USGS Satellite River Gaging (SatRSQ) & SWOT

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10th SWOT Applications Meeting
Pasadena, California
December 7-8, 2023

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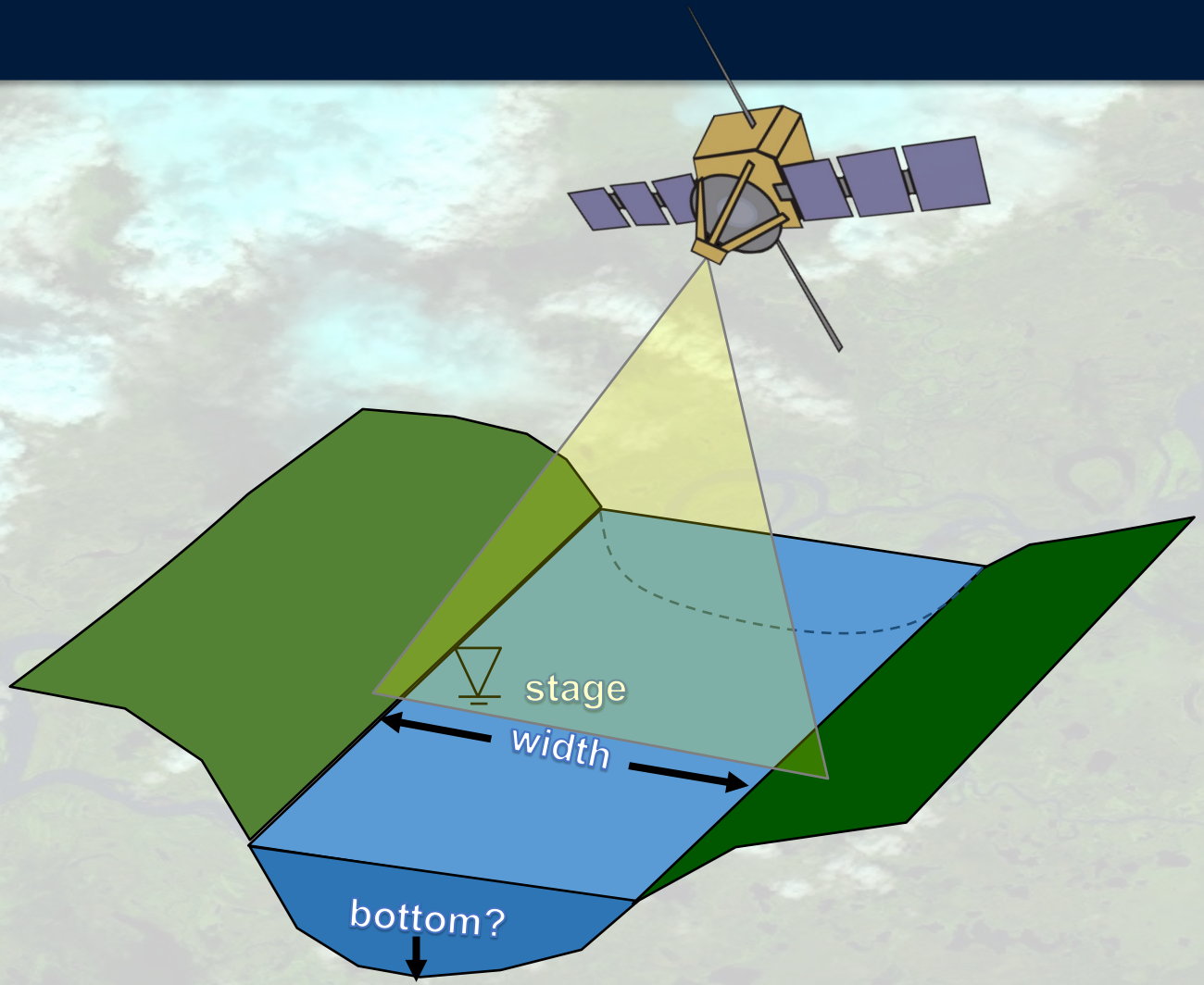
Satellite Remote Sensing of Discharge (SatRSQ)

- Objectives
  - Increase spatial surface-water gage coverage
  - Monitor remote locations
  - Safety
  - Cost

SatRSQ Challenge



Flow = Velocity x Area

Area = Width x Depth

SatRSQ Algorithm

- Modified Manning's Equation with stage-varying resistance
- Key component data
  - Altimetry
  - Reach-averaged surface water extent
  - Field calibration

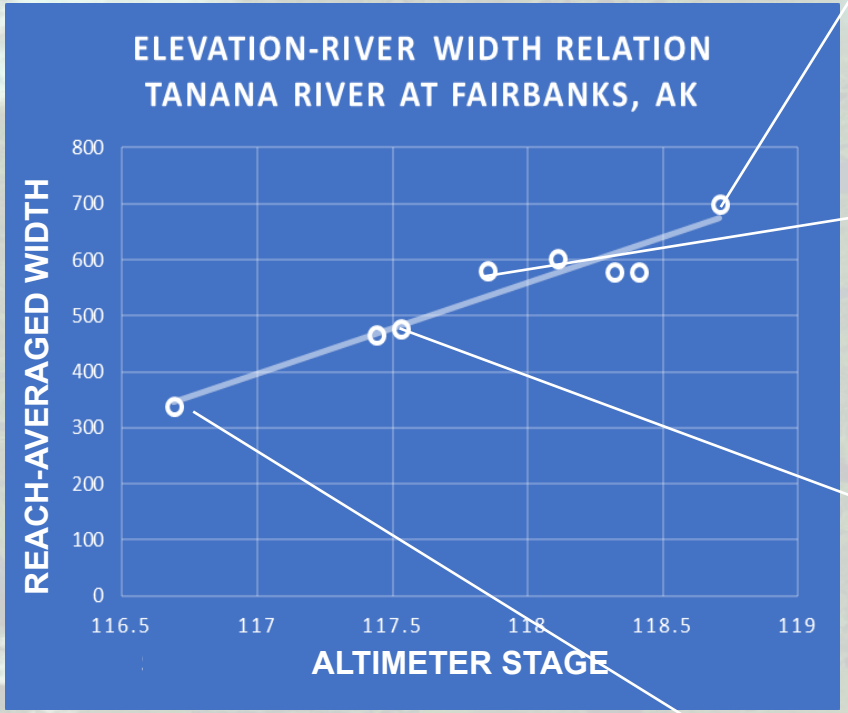
$$Q = \frac{\left[W * \left((h-B) * \left(1 - \left(\frac{1}{1+r}\right)\right)\right)^{1.67} * S^{0.5}\right]}{n}$$

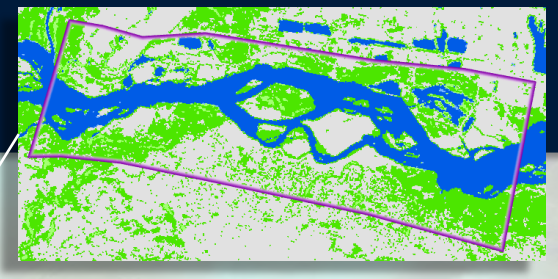
$$n = n_b * \left(\frac{(H-B)}{(h-B)}\right)^x$$

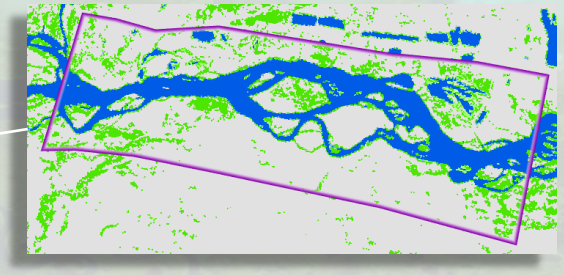
Equations 1 and 15 *from:* Bjerklie et al., 2018, Satellite remote sensing estimation of river discharge: Application to the Yukon River Alaska: *J. Hydrology*, 561, p.1000-1018.

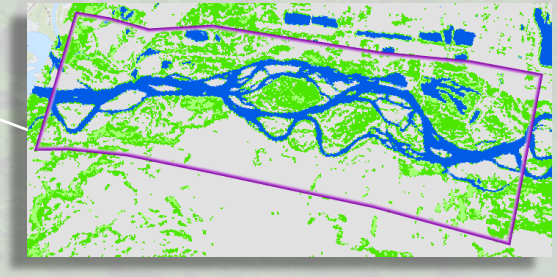
Variable	Observation	Data Source
Water surface heights (h, H, S)	Elevation	Altimetry
Reach averaged geometry (W)	Surface water area	DSWx / SAR / other
Channel roughness and invert (n_b, x, B)	Flow measurements	Field (calibration)

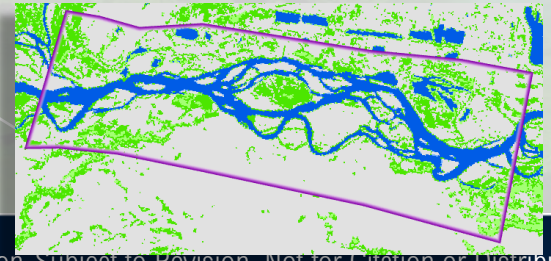
Altimetry & Surface Water Extent Data











Example Application: Tanana River, Alaska

USGS 15485500 TANANA R AT FAIRBANKS AK

PROVISIONAL DATA SUBJECT TO REVISION

Available data for this site | Ti

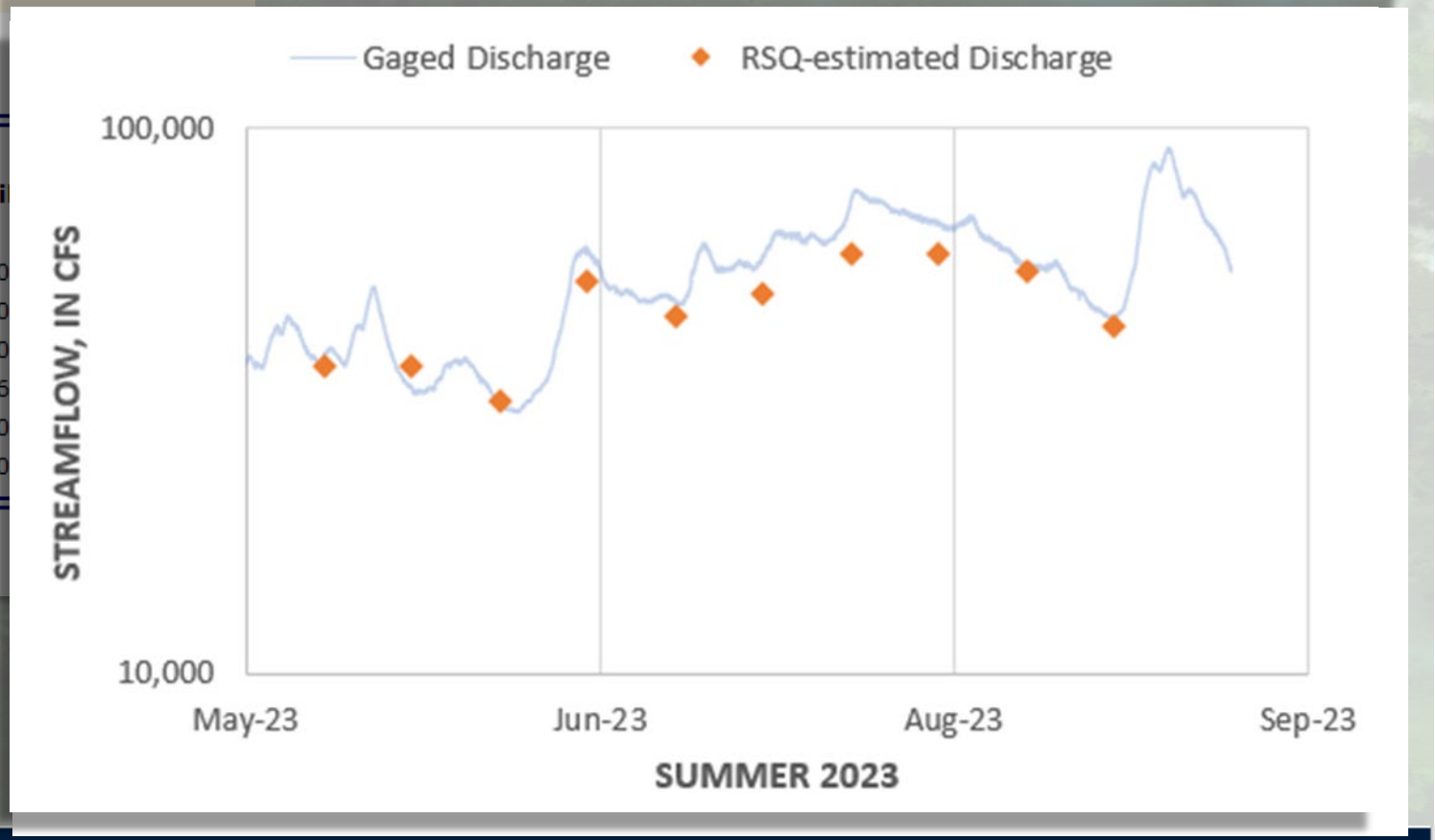
Click for station-specific text

This station managed by the Fairbanks Field Office.

Available Parameters	Avai
All 6 Available Parameters for this site	
00060 Discharge	1989-10
00060 Discharge [RSQ cfs]	2018-10
00065 Gage height	2007-10
70969 DCP battery voltage	2021-06
72333 Reach-avg water-surface elev [RSQ m]	2018-10
72397 Reach-avg water-surface elev [RSQ ft]	2018-10

Summary of all available data for this site

Instantaneous-data availability statement

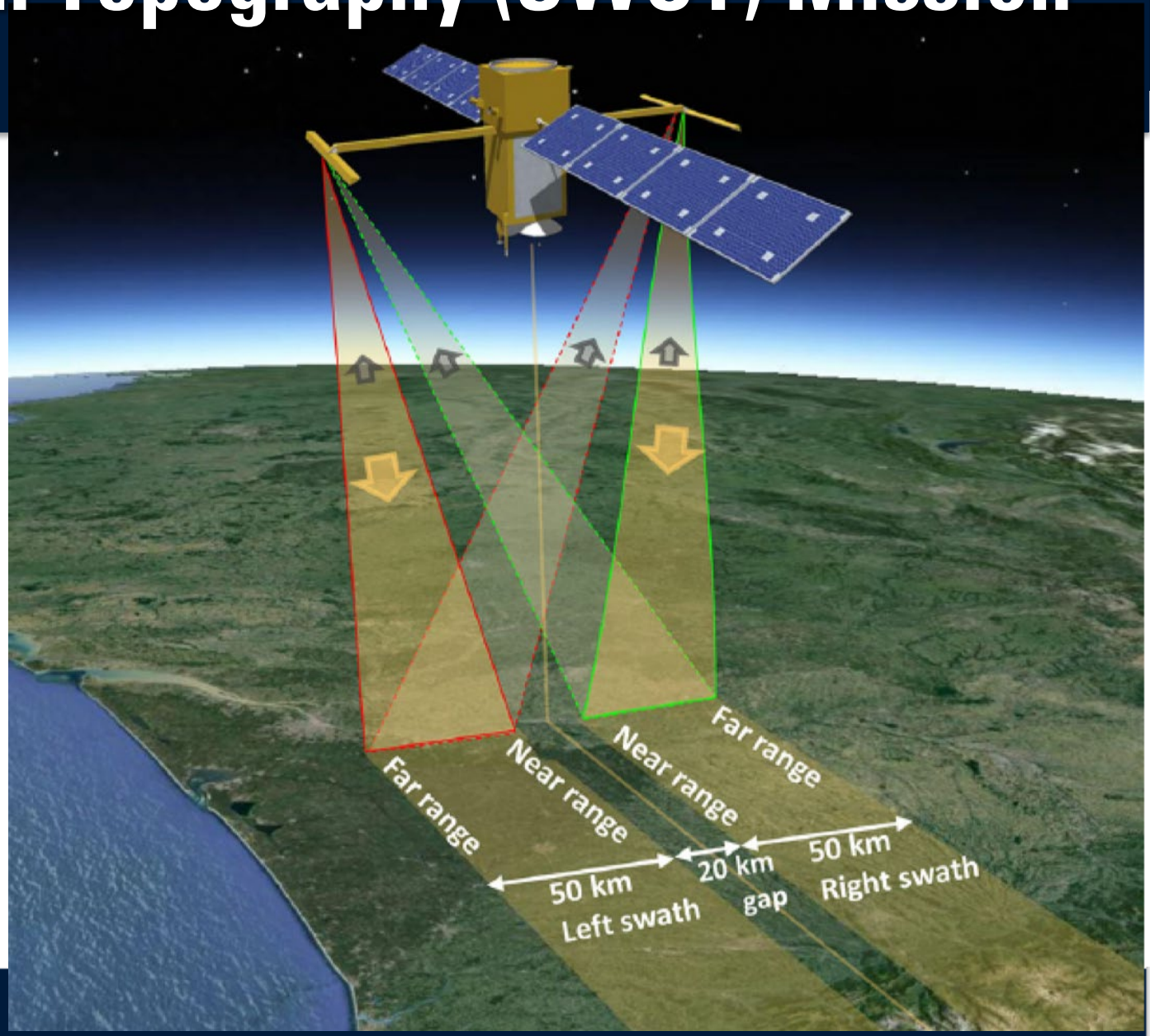


Data access presently limited to project cooperators and internal to USGS

Surface Water and Ocean Topography (SWOT) Mission

- Directly supports SatRSQ gaging methods

- Collaboration with PO.DAAC
  - Cassie Nickles, Catalina Taglialatela, Nicholas Tarpinian, Victoria McDonald, Frank Greguska, Nikki Tebaldi
  - USGS EA team
- Development of API to work with data access & visualization for USGS dashboard to support remote sensing activities



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