SWOT mission update

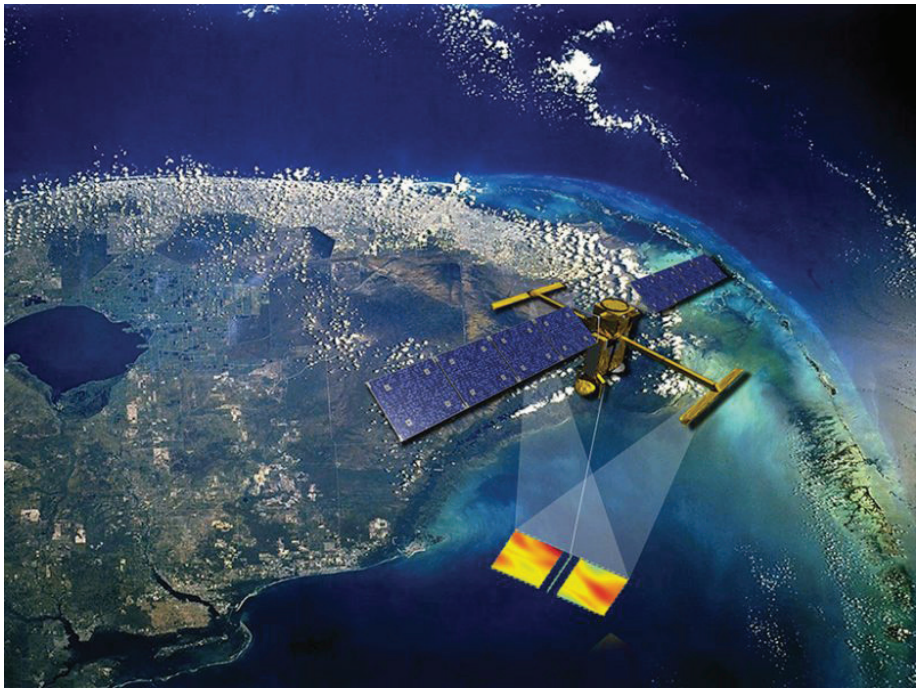
Ocean Leads : Lee-Lueng Fu (JPL/NASA) & Rosemary Morrow (LEGOS)

Hydrology Leads : Tamlin Pavelsky (UNC) & Jean-Francois Crétaux (LEGOS)

Project Managers : Parag Vaze (JPL/NASA) & Thierry Lafon (CNES)

Programme Managers : Nadya Vinogradova Shiffer (NASA) & Annick Sylvestre-Baron (CNES)

Project Engineers : Shailen Desai (JPL/NASA) & Nicolas Picot (CNES)

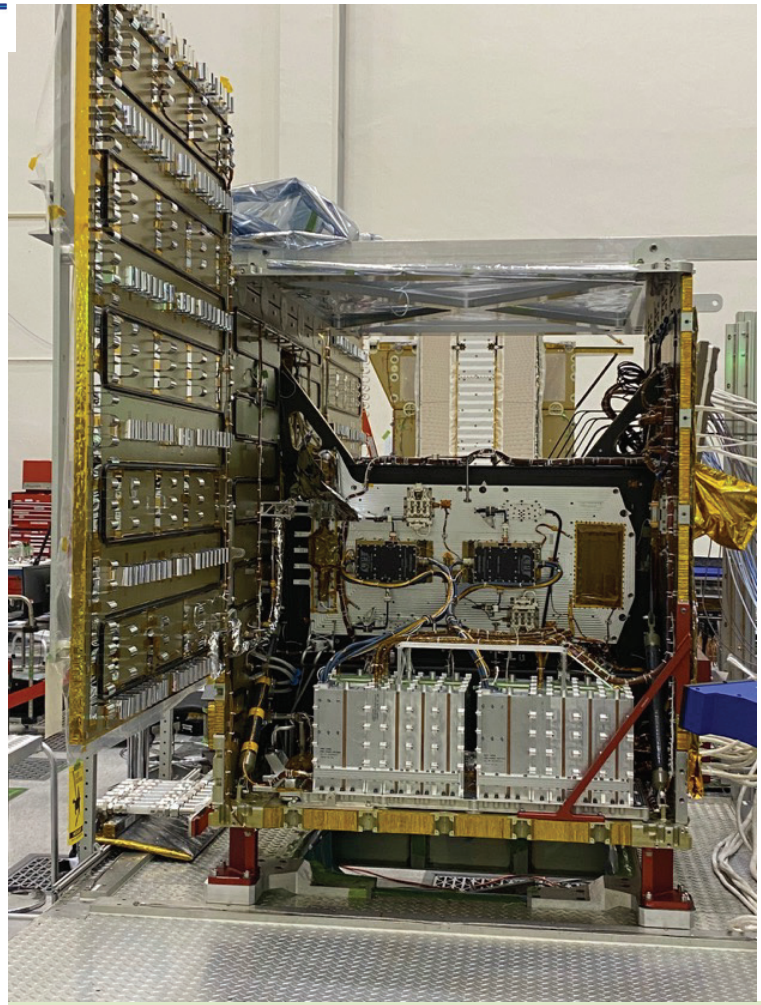


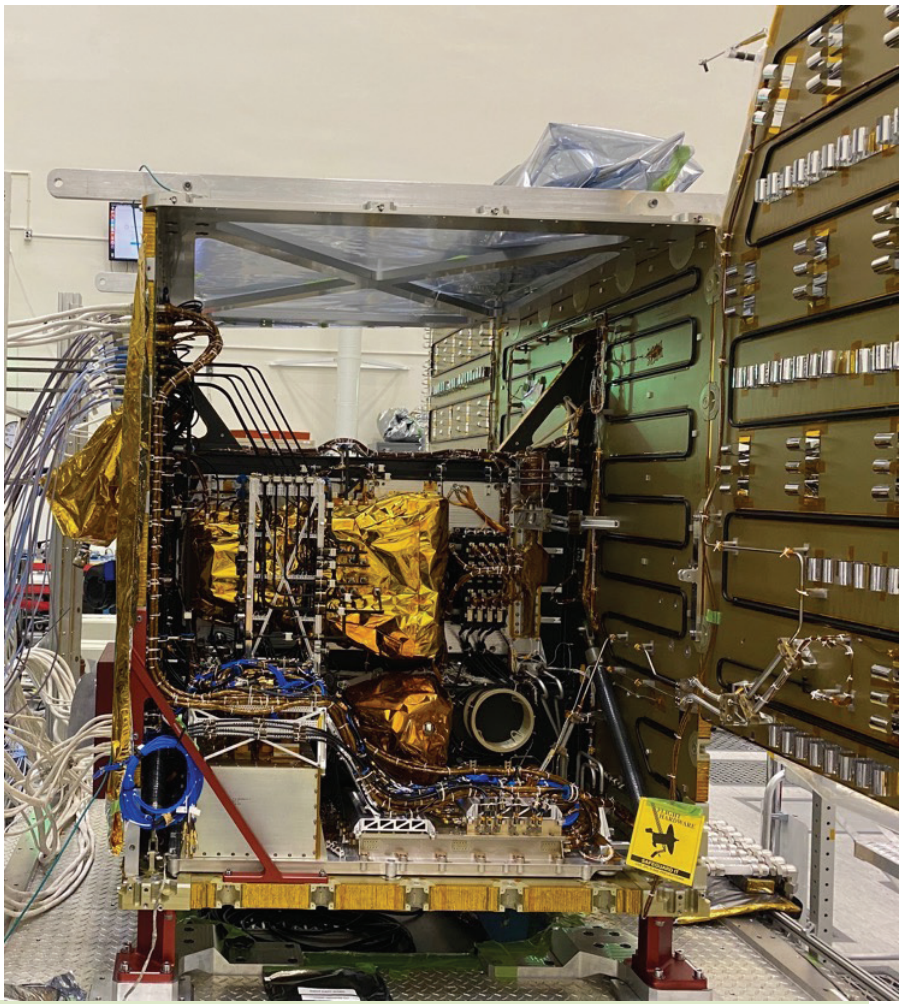
Project Summary Status

- All flight system elements in advanced stages of I&T
- THALES Platform completed and stored until Payload arrival
- Unfortunately key project elements are impacted by COVID-19 with probable programmatic impacts:
  - Key payload I&T items were stopped (March 2020) and then re-started in a limited fashion (April/May 2020)
  - Activities ramping up, despite tightened safety constraints
- Making good progress towards starting integrated payload testing in fall 2020 at JPL:
  - Deployable Antenna Assembly successfully tested
  - KaRin module starting final stages of environmental testing
- Project teams are working hard to minimize impacts:
  - Putting in place the necessary means to be able to remotely conduct the last stages of Payload AI&T
  - Anticipating preparations for Observatory AI&T
  - Continuing work on ground and science elements
- Revised schedule forecast in late fall 2020 when key assumptions would be more firm

I&T : Integration & Testing; AI&T : Assembly, Integration and Test

KaRIn Radar Module



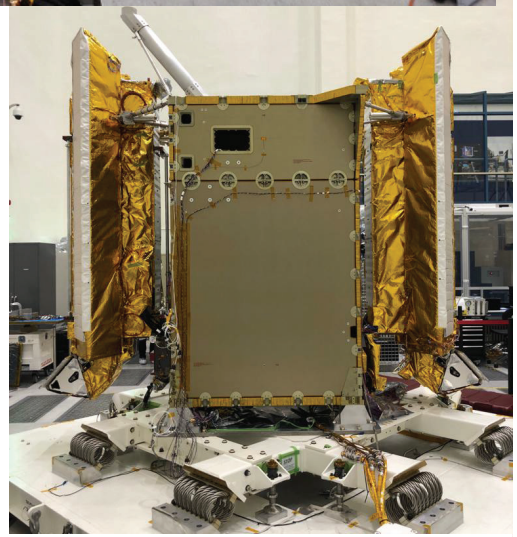


- Radar module integrated and functionally tested
- Being prepared for final TVac environmental testing
- Very good functional and performance test results with good margins

Deployable Antenna Assembly (DAA)

DAA Integrated on Dynamics Test Model

DAA Completed

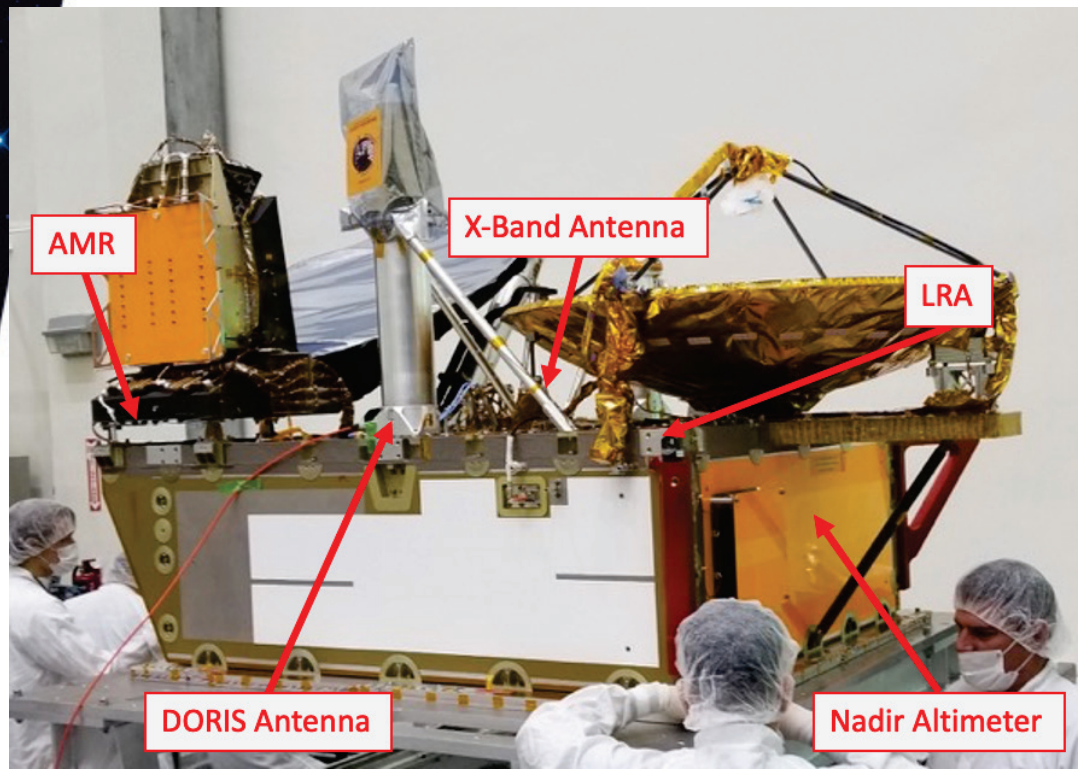


DAA on Dynamics Test Model

- Integrated and functionally tested
- Completed environmental testing

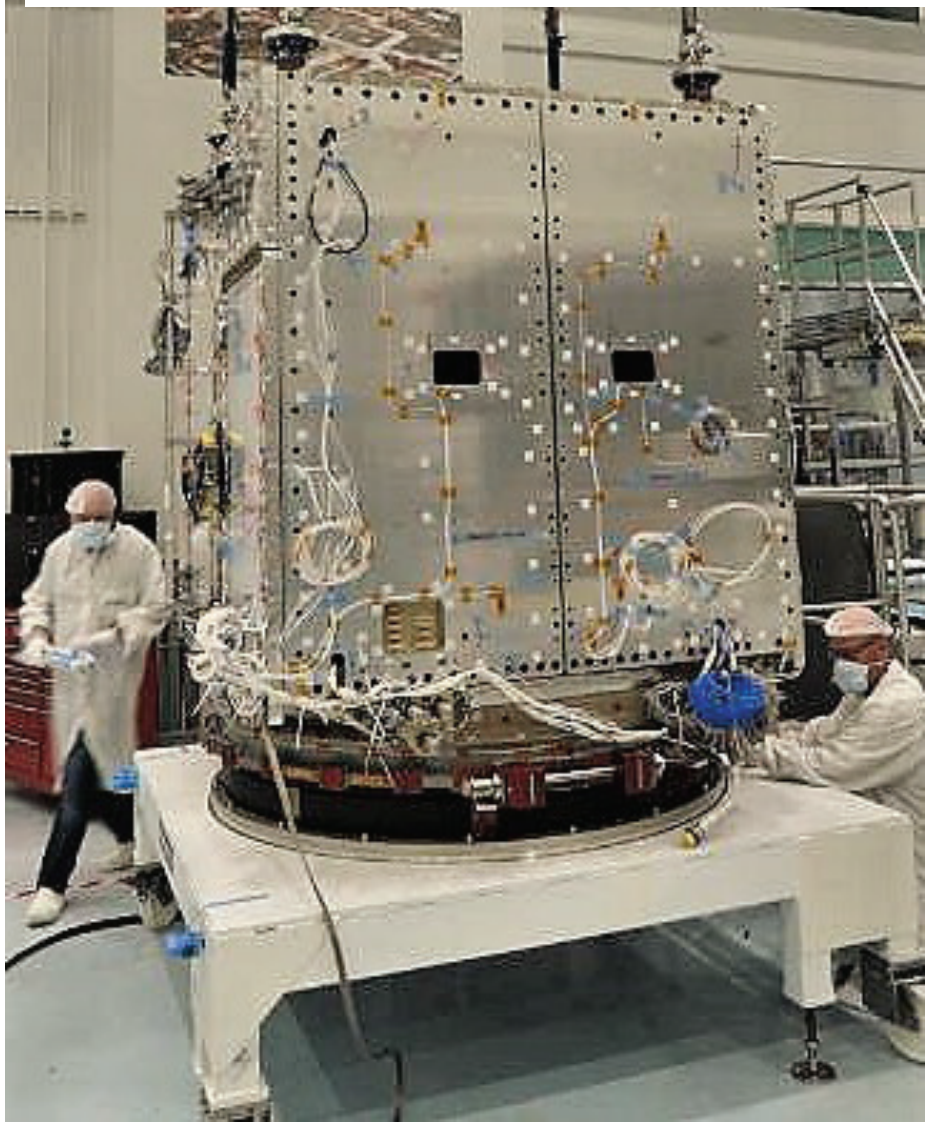
Nadir Module Status

- Nadir Module completed



CNES S/C Bus (Platform) Completed

S/C Bus (Platform) at (Thales – Cannes, France)



SWOT Products and Algorithms

Algorithm Development

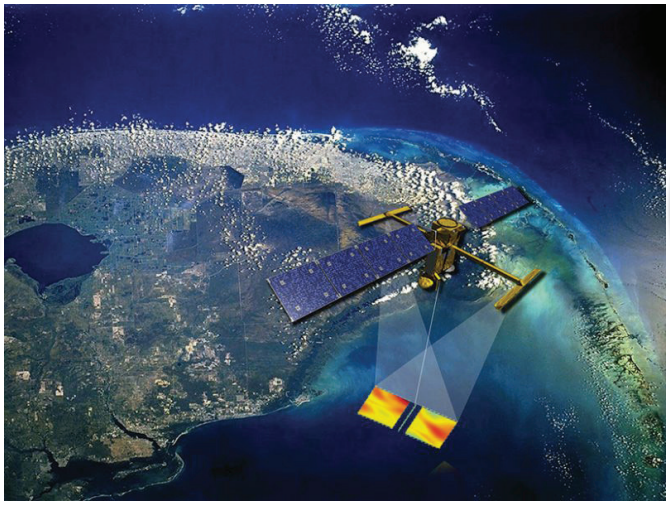
- Onboard Processor algorithms and Algorithm Theoretical Basis Document (OBP-ATBD) 2017
- SWOT Error Budget document : 2017/2019
- SWOT Product Description Documents now available: https://podaac.jpl.nasa.gov/SWOT?tab=datasets&sections=about
- SWOT Algorithm Theoretical Basis Documents: 2021

Documentation : *swot.jpl.nasa.gov & AVISO : future-missions/swot.html*

Science documents, White papers, SWOT PI Investigation plans

SWOT Science Team 2020-2023 :

New Ocean & Coastal Science Team : Working groups



Air-Sea interactions & Surface waves
5 teams US, FR

SWOT Data Inversion & Assimilation
8 teams US, FR, Intl

SWOT & alongtrack altimeter analyses for oceans & marine gravity
4 teams US, FR, Intl

Coastal & Estuarine Studies
6 teams US, FR, Intl

Regional Science Validation studies
9 teams US, FR, Intl

Tides & Internal Tides
3 teams US, FR

International Teams :
Australia (4), Canada, Denmark, Germany, Greece, India, Japan, UK, Portugal, Spain

SWOT Geodetic CalVal
4 teams US, FR, Intl

SWOT Adopt-a-Crossover (AdAC) International Consortium

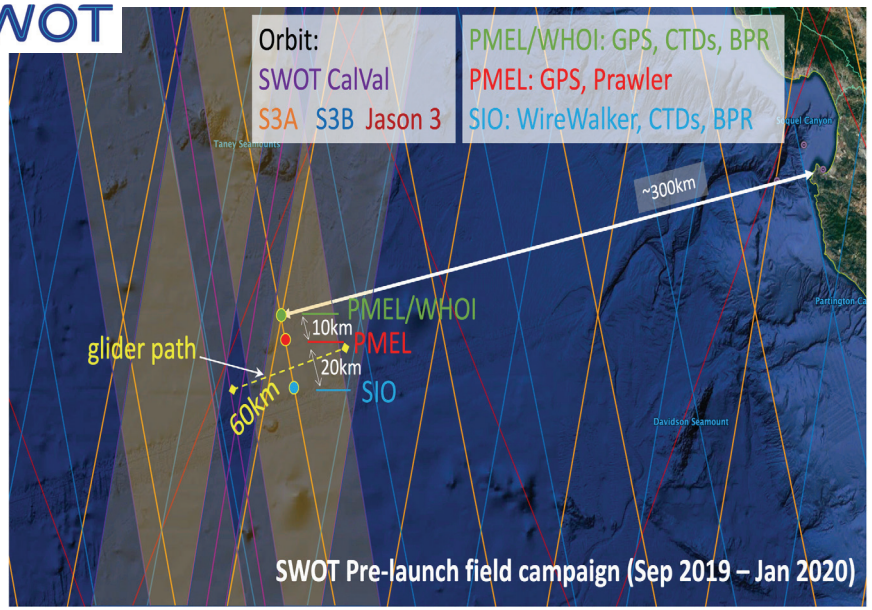
- CLIVAR endorsed project for an international multi-site in-situ deployment under SWOT swaths and crossovers
- Development of SWOT-supported in situ strategies for fine-scales dynamics in different regions and seasons
- Prelaunch campaigns tested in Californian Current, W Mediterranean, ACC.
- Multi-satellite data package to accompany in-situ deployments
- *Partners : US, France, UK, Canada, Australia, S Africa, Norway, Turkey, China, Argentina…*

Open to all ! Contact : Francesco d'Ovidio <francesco.dovidio@locean.ipsl.fr>

SWOT Ocean Californian validation campaigns

Assess the SWOT ocean SSH wavenumber spectral requirements and vertical structure

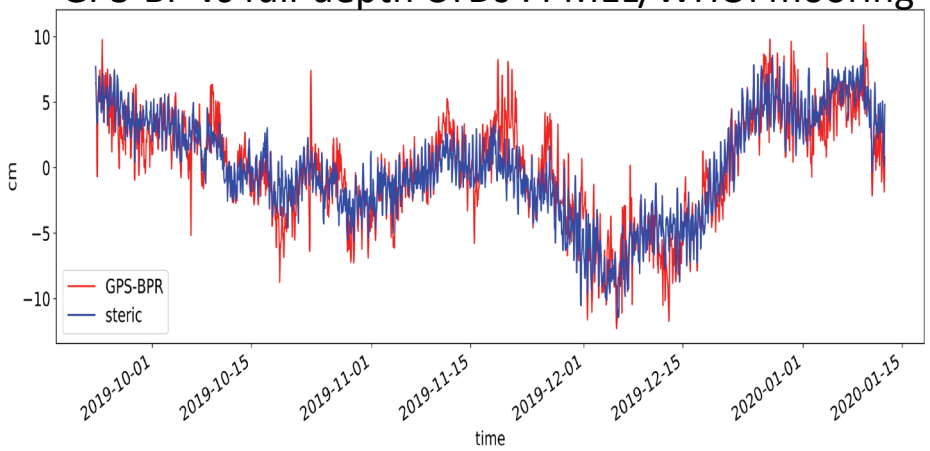
Prelaunch : 2018; Sep 2019 - Jan2020



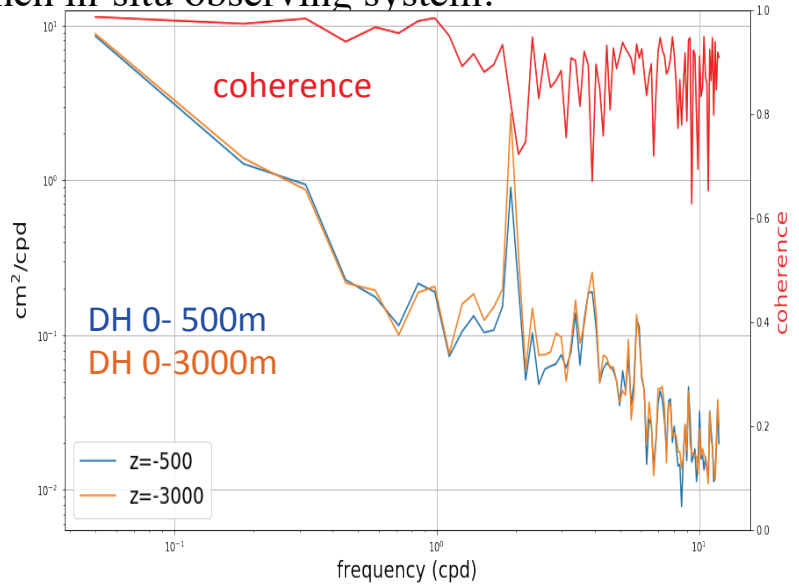
Californian Pre-launch Objectives

- Test the closure of determining SSH with GPS buoy, CTD mooring, and BPR.
- Evaluate the vertical scale of the upper ocean circulation that can be determined by SSH at the SWOT scales for different frequency bands.
- Evaluate the roles of bottom pressure in SWOT SSH signals.
- Provide information for the design of the post-launch in-situ observing system.

GPS-BP vs full-depth CTDs : PMEL/WHOI mooring



SSH is equivalent to dynamic height with negligent Bottom Pressure (BP) contributions.

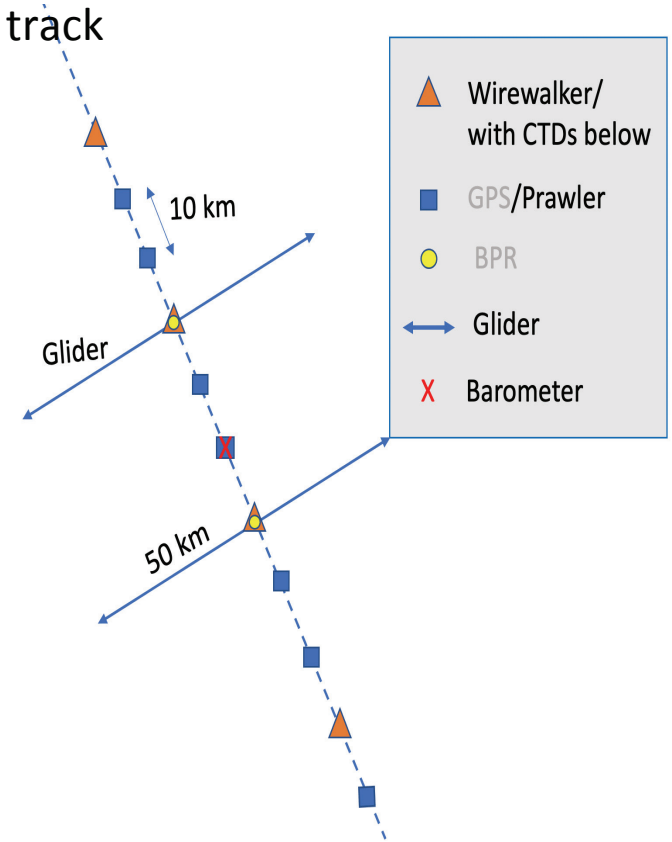


SSH is essentially dynamic height of the upper 500 m except for internal tides.

SWOT ocean postlaunch campaign plan

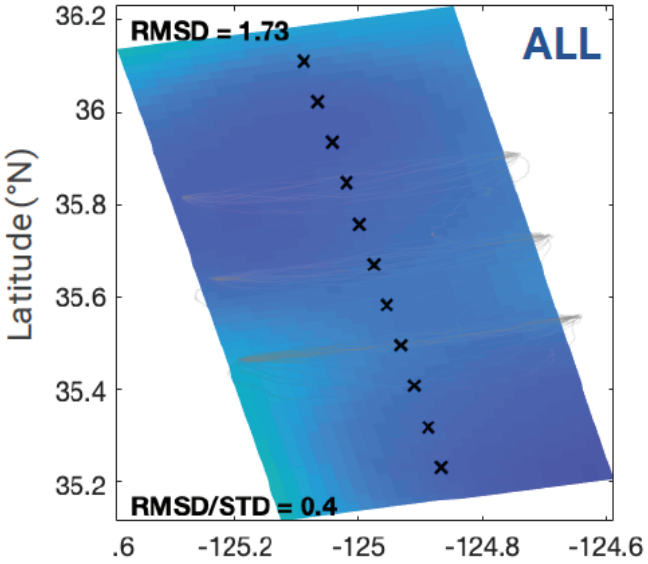
Assess the SWOT ocean SSH wavenumber spectral requirements and vertical structure giving SSH changes with independent validation data

Sentinel 3A track

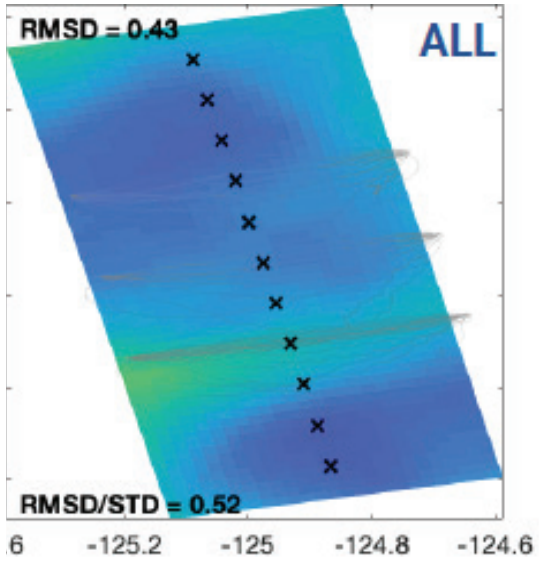


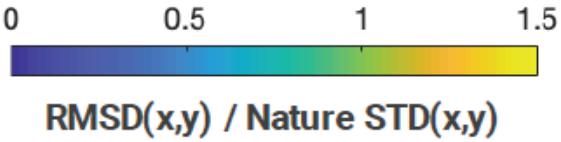
Performance of estimating the true ocean state assessed by an OSSE

Steric height



Temperature at 80 m





Prawlers : T/S 0-500 m

4 deep moorings are aimed at sampling the vertical structure of internal tides

New Hydrology Science Team

Lake/Wetland/Estuarine Science

Sylvain Biancamaria, LEGOS
Jida Wang, Kansas State U.
Marc Simard, JPL
Frederic Frappart, LEGOS
Manuela Grippa, GET/UMR5563
Fabrice Papa, LEGOS/IRD

Discharge Algorithms

Michael Durand, Ohio State
Colin Gleason, Umass
Pierre-Olivier Malaterre, G-EAU/INRAE
Mohammed Turian, U. Stuttgart
Karina Nielsen, DTU Space
Ernesto Rodriguez, JPL
Jida Wang, Kansas State U.

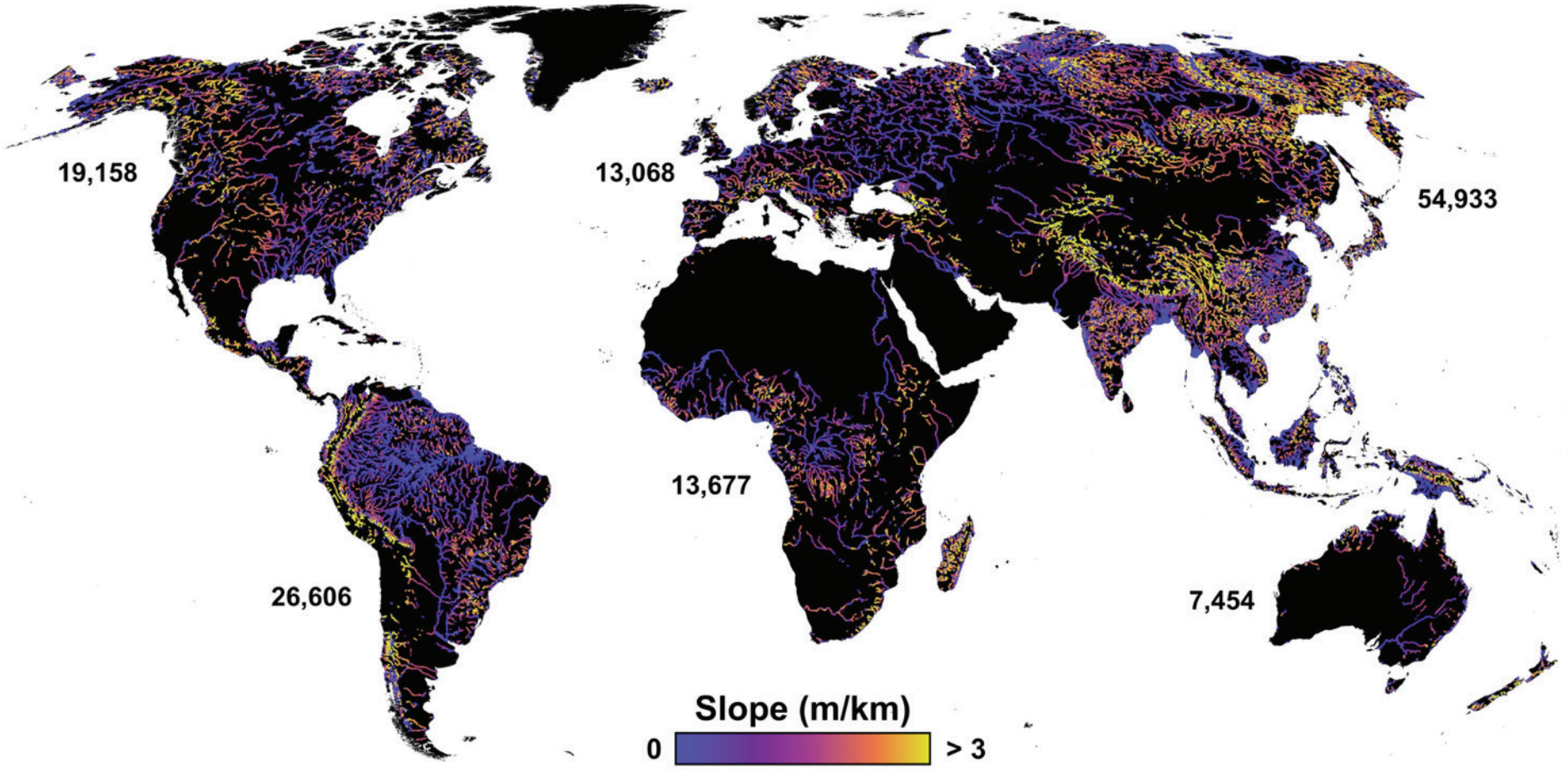
River Science

Larry Smith, Brown U.
Ernesto Rodriguez, JPL
Luciana Fenoglio, U. Bonn
Fabrice Papa, LEGOS/IRD
Karina Nielsen, DTU Space

Global Modeling & Remote Sensing

Aaron Boone, CNRM
Dennis Lettenmaier, UCLA
Jurgen Kusche, U. Bonn
Christian Schwatke, DGFI-TUM

SWOT River Spatial Coverage



By combining several global river datasets, we have developed an a priori set of SWOT reaches and nodes that will be the framework for SWOT river studies.

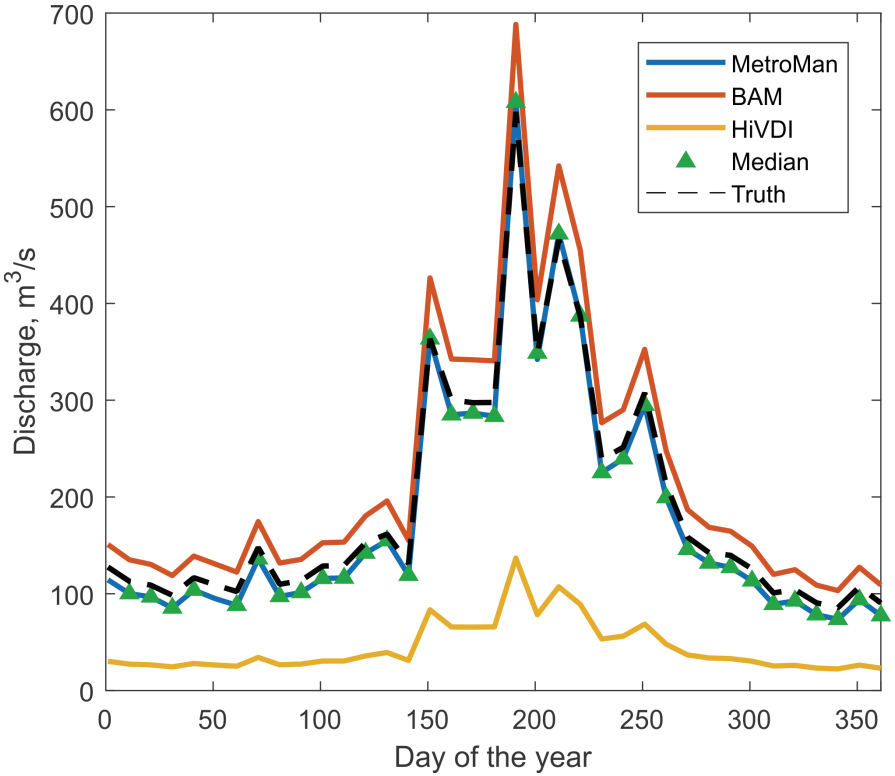
Slide Courtesy E. Altenau, UNC

SWOT Discharge Algorithms

Because SWOT can measure river width, slope, and water surface elevation, it can be used to estimate discharge using a simple flow equation like Manning's Equation:

$$Q = 1/n\ (A + A')^{5/3}\ W^{-2/3}\ s^{-1/2}$$

Simulation results suggest that we can expect discharge errors of about 50%, but errors for variations in discharge of about 10-15%.



Estimates of discharge on the Seine River from three SWOT discharge algorithms.

Implication: we will be able to measure the dynamics of discharge very accurately with SWOT.

Figure Courtesy M. Durand, Ohio State

Hydrology Validation

Rivers

French Led-Sites:
Rhine R.
Garonne R.
Maroni R. (S. America)
Madagascar Rivers

U.S. Led-Sites:
Willamette R. (Oregon)
Connecticut R.
Mississippi R.
Tanana R. (Alaska)
Sagavanirktok R. (Alaska)
Waimakariri R. (New Zealand)
N. Saskatchewan R. (Canada)

Plan for joint preparatory campaigns in U.S, France, and South America in 2021 (COVID permitting).

Lakes

French Led-Sites:
Issyk-Kul
Chilean Glacial Lakes
Rhine Valley
Pyrenees

U.S. Led-Sites:
Lake Tahoe
Central U.S. Prairie Lakes
Sierra Nevada Lakes
Pacific Northwest Lakes
Yukon Flats Lakes

Wetlands

Yukon Flats
Peace-Athabasca Delta (Canada)
Mississippi Delta
Everglades

SWOT going forward …

- Many OSTST science & measurement sessions in 1-D also overlap with SWOT 2-D issues, and will be discussed during this OSTST week …

  Tides splinter, surface roughness & waves, MSS/geoid

  Mesoscale/submesoscale science

  Hydrology/cryosphere science.

- 1st SWOT Science Team meeting with the new team was planned in June 2020 – cancelled

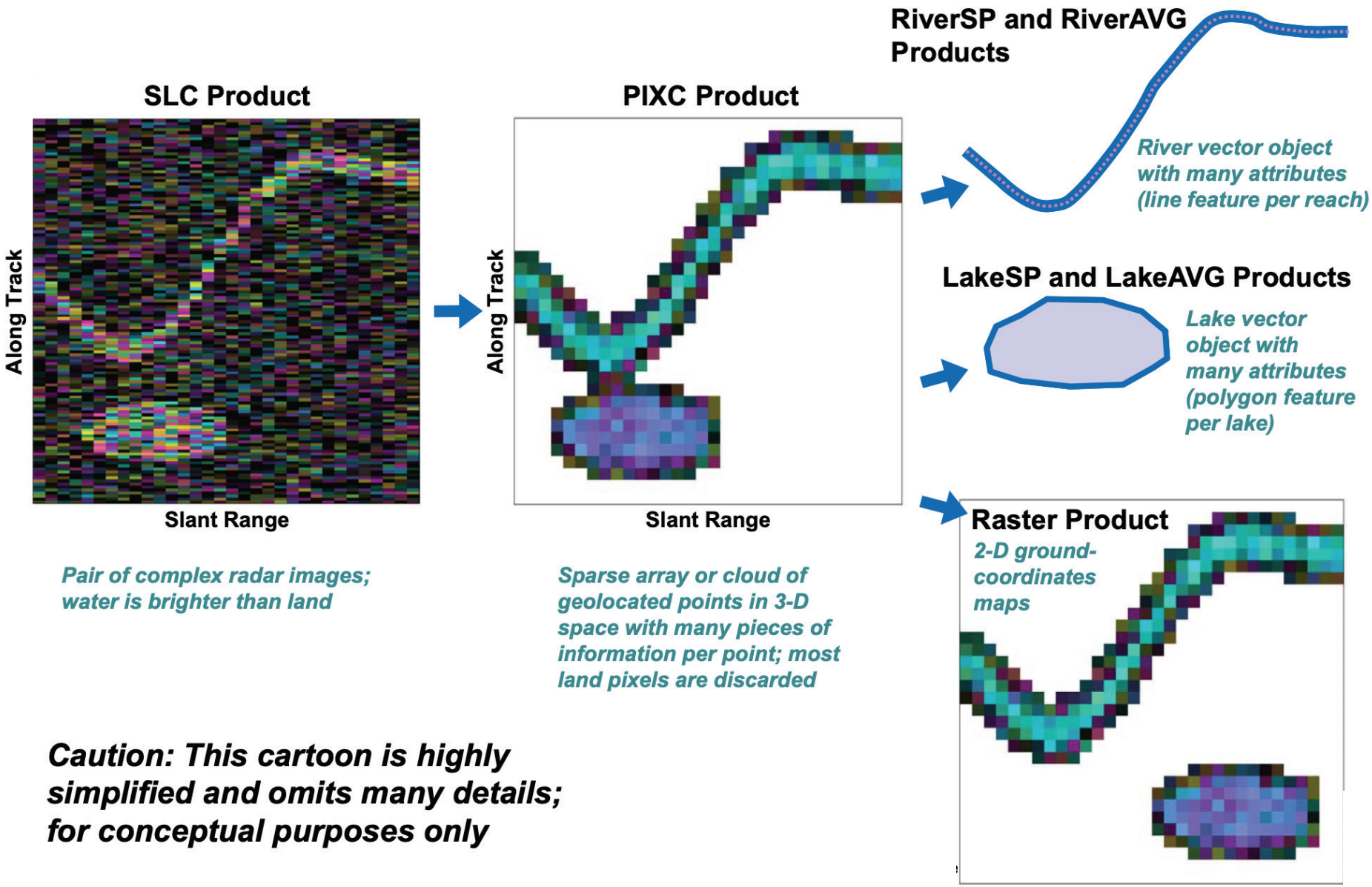
- **Plans in progress to conduct business remotely, with a 2021 Science Team Meeting still possible.**

Extra slides

SWOT Ocean Products Consist of 4 Half-orbit granule, Netcdf-4 files

File	Name	Description
1	Basic SSH ['Basic']	Provides corrected sea surface height (SSH), sea surface height anomaly (SSHA), flags to indicate data quality, geophysical reference fields, and the crossover height correction on a 2 km geographically fixed grid.
2	Wind and Wave ['WindWave']	Provides measured significant wave height (SWH), normalized radar cross section (NRCS or backscatter cross section or sigma0), wind speed derived from sigma0 and SWH, model information on wind and waves, and quality flags on a 2 km geographically fixed grid.
3	Expert SSH with Wind and Wave ['Expert']	Includes copies of the Basic and the Wind and Wave files plus more detailed information on instrument and environmental corrections, radiometer data, and geophysical models on a 2 km geographically fixed grid.
4	Unsmoothed SSH ['Unsmoothed']	Provides sea surface height (SSH), sigma0, and "mitigation" power without additional smoothing relative to the native KaRIn downlink resolution on a ~250 m native (center-beam) grid.

SWOT High-Rate Data Products



Slide courtesy Curtis Chen, JPL