Regional validation

In addition to the mission site under the California Xover

Regional Validation Working Group and AdAC

Eos
Science News by AGU

Scientists Invited to Collaborate in Satellite Mission’s Debut

The Surface Water and Ocean Topography mission will begin by scanning Earth’s surface once a day. We invite ocean scientists to contribute ground-based measurements to compare with the satellite data.

By **R. Morrow**, **L.-L. Fu**, **F. D’Ovidio**, and **J. T. Farrar** 2 January 2019

SWOT 'Adopt-A-Crossover' Consortium has been endorsed by CLIVAR

Submitted by Jing Li on Mon, 2019-06-03 16:31

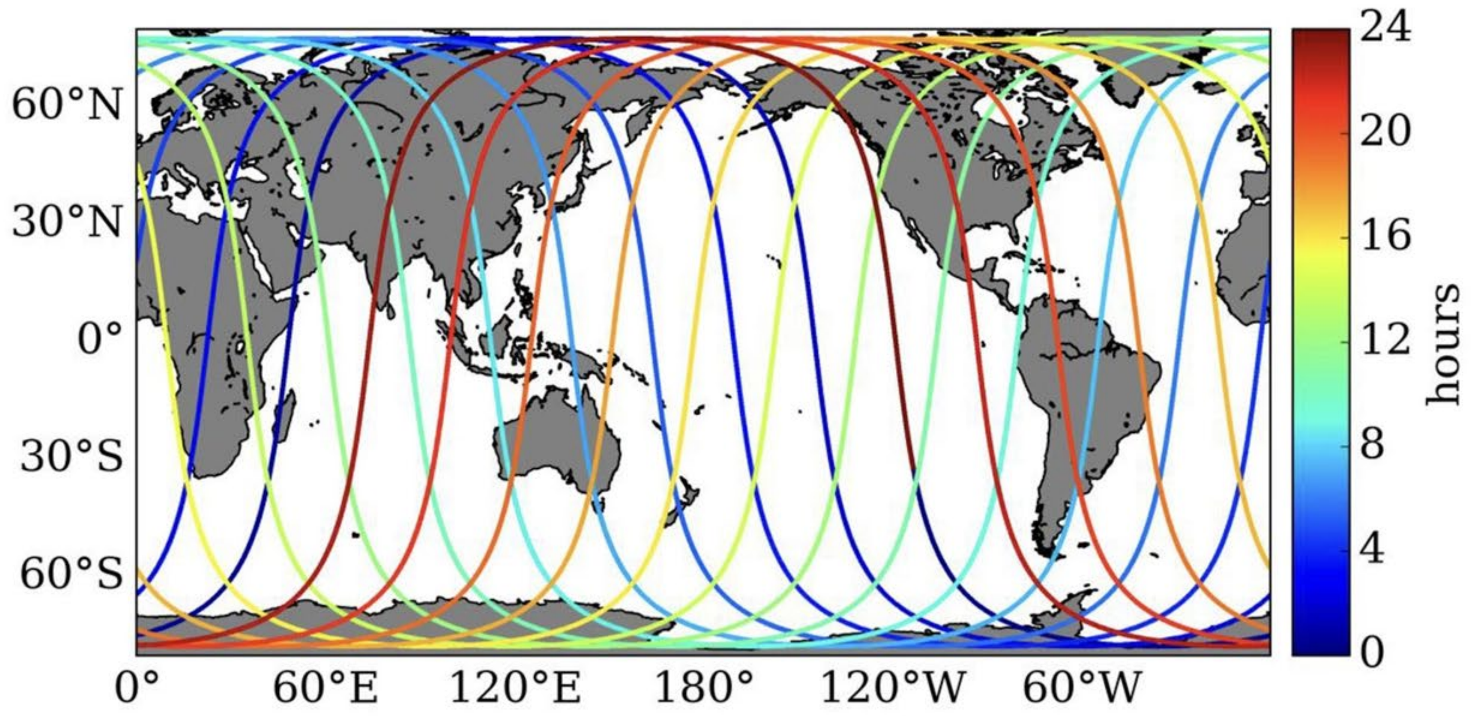


Figure 1: SWOT orbit during the fast-sampling phase (adapted from Wang et al., 2018a, © Copyright [2017] AMS). During the first months of the mission (expected for January-March 2022), the satellite will be on a special orbit which will overfly a smaller portion of the global ocean with a repeat cycle of 1 day (twice per day on crossovers). This so-called fast-sampling

The global consortium of SWOT validation campaigns

This consortium successfully integrated 28 oceanographic field campaigns, including coastal campaigns, conducted by scientists from 15 countries and regions: United States, France, United Kingdom, Argentina, Australia, Canada, China, Germany, Taiwan, India, Norway, Spain, and Turkey.

A partial list of instruments and platforms

1. GNSS BuoysMooringsEquipped with CTD and ADCP
2. PIES
3. AWAC
4. (zoo)Gliders
   a. Dynamic height computation
   b. Equipped with ADCP
5. Drifters300 drifters
6. ADCP (Acoustic Doppler Current Profiler)
7. MVP (Moving Vessel Profiler)
8. CTD (Conductivity, Temperature, and Depth)Along
9. ScanFish tracks
10. Thermosalinograph (TSG)
11. USV (Unmanned Surface Vehicle)
12. PIES (Pressure Inverted Echo Sounder)
13. CPIES (Current and Pressure Inverted Echo Sounder)
14. HFR (High-Frequency Radar)
15. Tide Gauges
16. Coastal Wave
17. BuoysGNSS-IR (Global Navigation Satellite System Interferometric Reflectometry)
18. AirSWOT (Airborne Surface Water and Ocean Topography)
19. Aircraft Lidar
20. Tidal Model Comparisons
21. Argo and bio-Argo
22. SeaStar aircraft Doppler
23. waveglider
24. …..

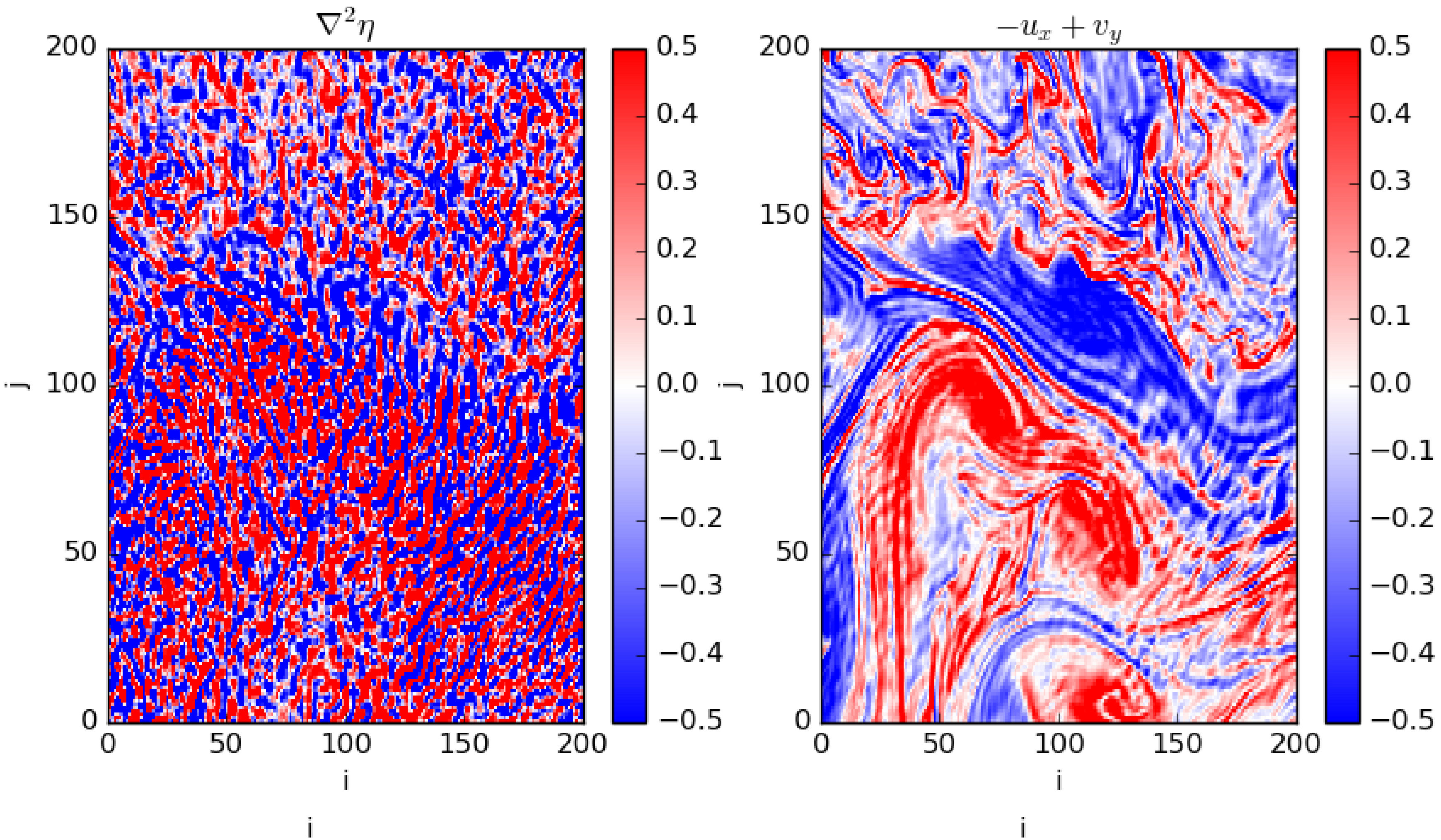
It is an approximation, good for one place, may not be good for others.

$$p'(z_0) = \int_{z_0}^{0} g\rho'\, dz + \rho_0 g\eta' + p'_a$$

Life is boring if everything is balanced

$$\frac{g\eta_x}{f} \approx ?\, v \qquad \frac{g\nabla^2\eta}{f} \approx ?\, \zeta$$

/ f



Validation aligns with new scientific insights

SWOT validation along the west coast of Canada – Guoqi Han

Extending the Corsica Facilities Up to SWOT Swath - Pascal Bonnefond

California xover beyond mission requirement validation – Luke Kachelein , Babette Tchonang

1. 7 min - **SSH and Small Scale Troposphere (Bass Strait)** - Andrea Hay
2. 7 min - **Lagrangian Trajectories Links to Current and Spectra** - Benoit Legresy
3. 12 min - **FaSt-SWOT** (two teams) - Laura Gomez Navarro, Everger-Miralles, *et al.*
4. 7 min - **Australian NW Shelf** - Nicole Jones
5. 7 min - **Brazil Abrolhos Bank**- Fabrice Henandaz
6. 7 min - **SWOT-UK: Residual Errors in Tide Gauge Comparisons** - Paul Bell
7. 7 min - **CONWEST-DYCO ssh mesoscale structure** - Luciana Fenoglio

Discussions

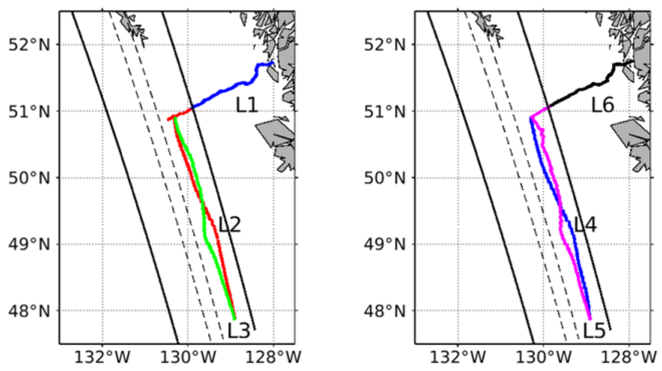
SWOT Validation Against Glider Data off Canada's West Coast

Guoqi Han, Jody Klymak, Tetjana Ross
Fisheries and Oceans Canada
University of Victoria

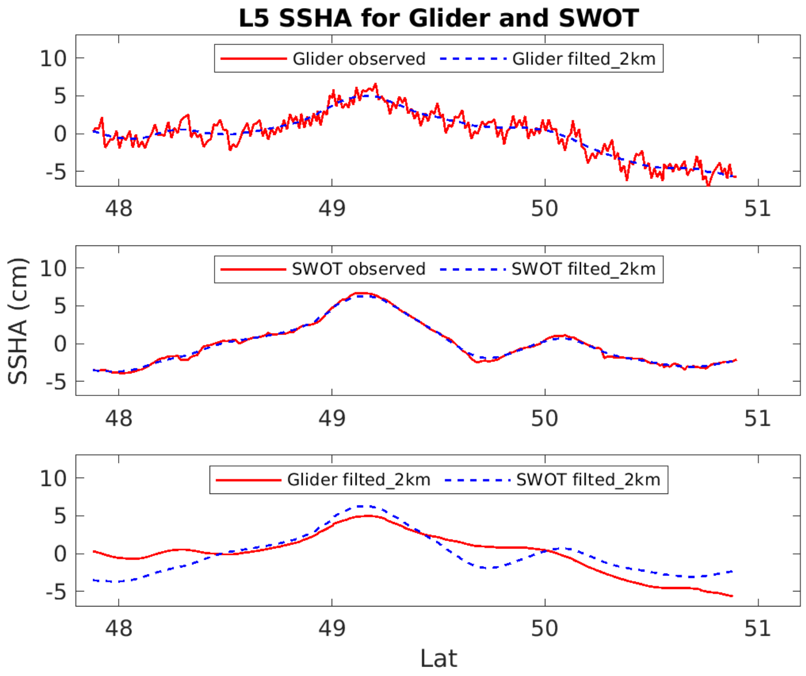
Supported by CSA SWOT-C Program

SWOT and Glider Data

- 1-d repeat, 2-km Level-3 SWOT SSHA product off Canada’s west coast from April to July 2023.
- Steric heights relative to 1000 db are calculated from glider data for May-July 2023, on L2, L3, L4, and L5 tracks.
- SWOT data are interpolated onto glider sampling location and time.
- Both SWOT and glider SSHA are interpolated on to a 2-km grid.
- The mean over each track is removed.



SWOT and Glider SSHA



Shown are track L2 (smallest difference) and L5 (largest difference).

A 20-km along-track low-pass filter (about the distance of half-day glider travelling) is applied to glider data.

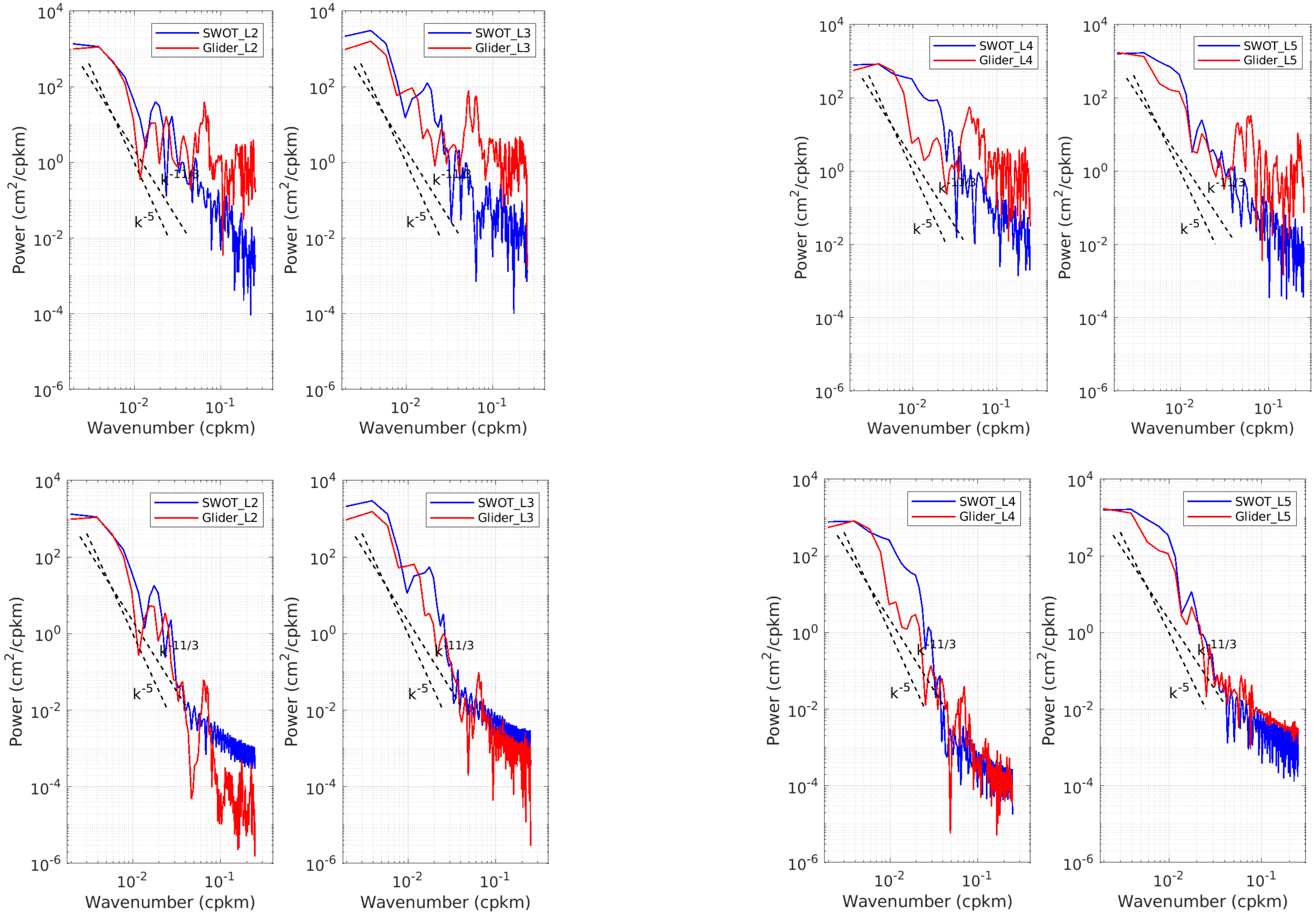
The RMS differences are 1.0 to 1.7 cm with filtering and 1.3-2.0 cm without filtering.

SWOT and Glider SSHA Spectra

Consistent at 25 km and longer

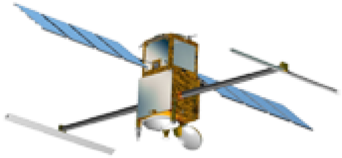
unfiltered

filtered



Main Outcomes from Corsica Facilities (FOAM(S) Team)

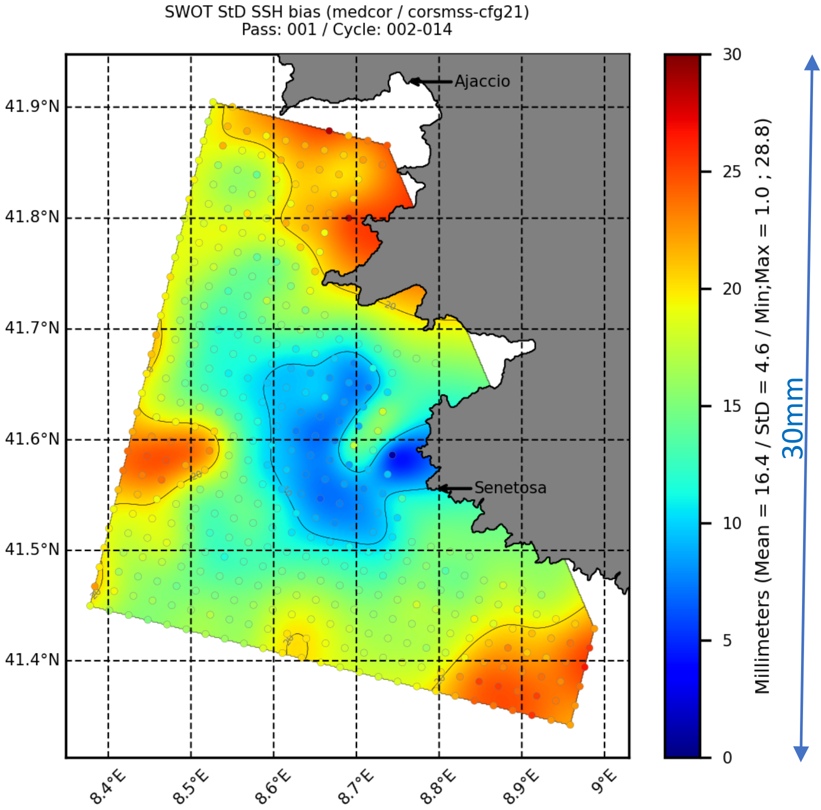
Full presentation available at: https://share.obspm.fr/s/j5rPt2ECyz6bKqN



- <u>**SWOT KaRIn SSH bias (pass #001, LR Version C):**</u>
  - **Product "easy" to use** with some basic altimetry skills
  - **From cycle to cycle**, the **SWOT SSH bias is stable** (**σ=16.4mm**) over the whole time series but shows some patterns that are probably located in **areas with stronger "ocean dynamic"** even if this region is known as having low dynamics
  - For comparison, our **long-term historical of nadir altimeters** (T/P, Jason, …) shows a standard deviation of **~30mm**
    -> **SWOT is 2 times better** (**16.4mm**) and over a very much larger area ($2000km^2$ / $\sim 80km^2$)
  - **Small slopes** over swath **below 1mm/km** *(1µrad)*

- <u>**SWOT nadir altimeter SSH bias (pass #542):**</u>
  - **Mean SSH bias = -17mm / Standard deviation = 21mm.** Very comparable to other POSEIDON altimeters and even better in standard deviation

SWOT **σ** SSH bias over cycles 002-014

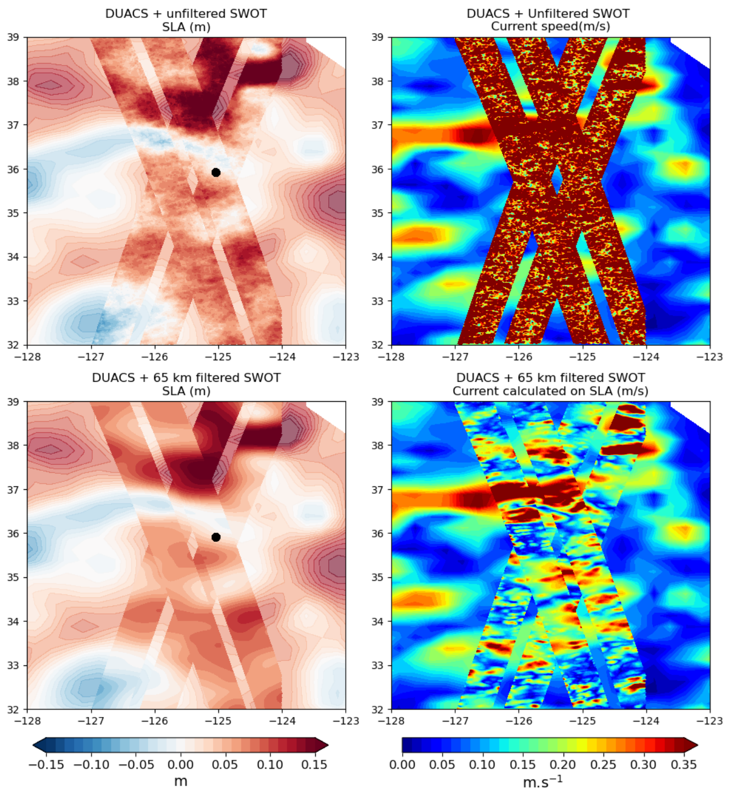


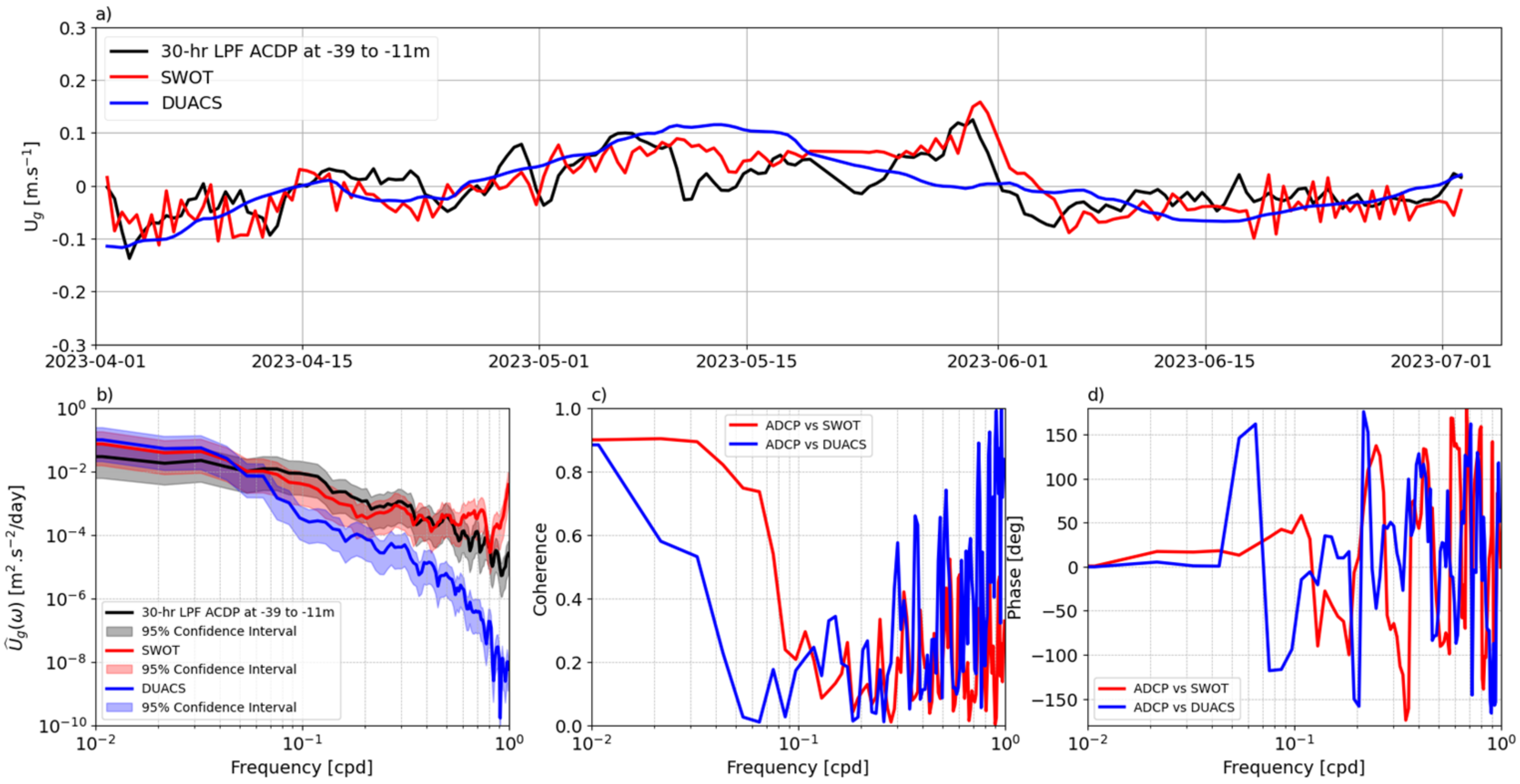
<u>**New "who's who" game:**</u>

We are somewhat at a such level that different means (space-based and in-situ), even if of comparable excellent precision, most probably do not measure physically exactly the same phenomenon.
We will learn a lot from each other.

FOAM(S) Team: **F**rom **O**cean to inland waters **A**ltimetry **M**onitoring ("S" for SWOT dedicated studies)

SWOT-derived velocity can match low-pass in-situ ADCP to about 5 cm/s rmsd



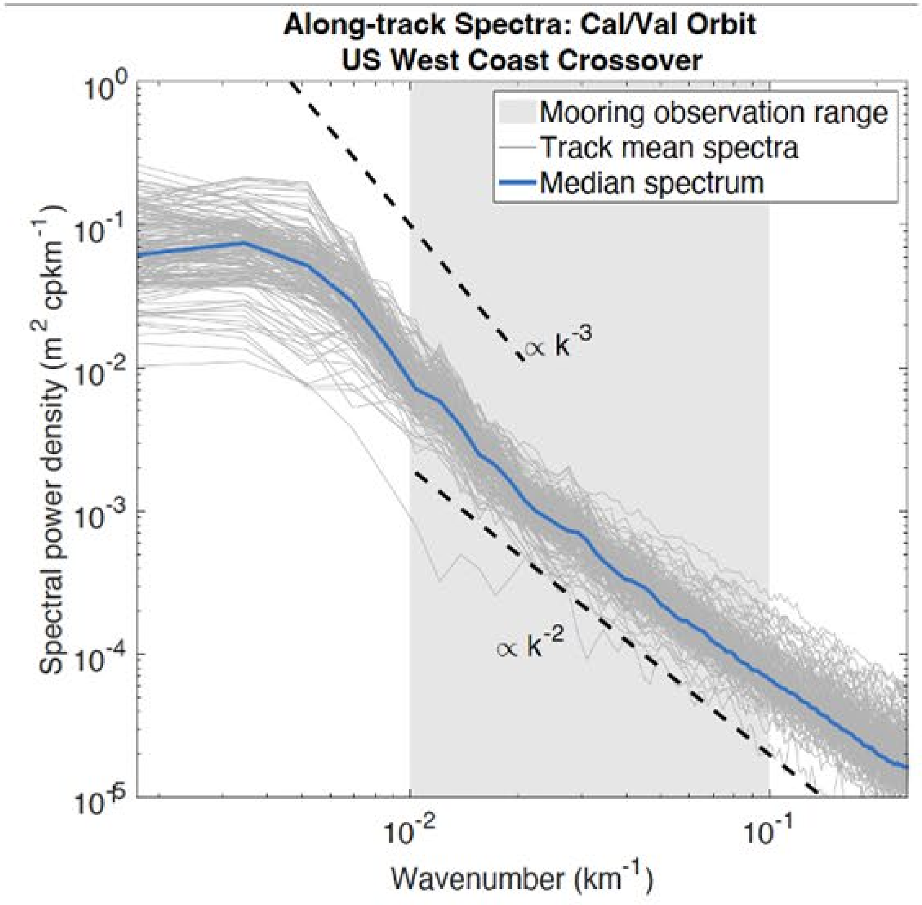


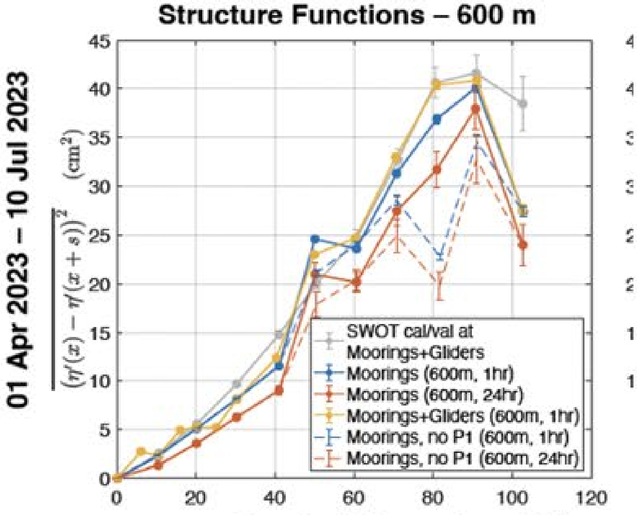
Babette C. Tchonang et al. (poster)

Submesoscale Turbulence Structure from SWOT and in situ

Steric Height in the California Cal/Val Crossover

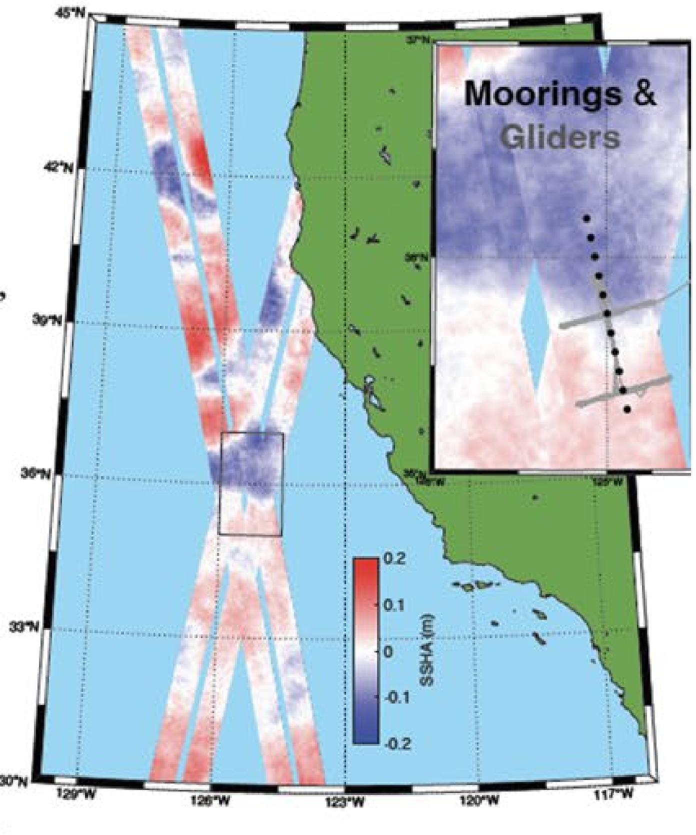
Luke Kachelein's poster





Spectral Slopes from S.F.s

	0-40 km	0-90 km
Moor. - 24 hr	-2.32 ± 0.01	-2.47 ± 0.01
Moor. - 1 hr	-2.16 ± 0.01	-2.31 ± 0.01
M+Gli. - 1 hr	-2.12 ± 0.01	-2.36 ± 0.01
SWOT at M+G	-2.35 ± 0.01	-2.34 ± 0.02
SWOT - all	-2.15	-1.88



e,
rs,
&
it
ar
is.

Discussions

1. Is SWOT meeting requirements, pre-launch expectations
2. New results being revealed (tell Nadya/Yannice what you love about SWOT)
3. Challenges remaining : steps forward

1. Based on existing results, what are the gaps and challenges
2. What are our future plans
   a. data analysis and sharing
   b. Joint publications
   c. plan campaigns and data collecting in two years?
   d. collaboration with other working groups through data challenge?
3. The needs of a centralized data products support? Instruments/satellite data products/human resource.

Conclusions

1. Regional validation group and AdAC have succeeded in sampling different dynamic regimes and seasons.
2. We have already identified different regimes opening doors to future campaigns with more coordination and strategy.
3. In-situ measurements take more time to clean up and share.
4. Advocate continuation of AdAC.
   a. workshop, 2025?
   b. regular meetings through 2025 (every other month) and on the open-science platform