

Overview of Inland Hydrology Cal/Val

J. Toby Minear
University of Colorado, Boulder
ESOC / CIRES



Science Requirements



From the Science Requirements Document (2018):

Water surface elevation:

2.8.4 [Requirement] Using the pass-by-pass data of requirement 2.6.3.b, after processing elevations, river height accuracy shall be (1) 10 cm (1σ) or better over an area of 1 km² inside the non-vegetated river mask, and (2) 25 cm or better for water bodies whose non-vegetated surface area is between (250m)² and 1 km².

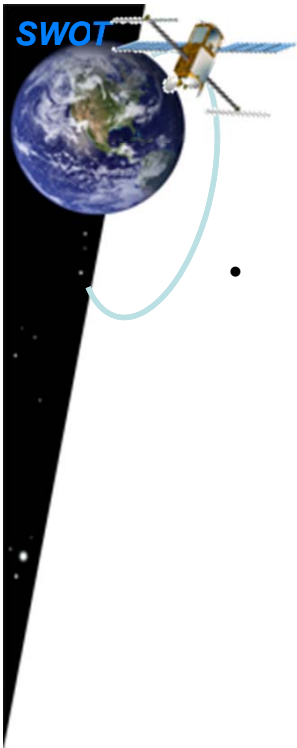
Slope:

2.8.5 [Requirement] Using the Level-2 data of requirement 2.6.3.b, after processing elevations over a maximum 10 km of flow distance, river water slope accuracy shall be 1.7 cm/1km (17 μ rad) (1σ) or better for river widths greater than 100 m.

Inundated area:

2.8.2.a [Requirement] The surface water areas estimated using the Level-2 water mask (requirement 2.6.3a) shall have a relative error smaller than 15% (1σ) of the total water body area for water bodies whose non-vegetated surface area exceeds (250m)² or river reaches whose width exceeds 100 m on average and length exceeds 10 km.

For Cal/Val measurements, our target is 10x more accurate



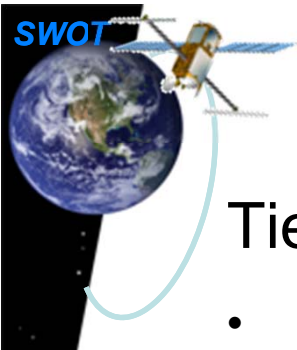
Inland Hydrology Cal/Val Sites



- **Tier 1 sites – ‘Gold standard’**
 - Numerous measurements at each site but relatively few sites
 - ♦ Existing data: Streamgages, aerial lidar, hydraulic model
 - ♦ SWOT planned measurements: Arrays of 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 on existing gage infrastructure
 - ♦ E.g. lake and streamgages
 - Rivers, Lakes, Wetlands, Tidal / Estuarine
 - Increase geographic spread of SWOT Cal/Val

- **Remotely-sensed Cal/Val sites? Other in-situ data?**

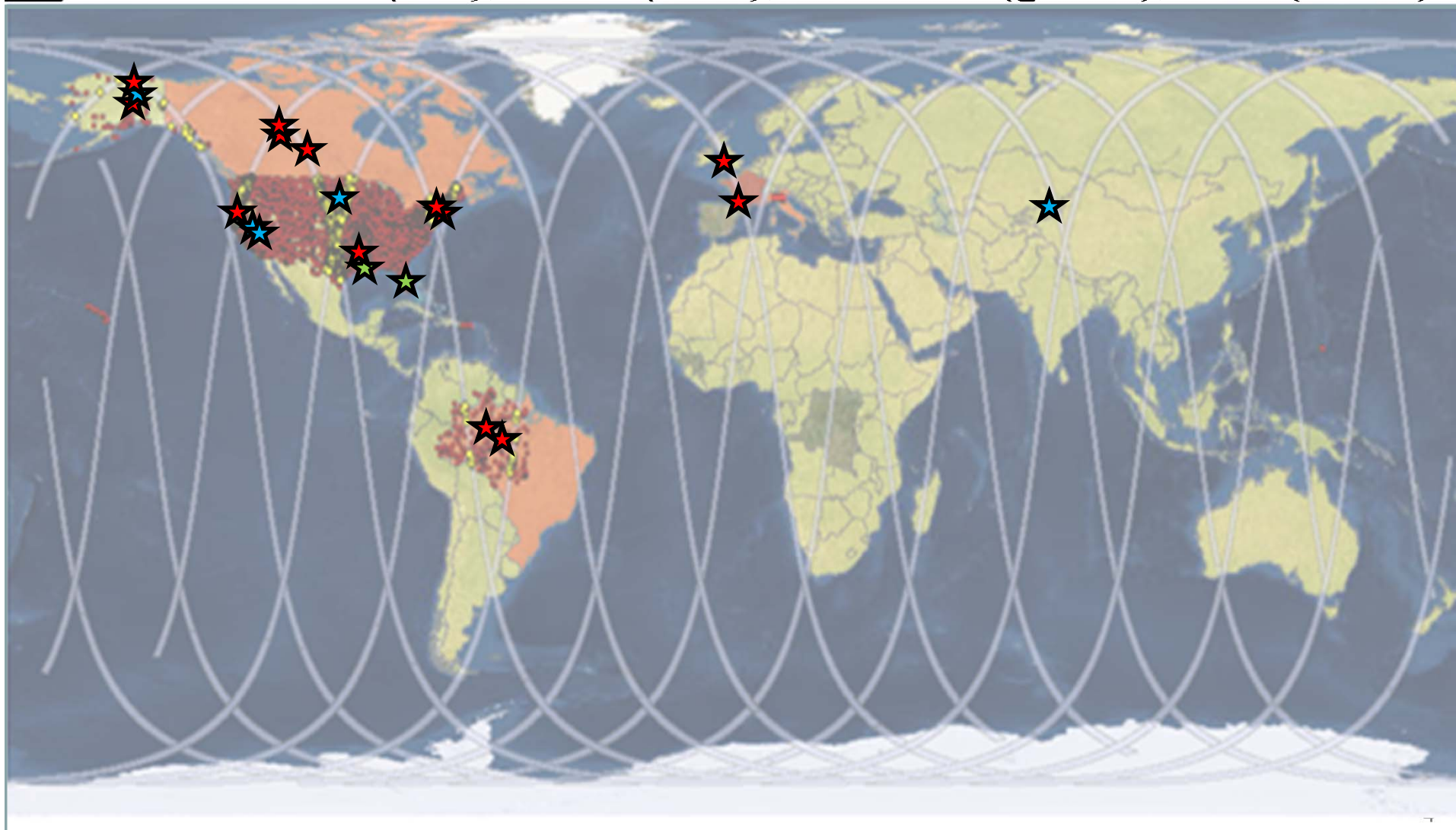


Inland Hydrology Cal/Val Sites



Tier 1 sites:

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



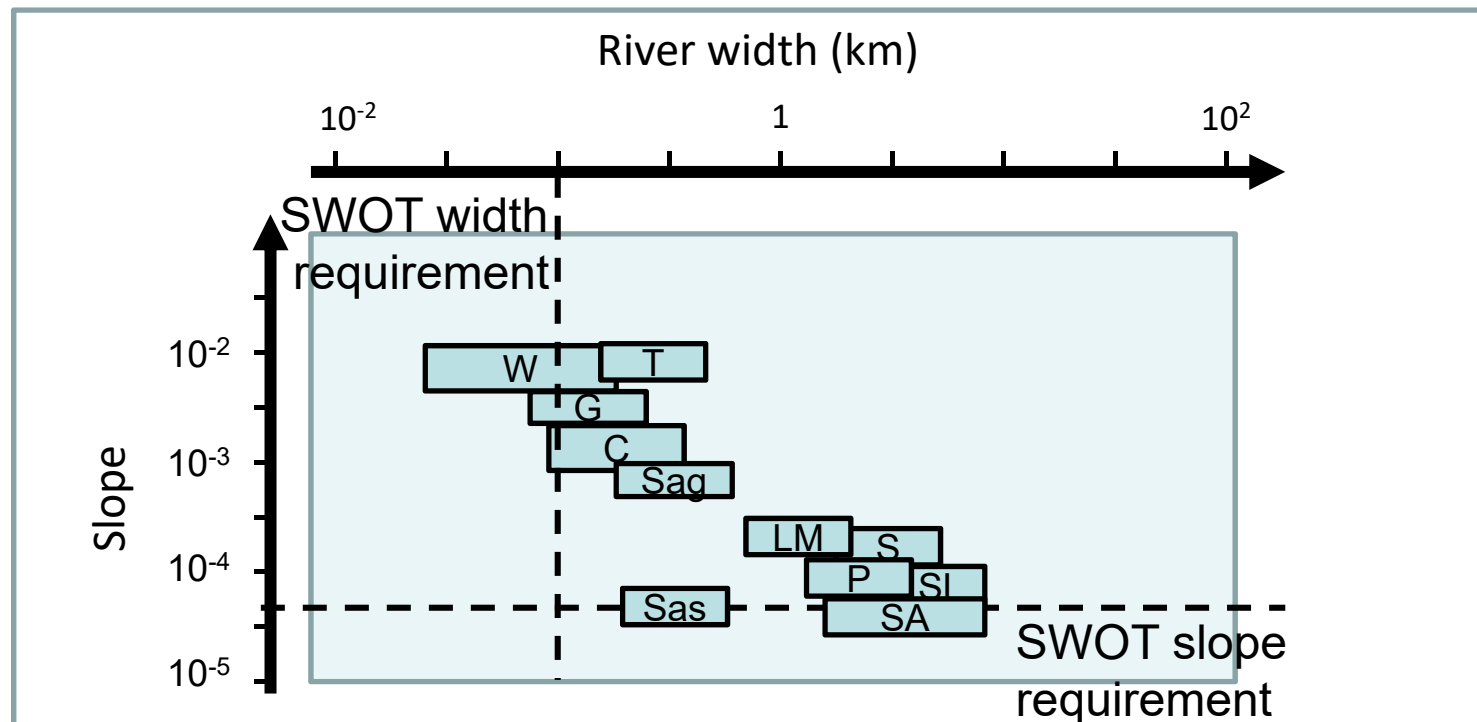


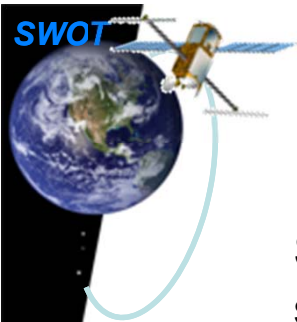
Inland Hydrology Cal/Val Sites



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

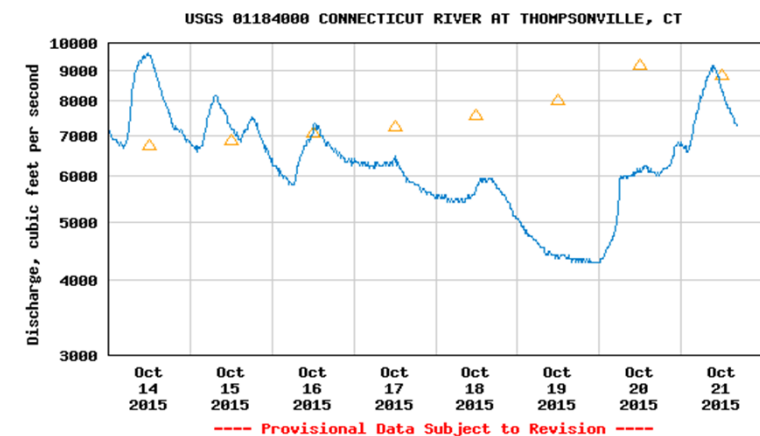
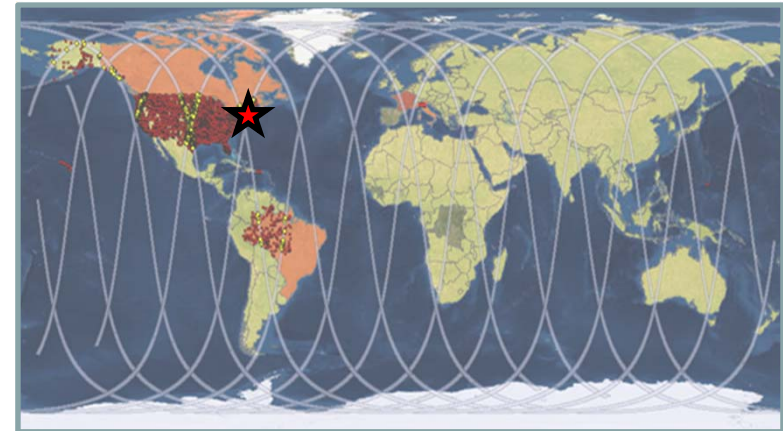
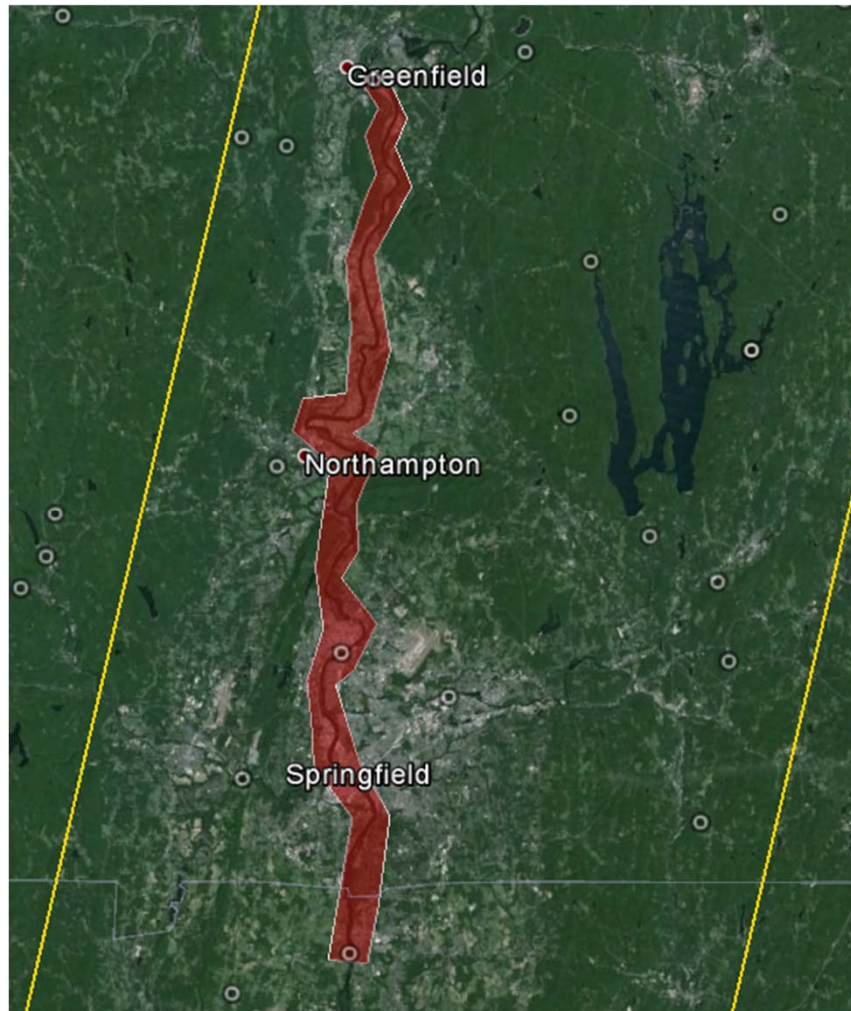


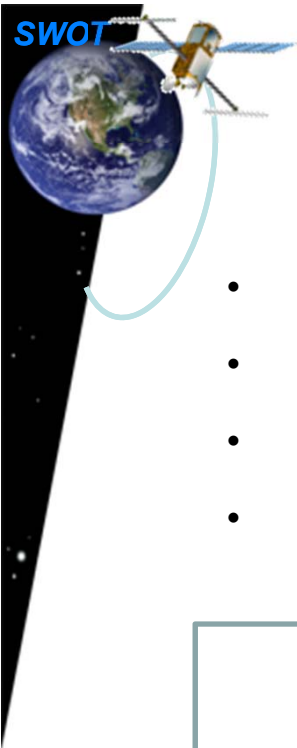


Tier 1 Example: Connecticut River



Single-thread, moderate width (~180-260m) channel with instream structures and nearby cities

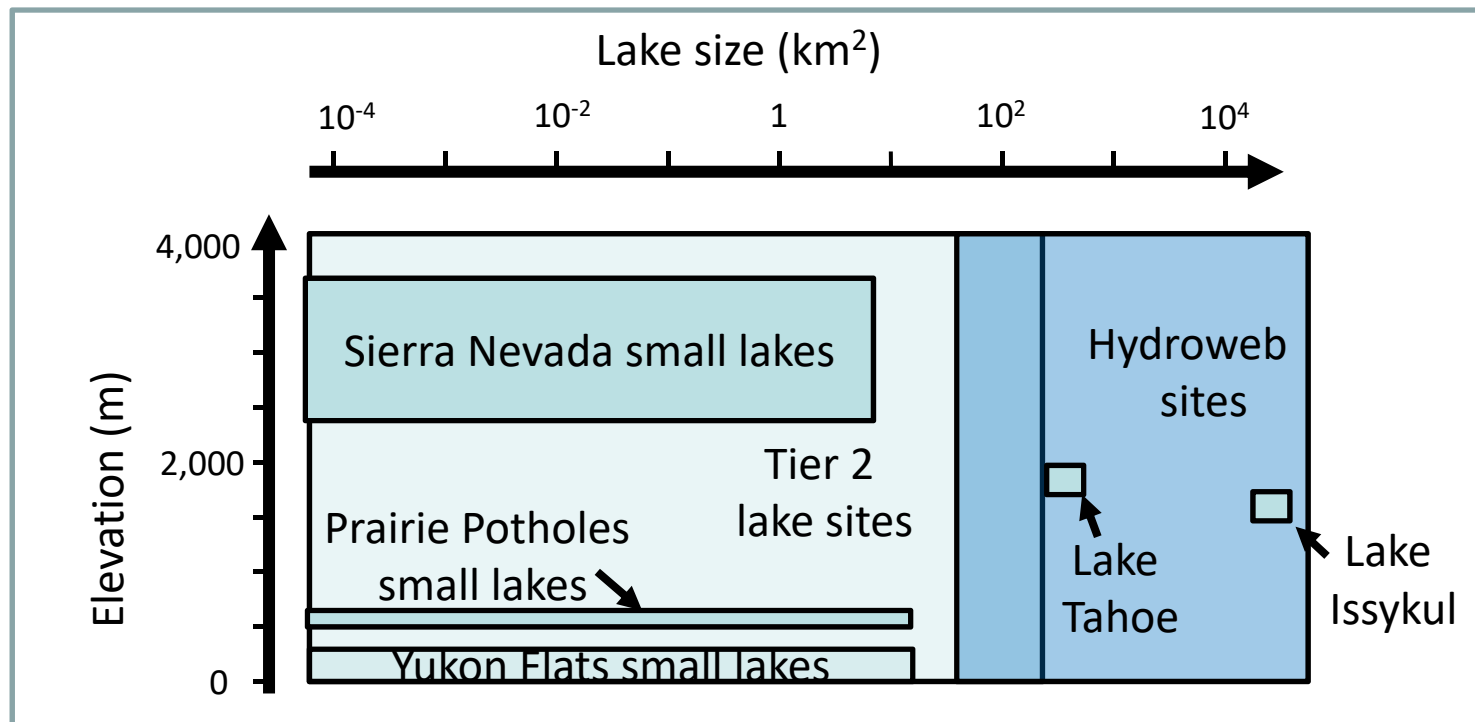


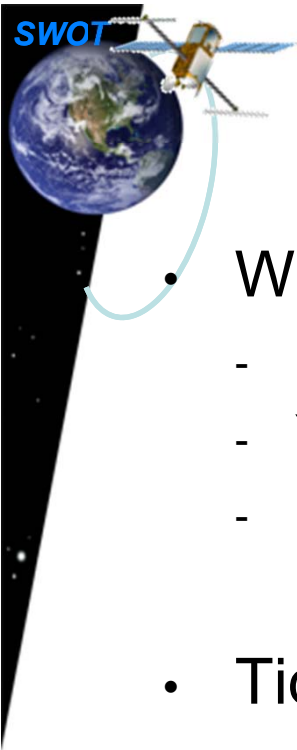


Tier 1 Lake Sites



- Lake Issykkul (FR)
- Lake Tahoe (US)
- Prairie Potholes (US)
- Yukon Flats Lakes (US)
- Sierra Nevada (US)
- South American Lakes (FR)
- HydroWeb

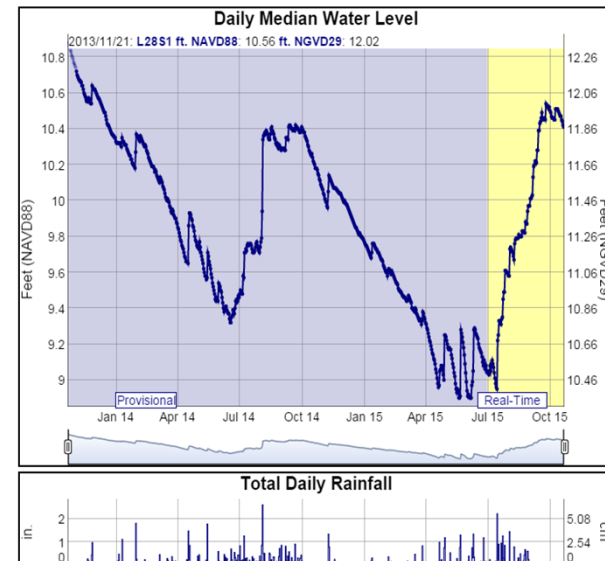
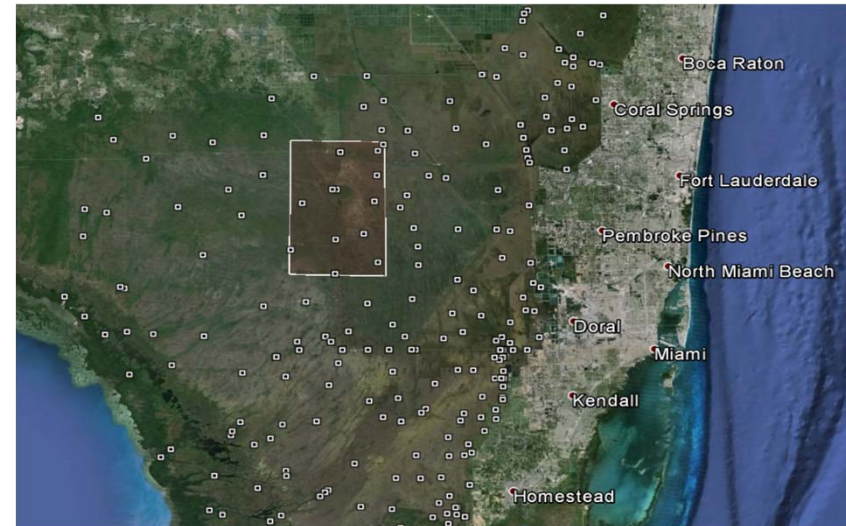




Tier 1 Wetland and Tidal Sites



- Wetlands:
 - Mississippi Delta (US)
 - Yukon Flats Wetlands (US)
 - Everglades (US)
- Tidal / Estuarine:
 - Severn (UK)
 - Connecticut (US)



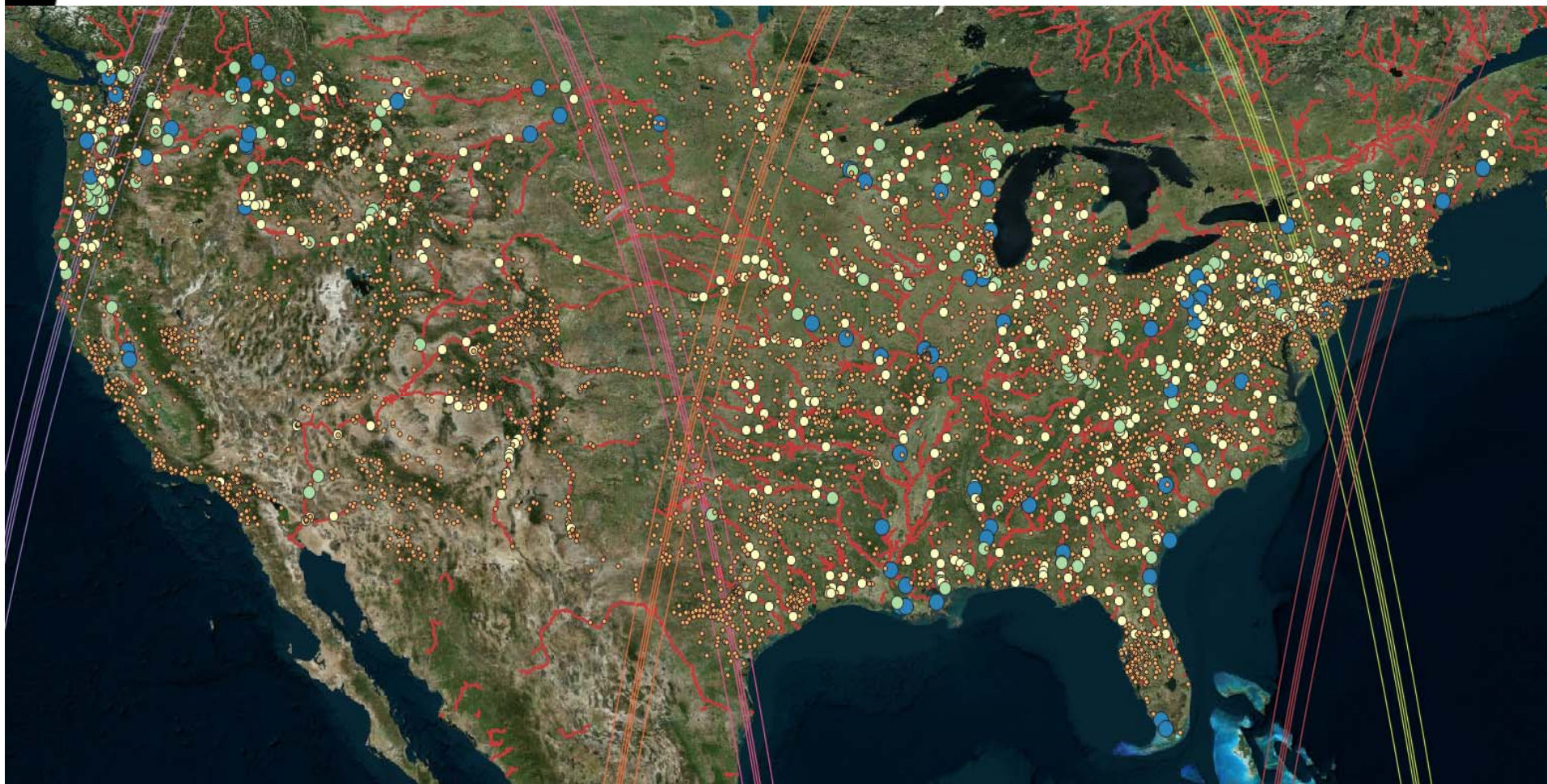


SWOT Cal/Val sites: Tier 2



Tier 2 sites:

- ~75 being selected





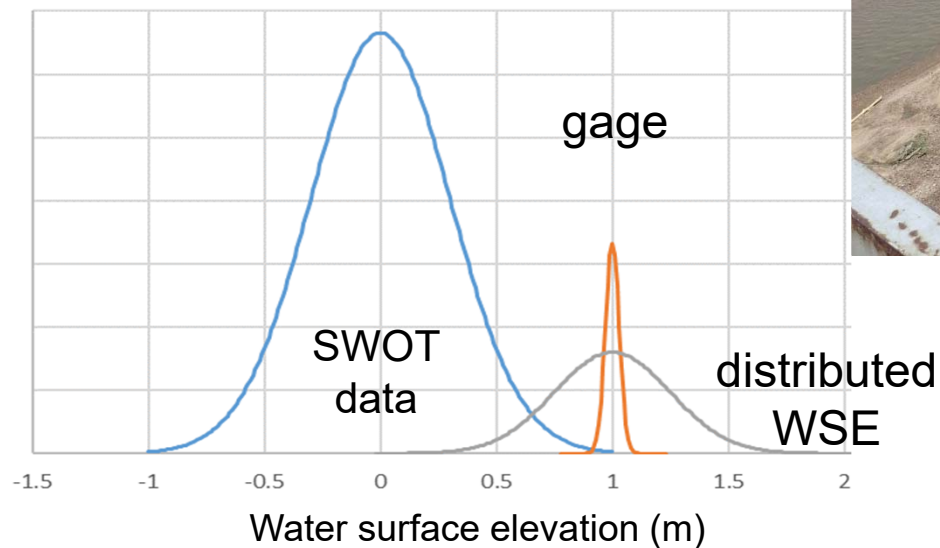
Natural water surface distributions

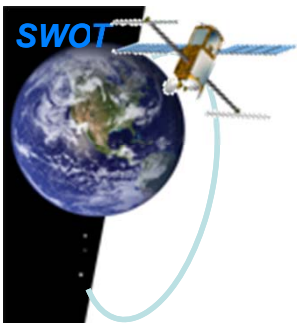


- Better understanding of natural water surface distributions

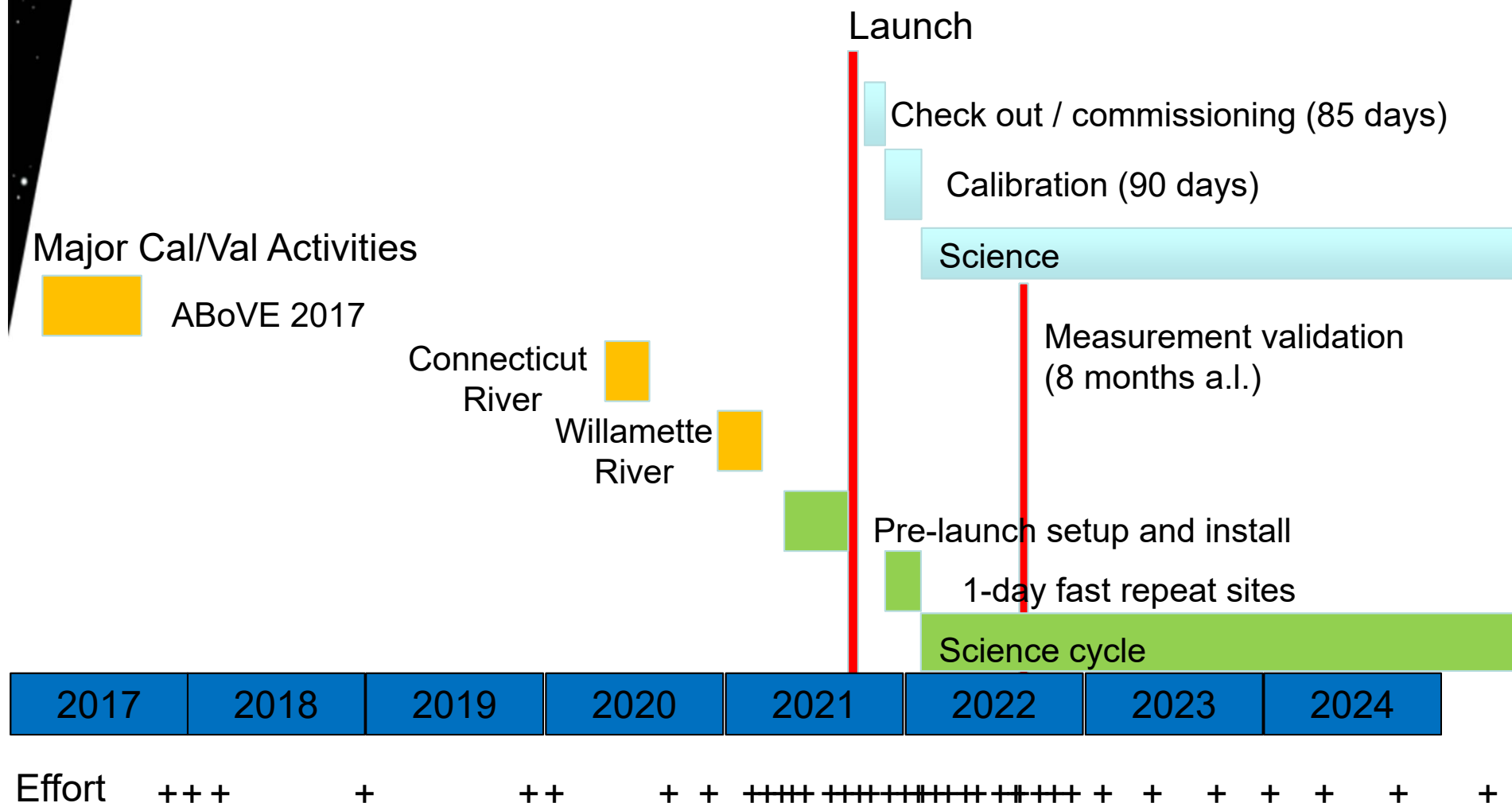
USGS gage: South Platte at Fort Morgan, CO (under 1-day SWOT orbit)

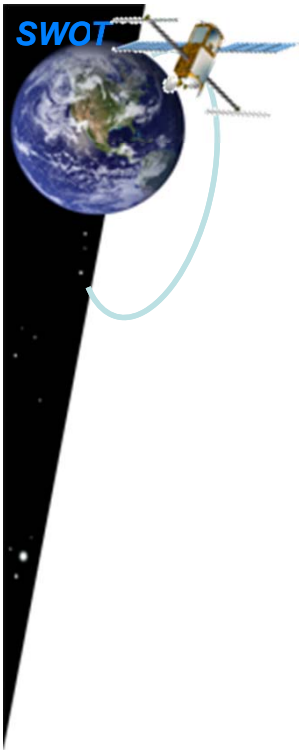
- SWOT observable





Cal/Val Timeline





Supplementary Slides