Jet Propulsion Laboratory
California Institute of Technology

Delta-X AirSWOT Water Level Data Products

2023 Delta-X Open Data Workshop

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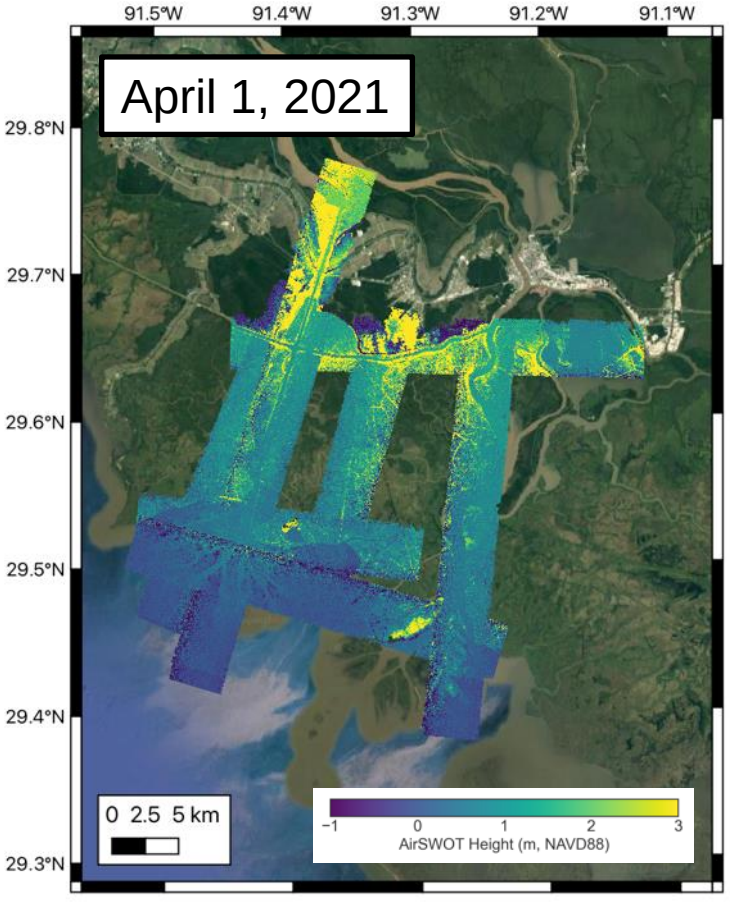
Introduction

- AirSWOT successfully collected a **record 409 flight lines** during the Delta-X Spring and Fall campaigns, over the course of 21 science flights.
- Different Products Available:
  - Level 1B Interferogram Products in Radar Coordinates
    https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=1996
  - Level 2 Geocoded Water Surface Elevation (GeoTIFF)
    https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=2128
  - Level 3 Water Surface Elevations (Point Data CSV)
    https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=2133
- More flight lines than AirSWOT has ever collected before, **with more temporal revisits than any previous AirSWOT campaign**.
- Data from two Fall science flights (September 1 and September 5, 2021) had large errors, but the other nineteen science flights had errors consistent with previous AirSWOT campaigns (water surface elevation mean absolute error of ~10 cm or less).

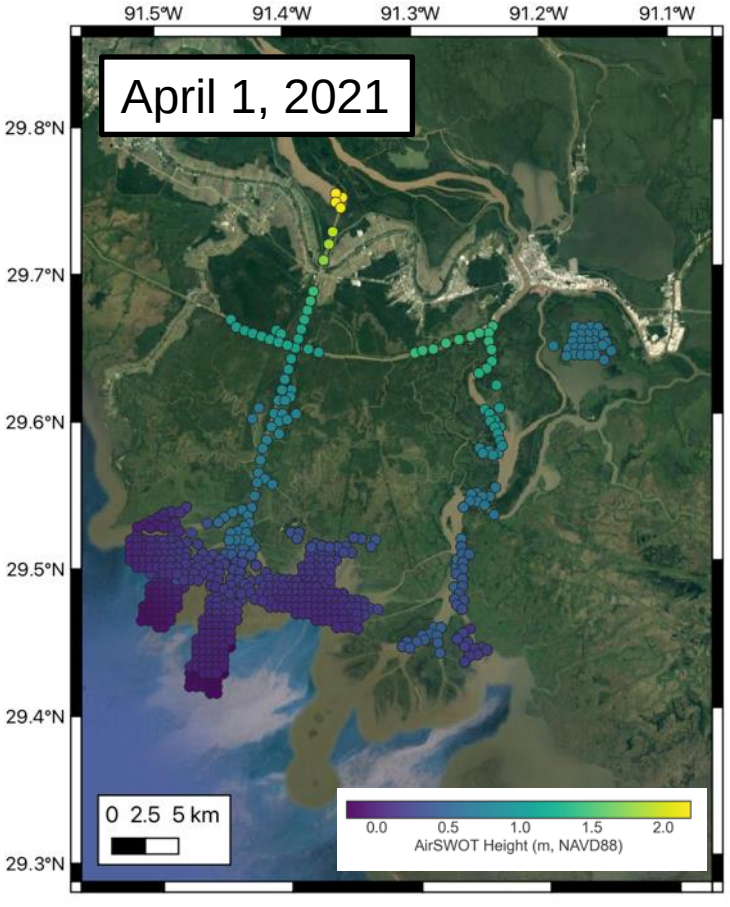
AirSWOT L2 Data Product Overview

- Geocoded GeoTIFF Raster Files
- UTM Coordinate System, Zone 15N
- Water surface elevation with respect to the WGS84 ellipsoid (.hgt.tif) or NAVD88 GEOID12B (.ghgt.tif)
- Uniform 3.6 m pixel spacing
- In addition to height, contains backscatter and radar coherence information
- Highest fidelity to the radar imagery collected by AirSWOT
- Requires masking and filtering to separate land from water pixels and to reduce noise

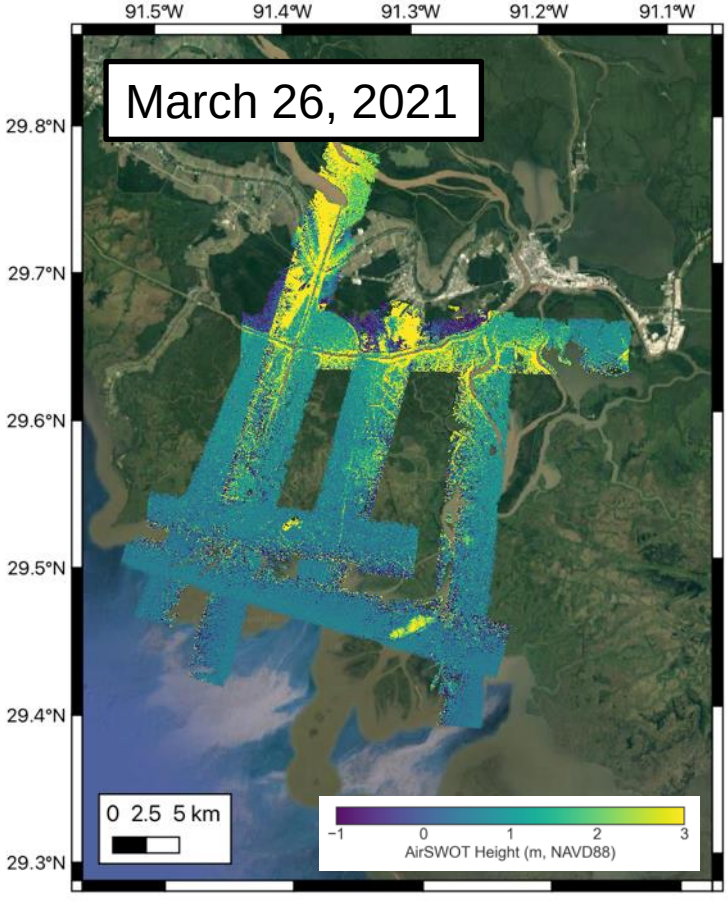


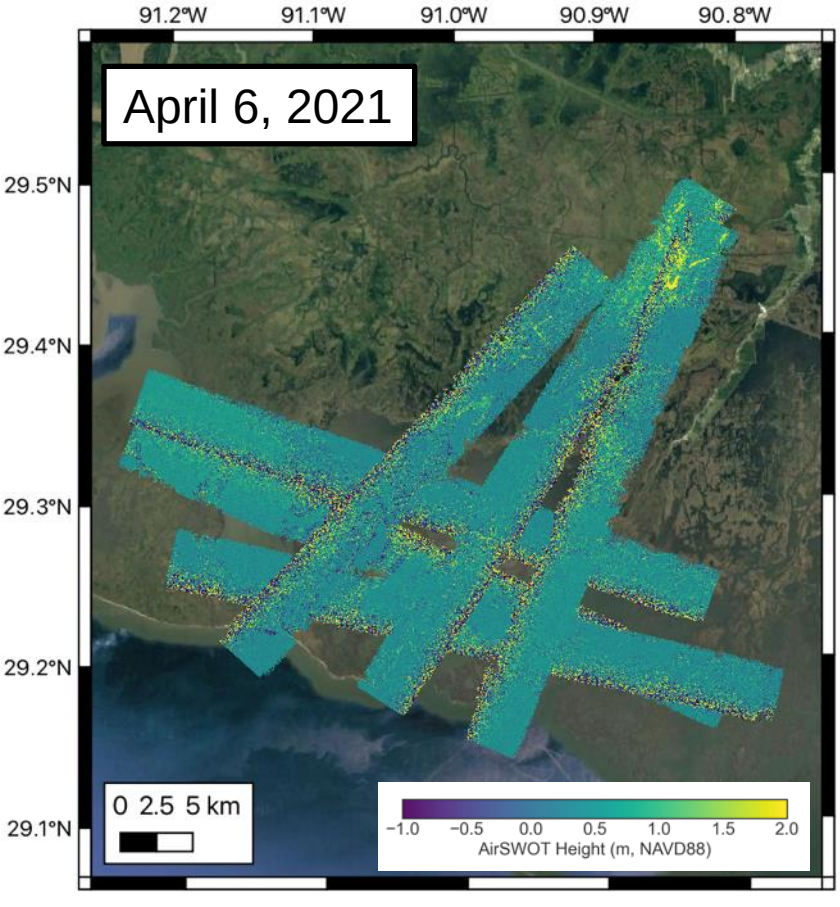
AirSWOT L3 Data Product Overview

- Plain Text, Comma-Separated Values
- Small Data Volume, Highest Processing Level
- Includes latitude, longitude, UTM coordinates, and water surface elevation with respect to WGS84 and NAVD88 as attributes.
- Water points only; land is masked out using UAVSAR data
- Node density varies depending on water location, channel width, and water roughness
- Filtered and averaged to reduce noise
- Can easily track water level over time at a given node as seen by AirSWOT
- Can plot profile data and extract water surface slopes for selected channels

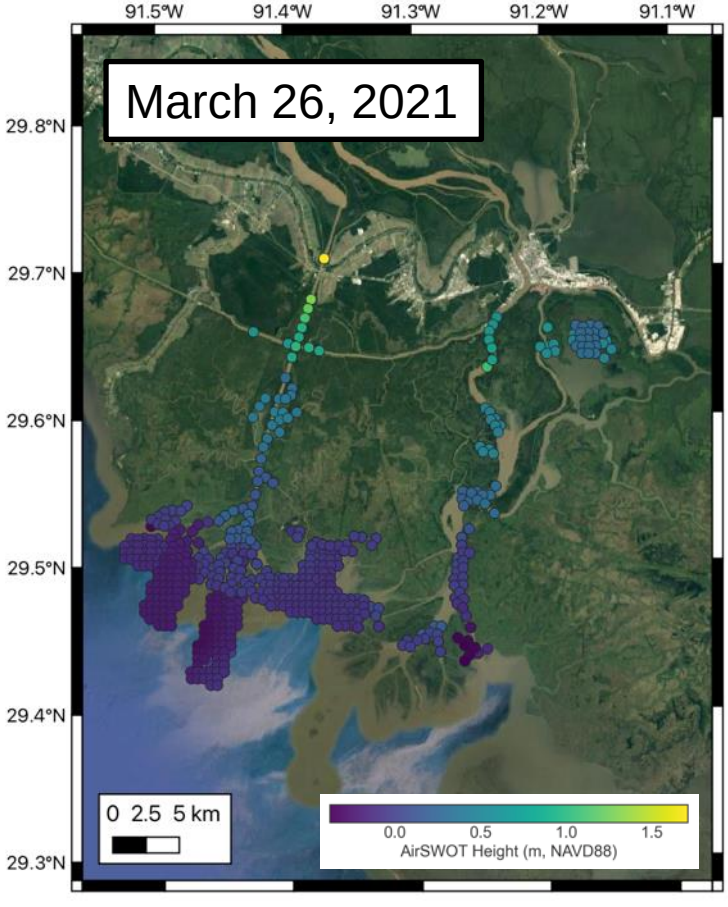


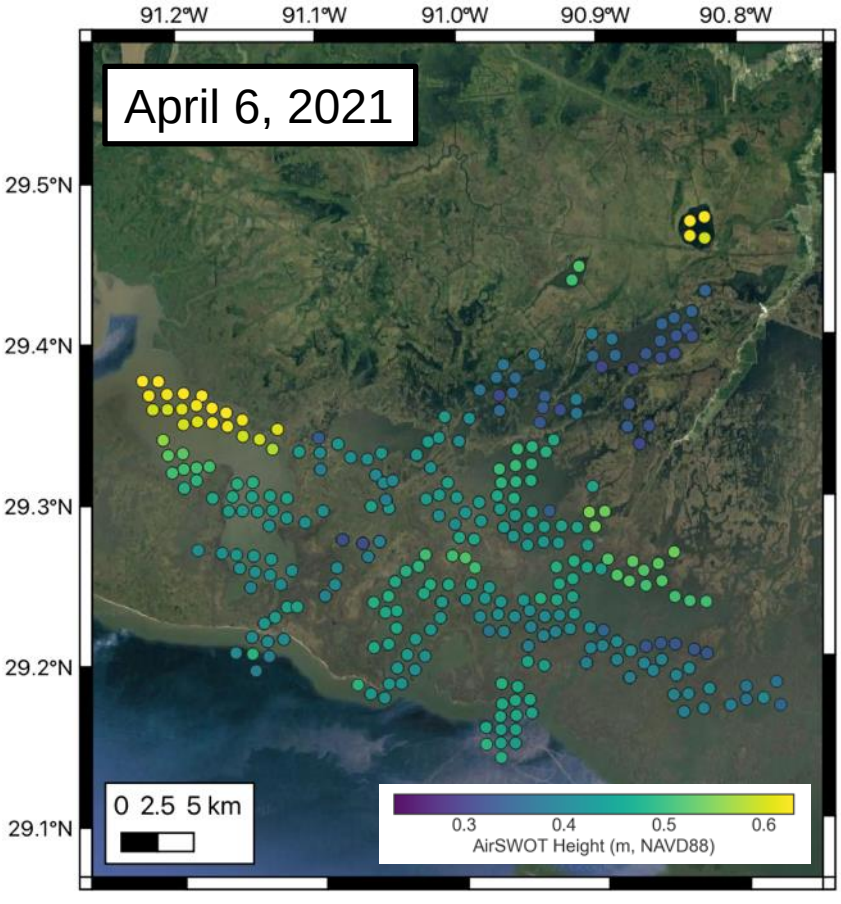
Examples of AirSWOT L2 Products





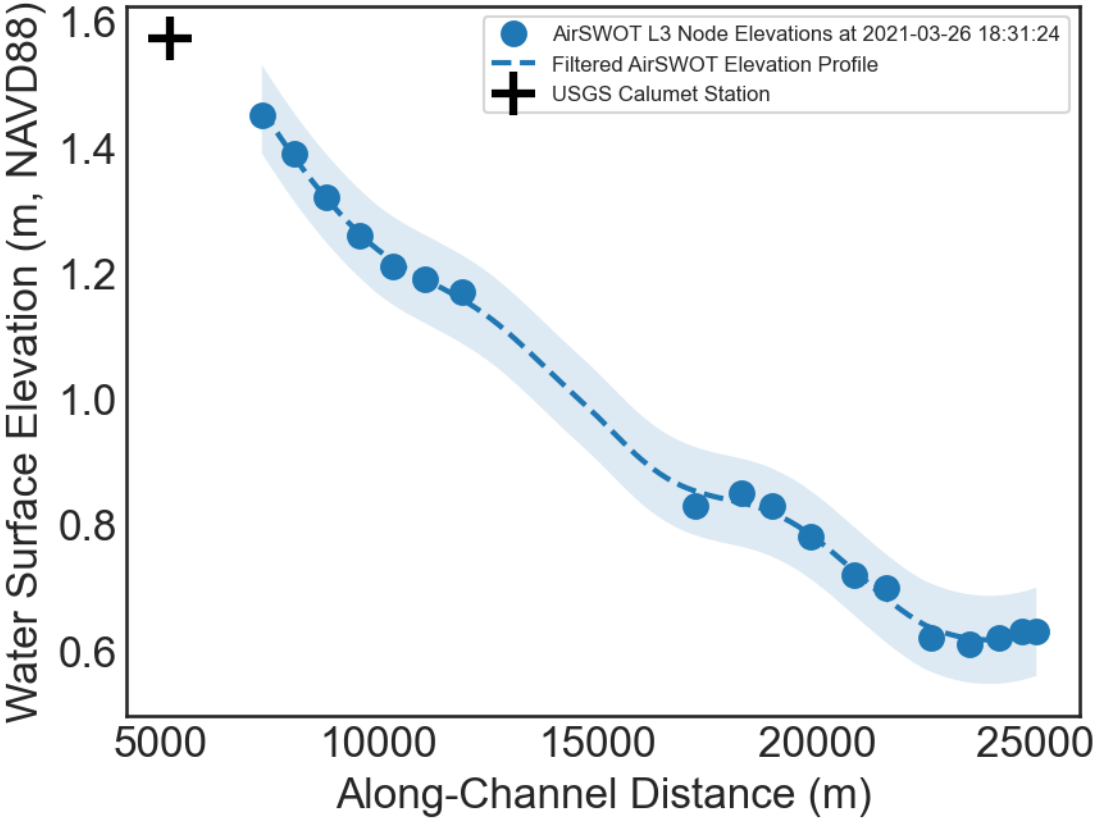
Examples of AirSWOT L3 Products

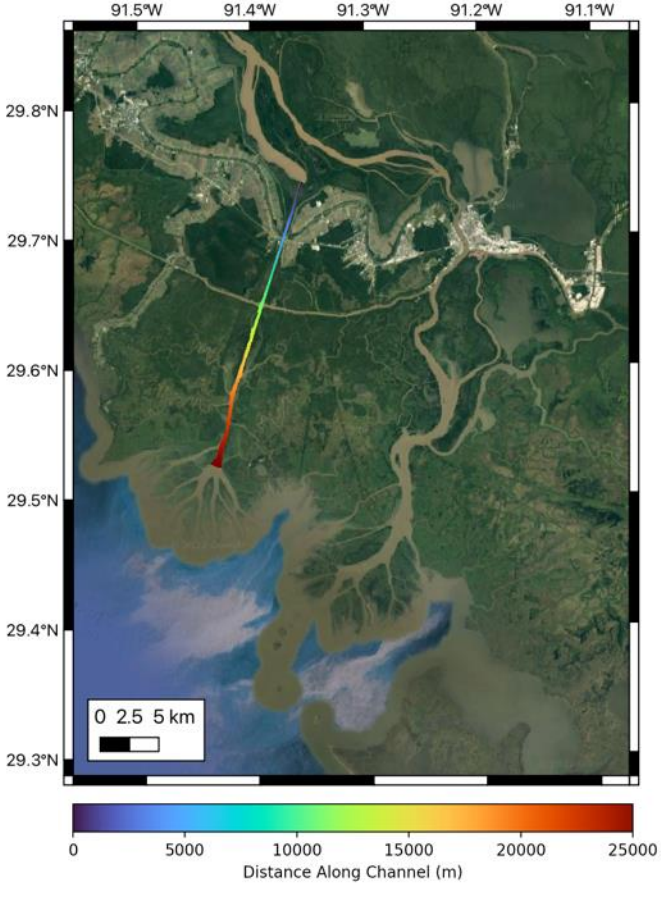




AirSWOT Water Elevation Profiles

Plotted AirSWOT L3 Node Elevation and Filtered Elevation Profile in Wax Lake Outlet





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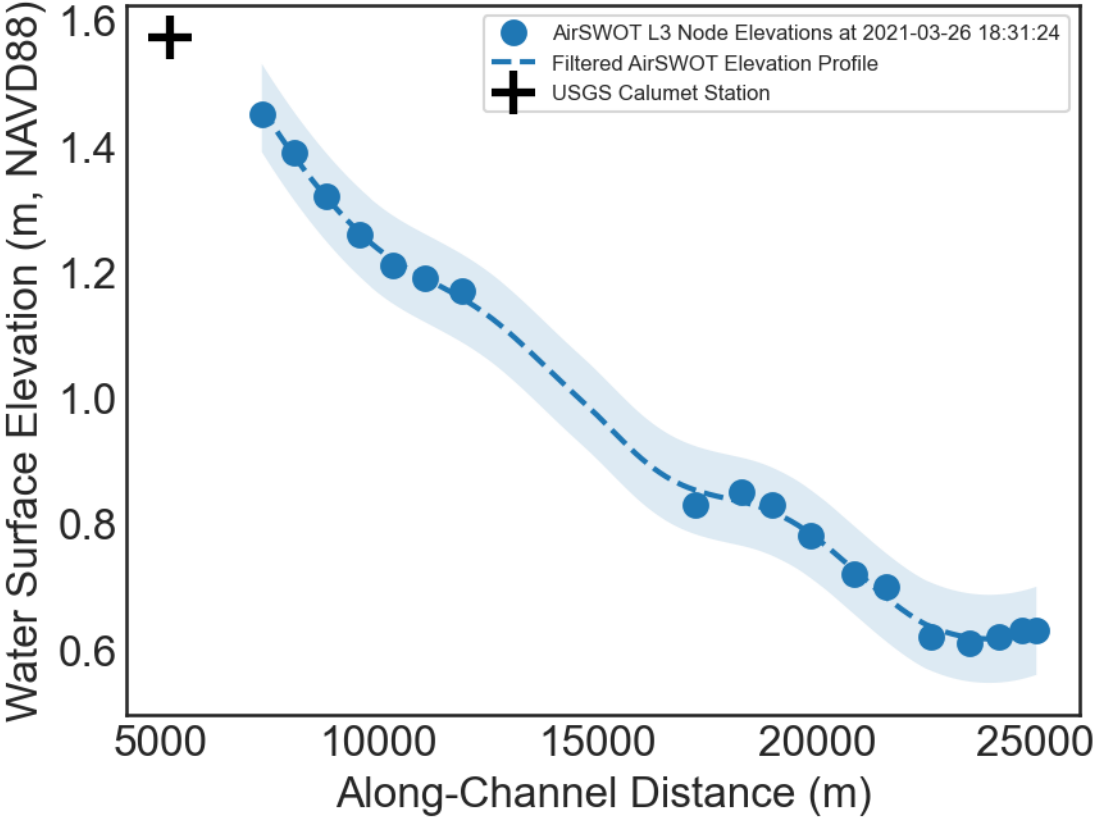
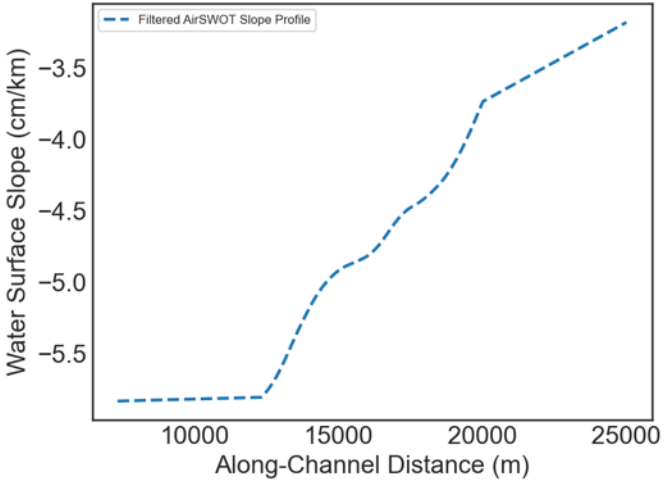
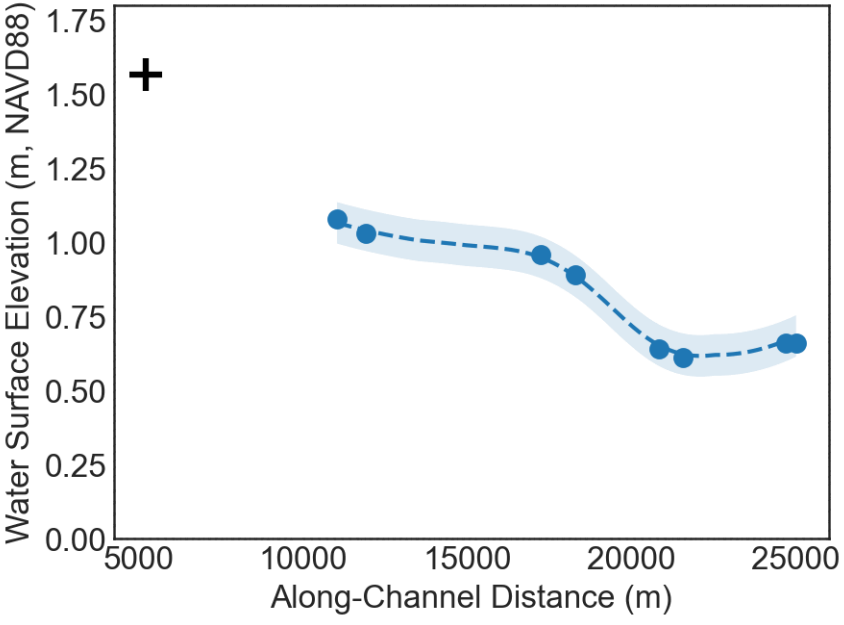


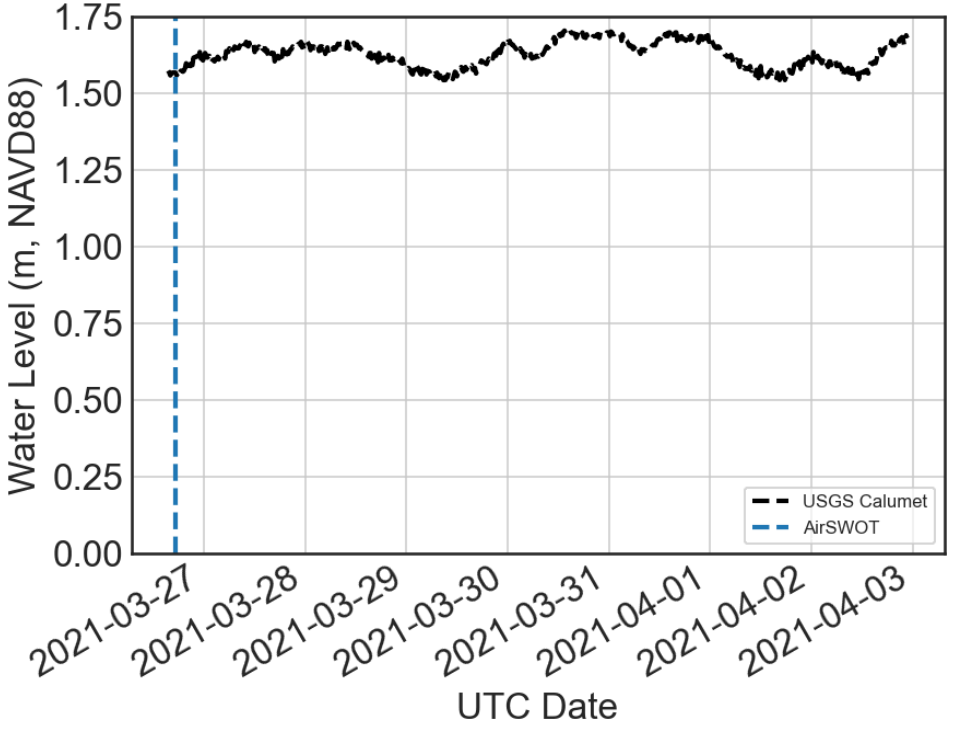


Slope estimated in 10 km moving window using second order Savitzky-Golay filter.

How do AirSWOT water elevation profiles change over time?

Wax Lake Outlet Channel

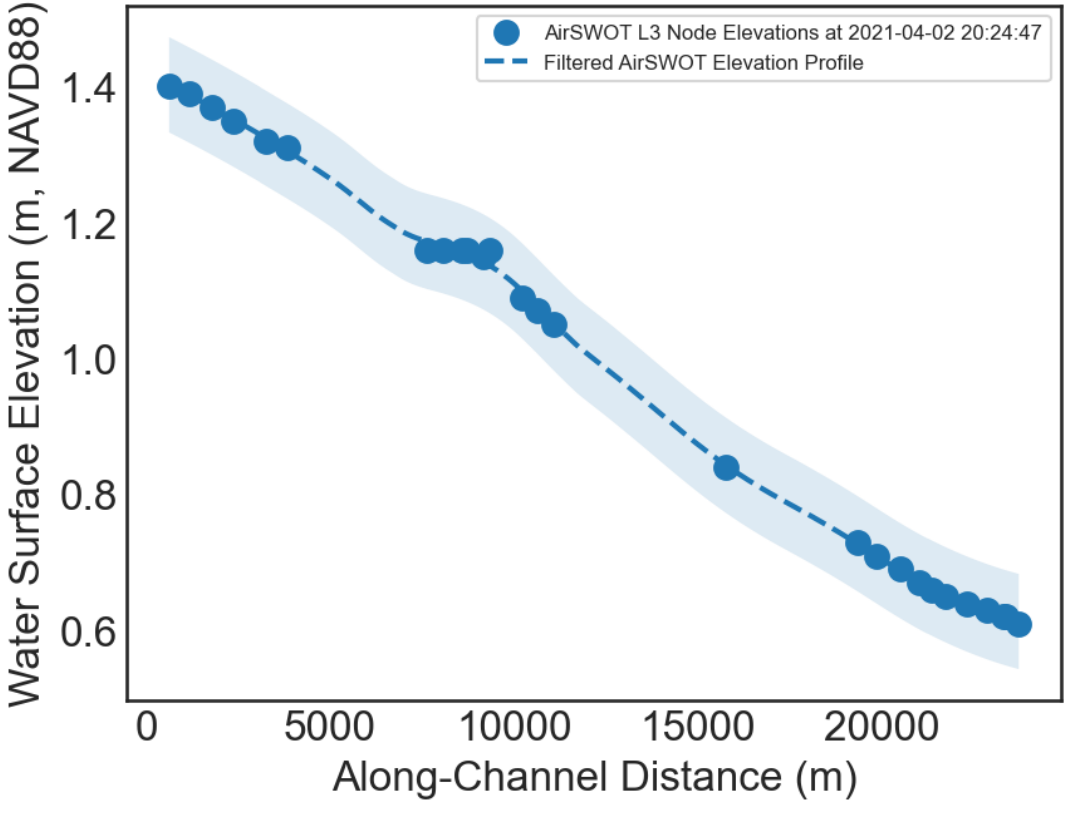


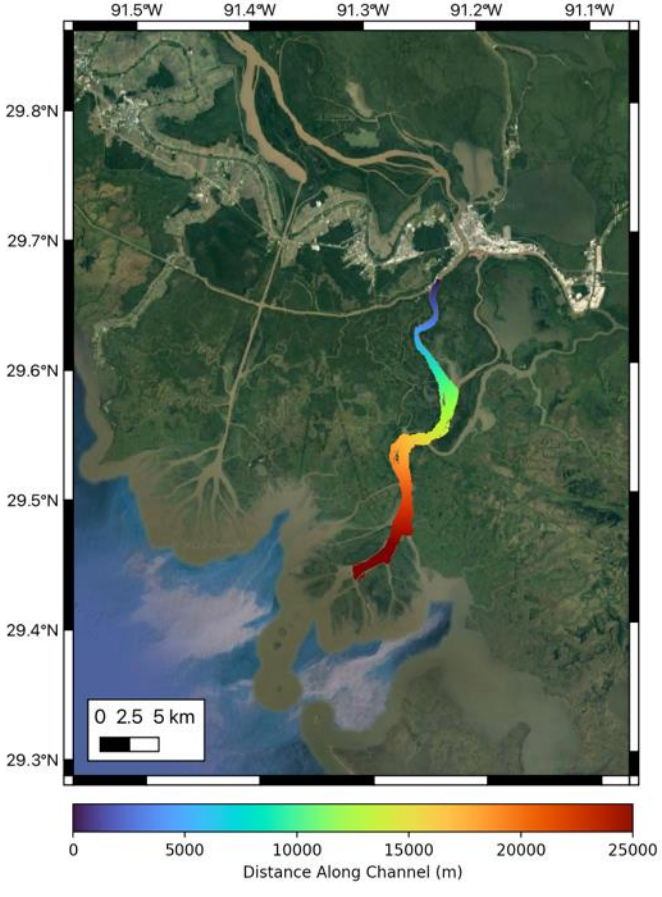


Wax Lake Outlet during the Delta-X Spring campaign. AirSWOT allows changes in water surface slope to be measured over time at different parts of the tidal cycle.

AirSWOT Water Elevation Profiles

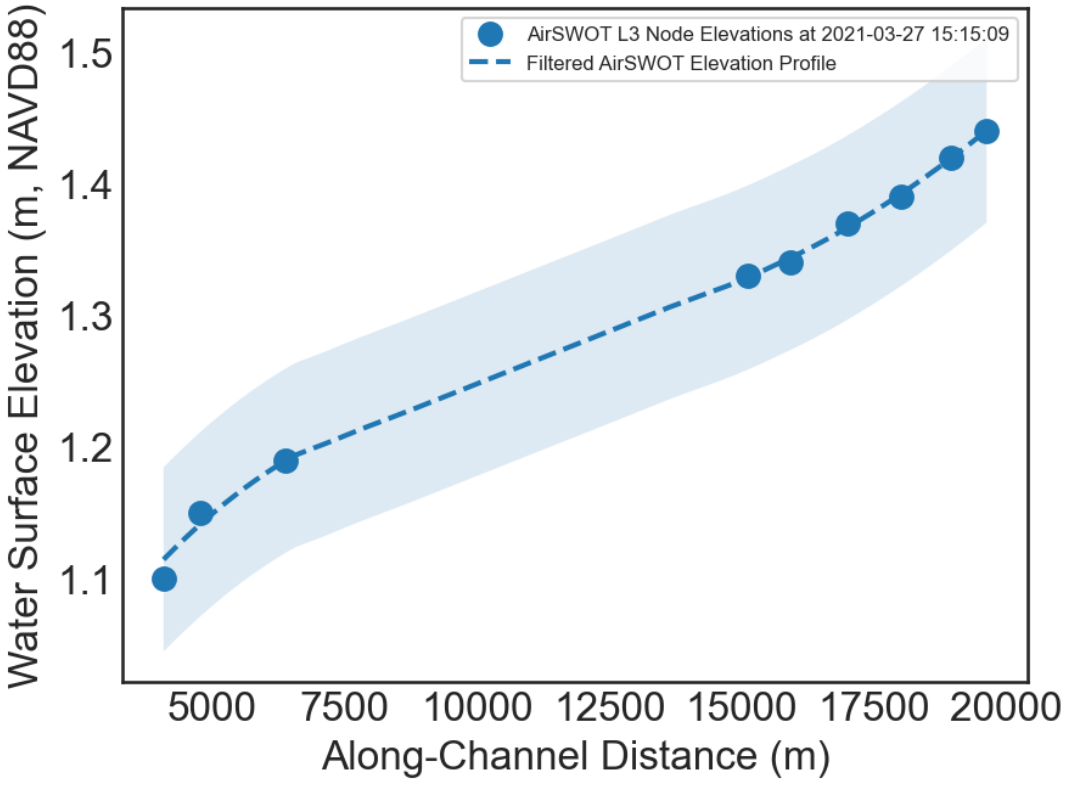
Plotted AirSWOT L3 Node Elevation and Filtered Elevation Profile in Atchafalaya

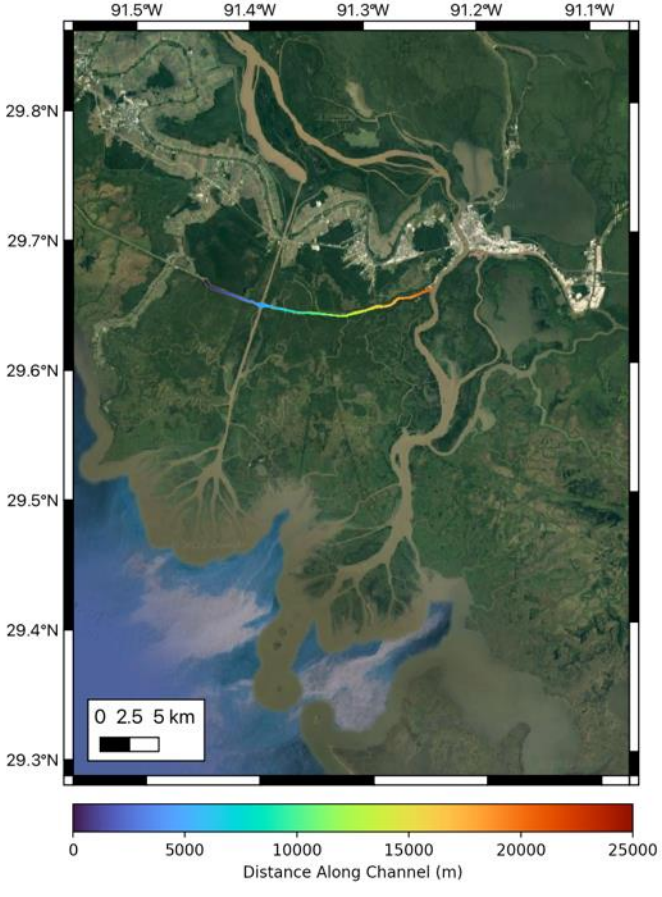




AirSWOT Water Elevation Profiles

Plotted AirSWOT L3 Node Elevation and Filtered Elevation Profile in ICWW





Conclusions

- AirSWOT collected more data for Delta-X than any previous campaign. L2 and L3 products have been updated to “version 2” with calibration improvements and new data (e.g. NAVD88 height files for L2 products, water area attribute added to L3 products).
- L2 and L3 products can be useful for different applications. L3 products are the highest “science-ready” processing level, easiest to use, and have water masking and spatial averaging applied, while L2 products are closer to the actual radar imagery collected by AirSWOT and have higher resolution.
- AirSWOT can be used to map water surface elevation and slope in both time and **space**!
- If you are interested in AirSWOT data and have questions or feedback, please contact me: michael.w.denbina@jpl.nasa.gov.

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