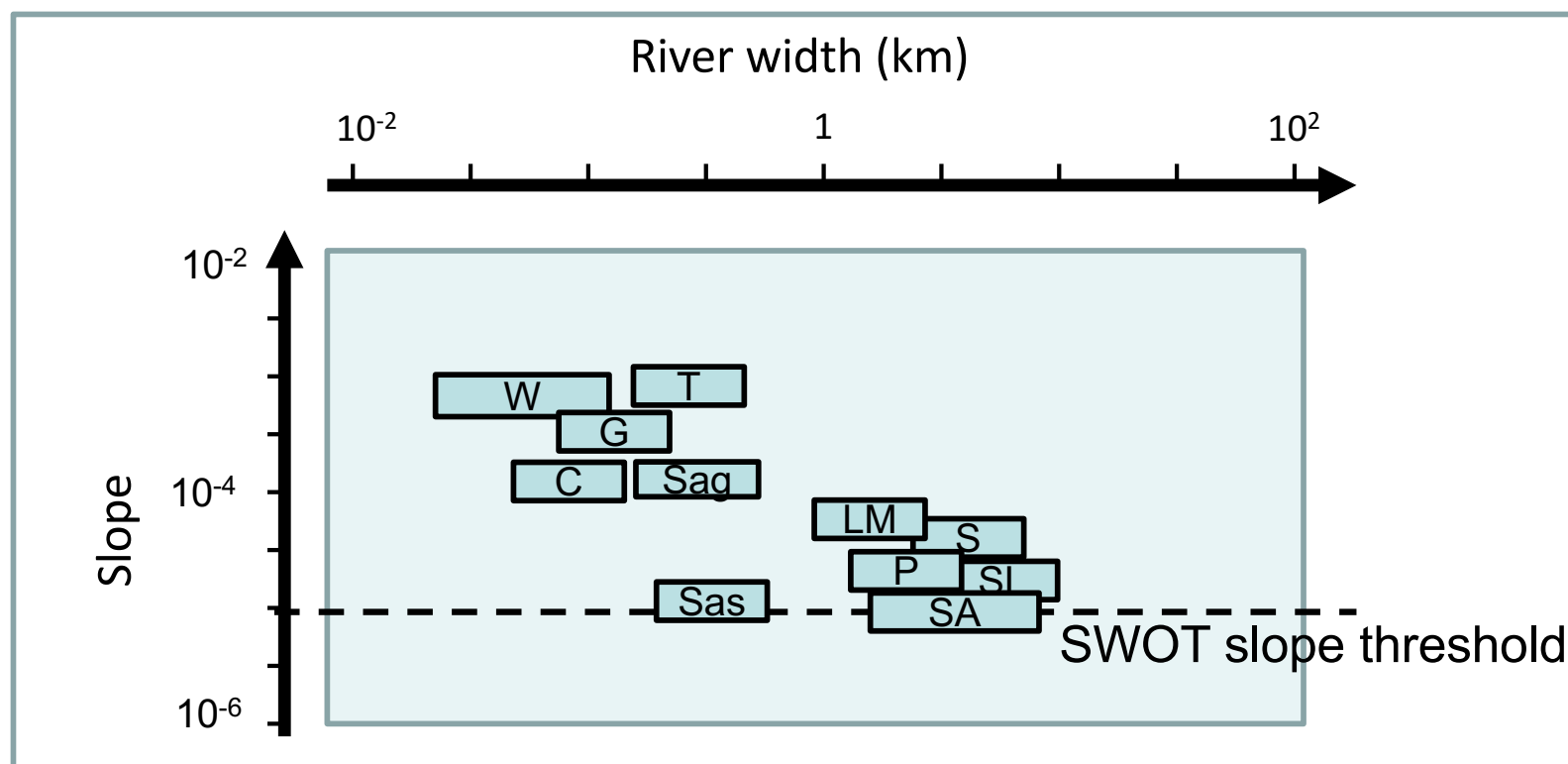
## Supplementary Slides





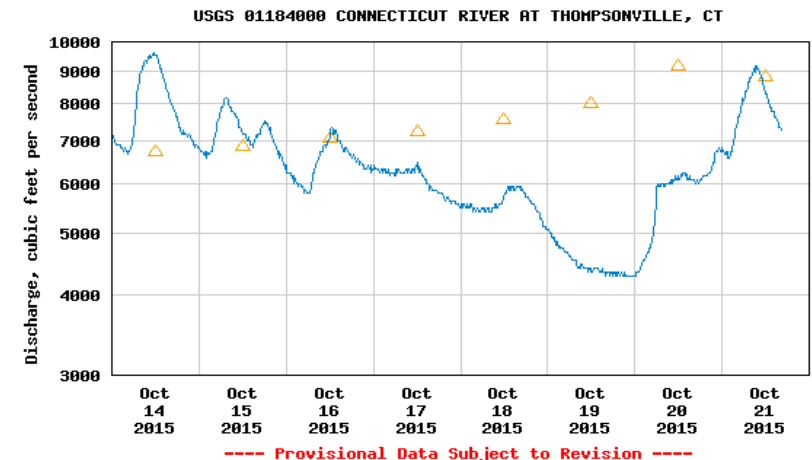
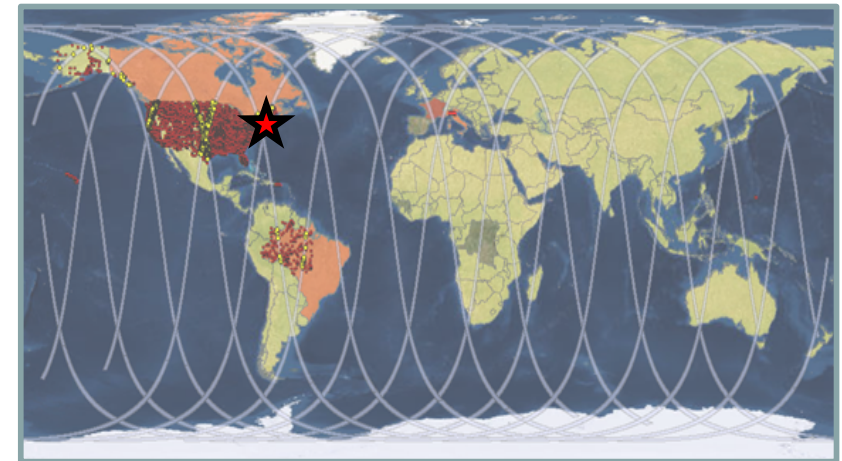
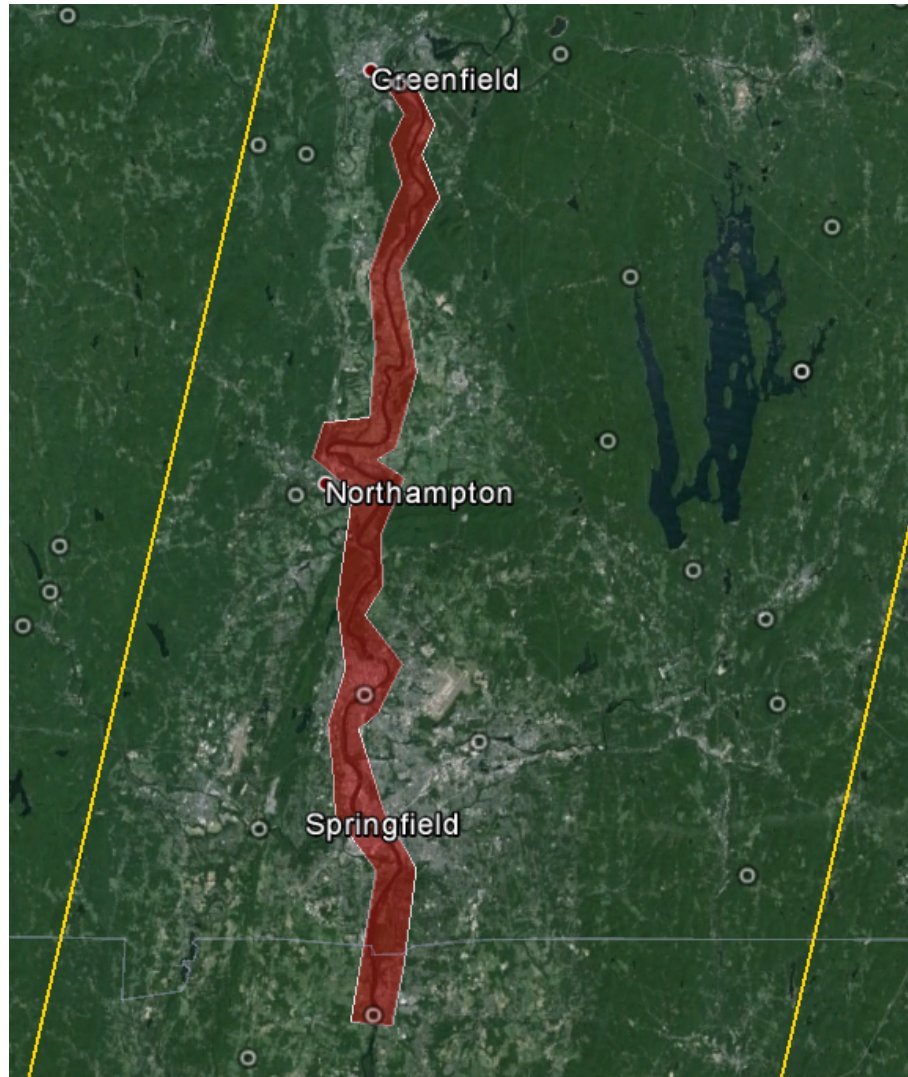
# Tier 1 River Sites

- Willamette River (US)
- Garonne River (FR)
- Lower Mississippi River (US)
- Connecticut River (US)
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# Tier 1 Example: Connecticut River

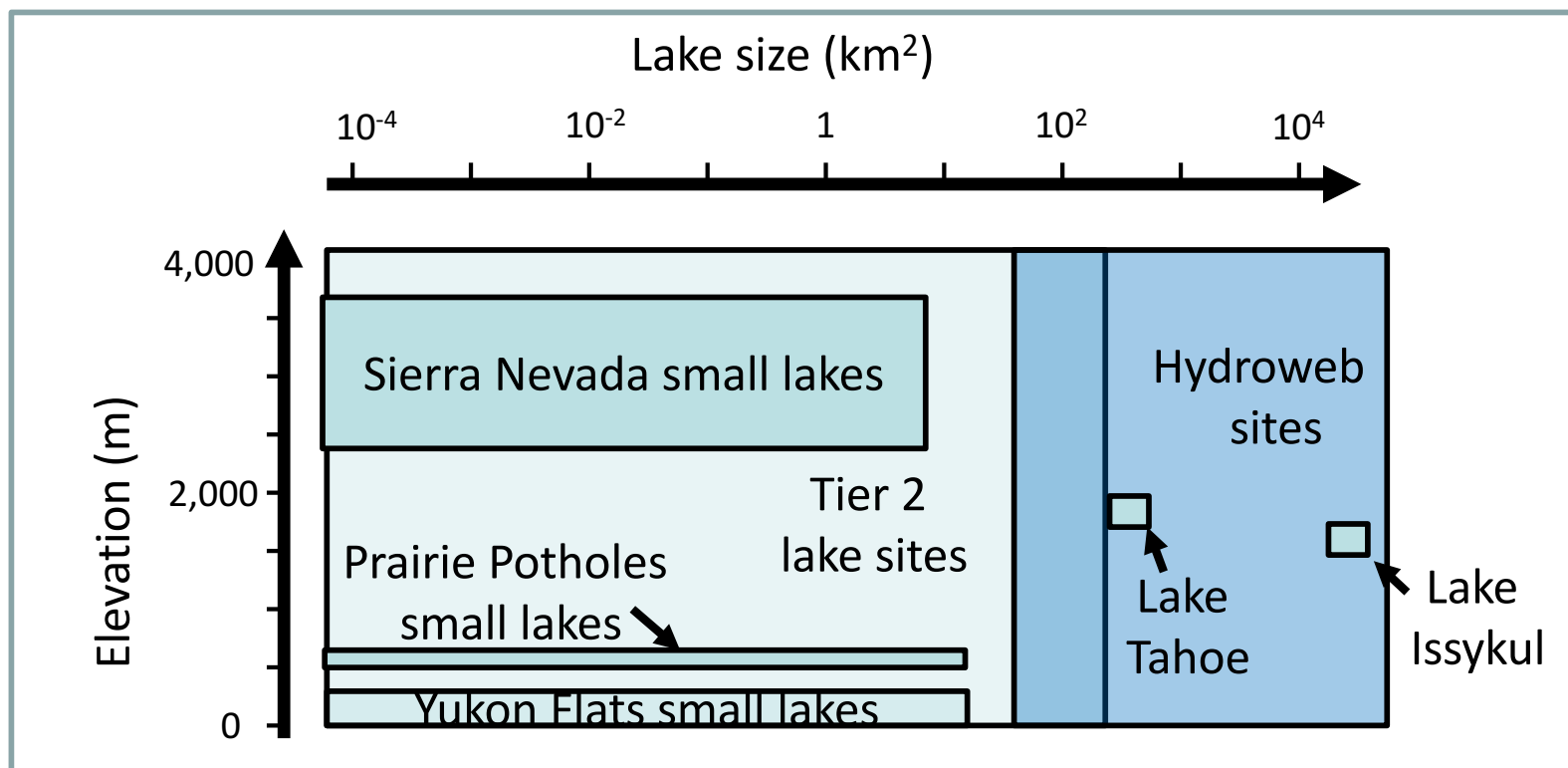




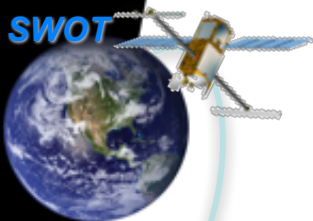
# Tier 1 Lake Sites



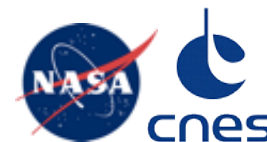
- Lake Issykkul
- Lake Tahoe
- Prairie Potholes Small Lakes
- Yukon Flats Lakes
- Sierra Nevada Alpine Lakes
- Chilean Lakes
- South American Lakes
- HydroWeb



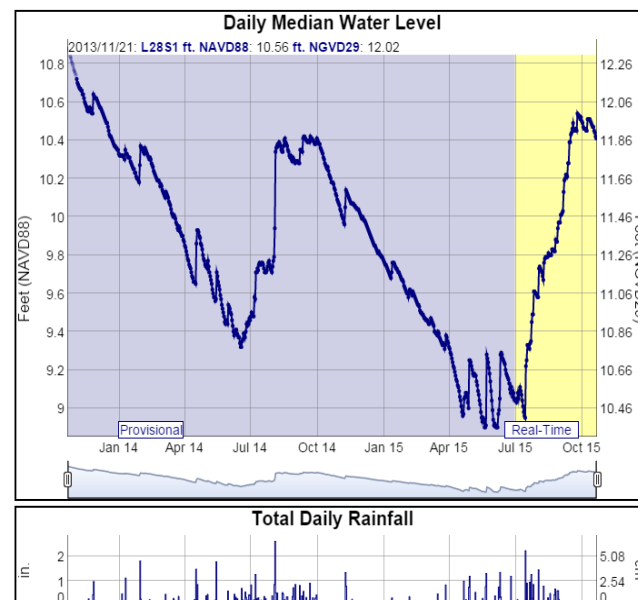
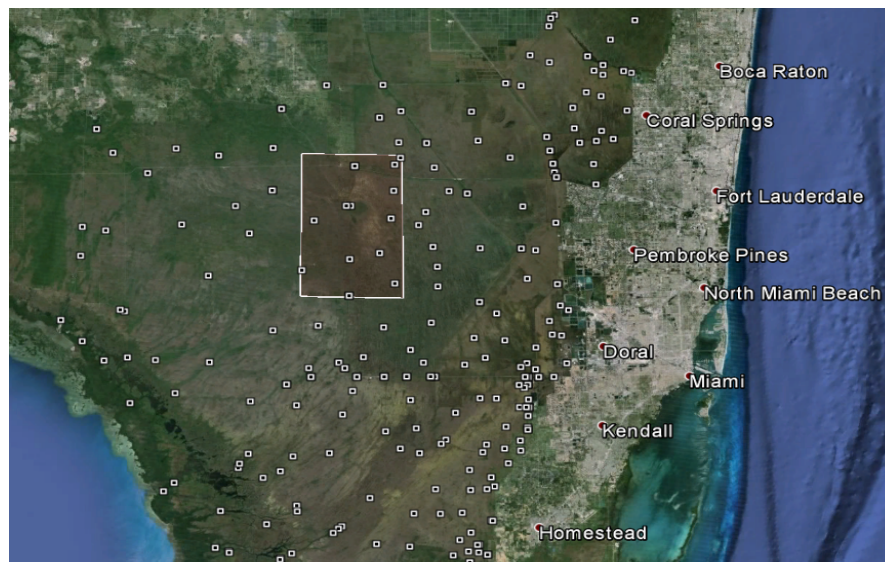


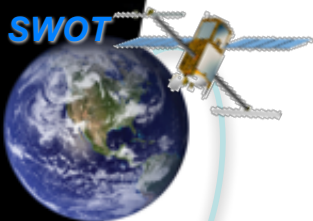


# Tier 1 Wetland and Tidal Sites



- Wetlands:
  - Mississippi Delta
  - Yukon Flats Wetlands
  - Everglades
- Tidal / Estuarine:
  - Severn
  - Connecticut

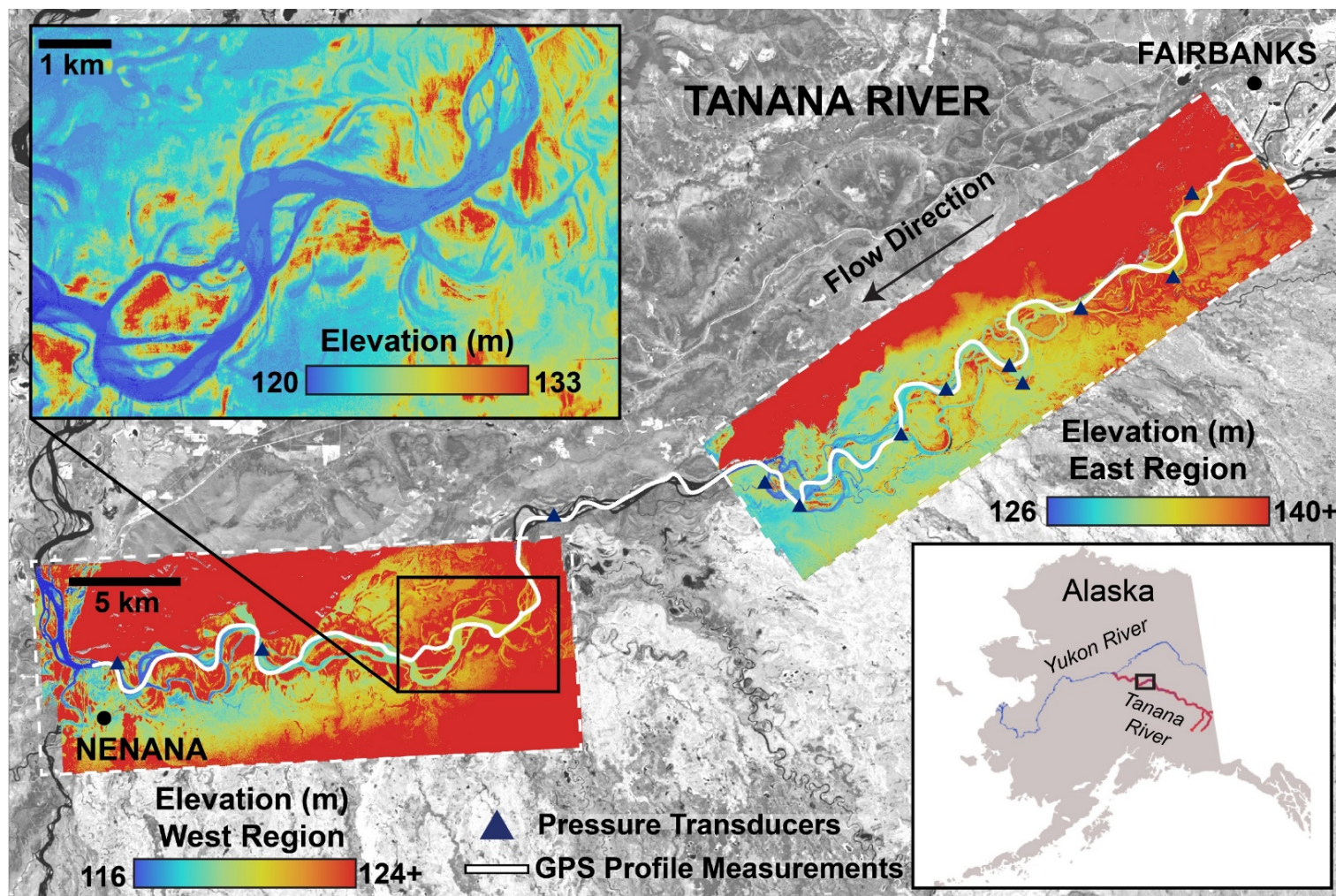




# AirSWOT 2015 Results



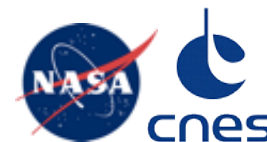
## AirSWOT Results: Tanana River, AK (June 9, 2015)



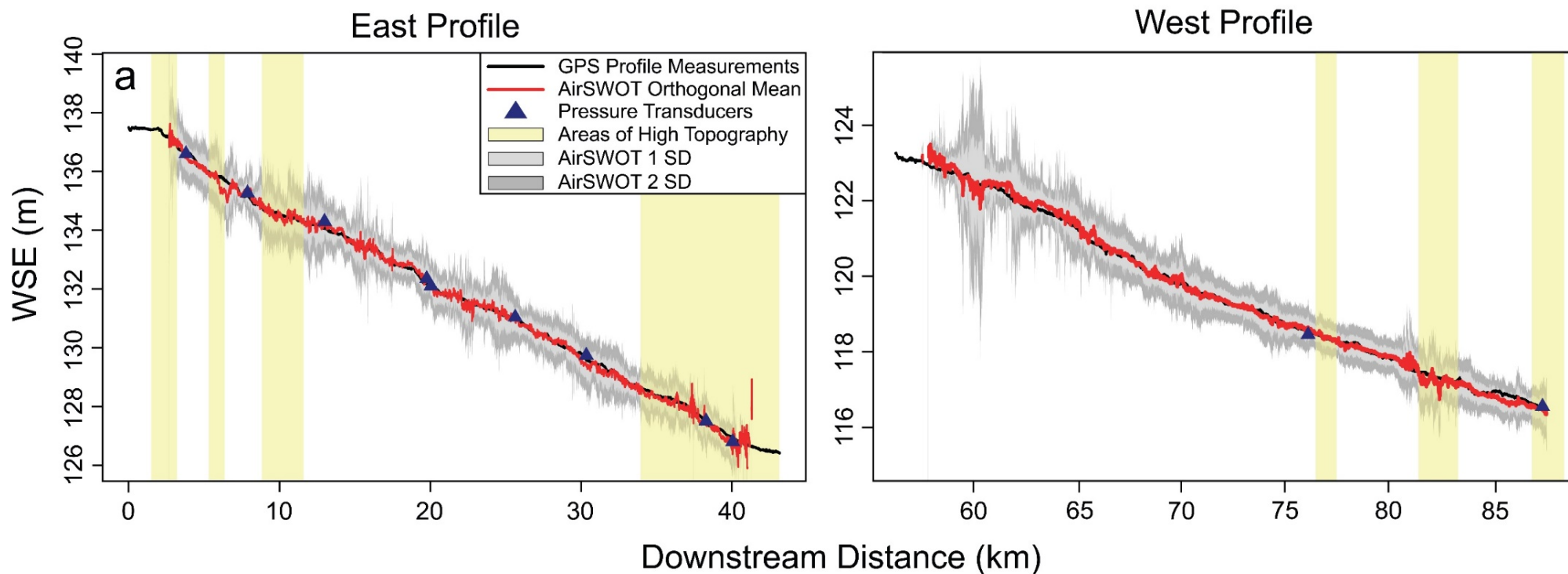




# AirSWOT 2015 Results



## Water Surface Elevation (WSE) Results: Tanana River, AK







# Conclusions from AirSWOT 2015



- Results on the Tanana and Willamette suggest that AirSWOT can, in some respects, do what it promised: provide SWOT-quality measurements of WSE and slope.
- AirSWOT can detect spatial variations in slope that are on the scale of 1 cm/km.
- We are still down in the weeds figuring out some aspects of AirSWOT error characteristics, and additional data will really help us out.
- Data from the 400 MHz inner swath will be required to do most of the phenomenology work that we want to do.