SWOT Status: Prelaunch Ocean Campaign

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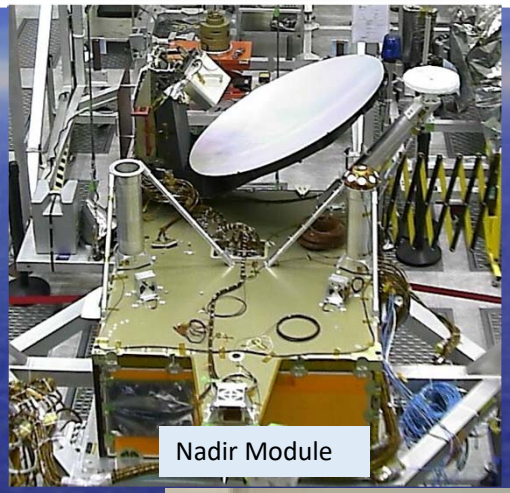
Summary Project Status

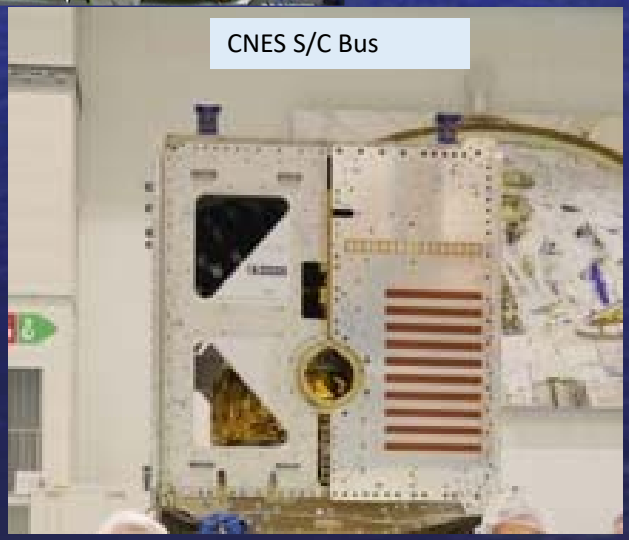
- All Flight hardware completed and now in progressive levels of I&T
  - Nadir Payload: Nearly complete at JPL
    - » AMR, GPSP, LRA, DORIS, X-band all integrated; Nadir Altimeter in next month
  - KaRIn Module: Nearly complete at JPL
    - » Testing shows good performance results, meeting requirements
  - Deployable Mast/Antenna: Hardware completed and in system I&T (JPL)
  - Next year dedicated to final payload I&T and delivery for S/C I&T (France)
  - CNES S/C Bus I&T about to start and expected to complete (Apr 2020)
- Launch vehicle (SpaceX-Falcon9): Nominal development progress
- JPL/CNES Ground system development continuing and preparing for integrated testing
- Algorithm and Cal/Val development progressing to support launch
- Developed and now implementing design to significantly improve the science data product latency (goal <3 days)
- Overall project is overcoming hurdles of implementing a challenging mission and nearing final stages of development in 2021

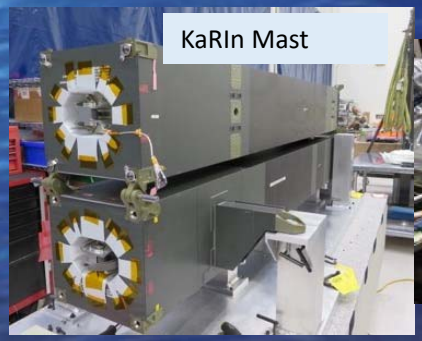
SWOT

Flight Hardware


KaRIn Module


Nadir Module


CNES S/C Bus


KaRIn Mast

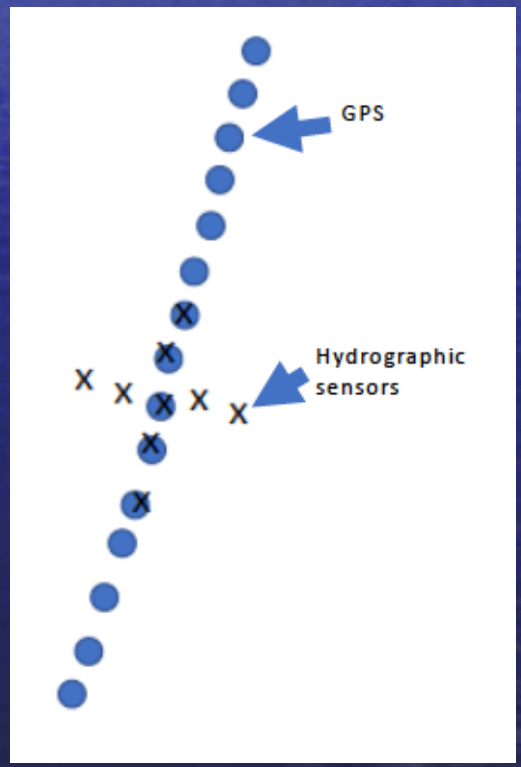

KaRIn Antenna

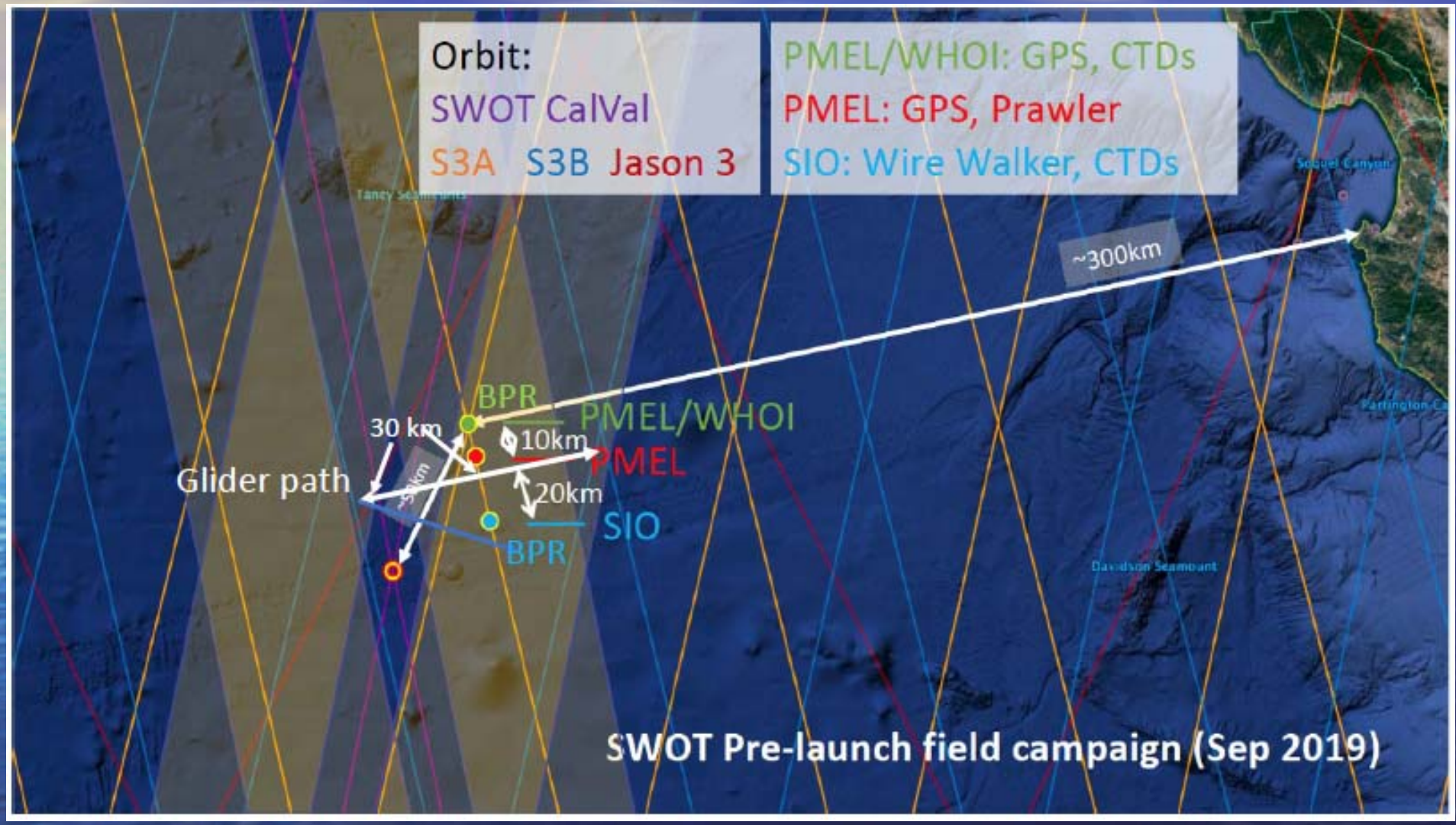
The most important task after launch is to evaluate the measurement performance for studying ocean circulation

Meeting the challenges of CalVal with an in-situ observing system

A strawman design for post-launch CalVal (pending on the findings from the pre-launch campaign):

1. **Geodetic component**: An along-track array of GPS buoys for SSH validation
   The minimum length of the GPS array needs to be ~ 120 km, according to a modeling study of the long-wavelength calval by the SWOT nadir altimeter.
2. **Oceanographic component**: A two-dimensional array of hydrographic sensors (gliders, moored wire walkers/CTDs, etc.) for oceanographic understanding and validation.




Orbit:
SWOT CalVal
S3A S3B Jason 3
PMEL/WHOI: GPS, CTDs
PMEL: GPS, Prawler
SIO: Wire Walker, CTDs
~300km
BPR
PMEL/WHOI
30 km
10km
PMEL
Glider path
20km
SIO
BPR
SWOT Pre-launch field campaign (Sep 2019)

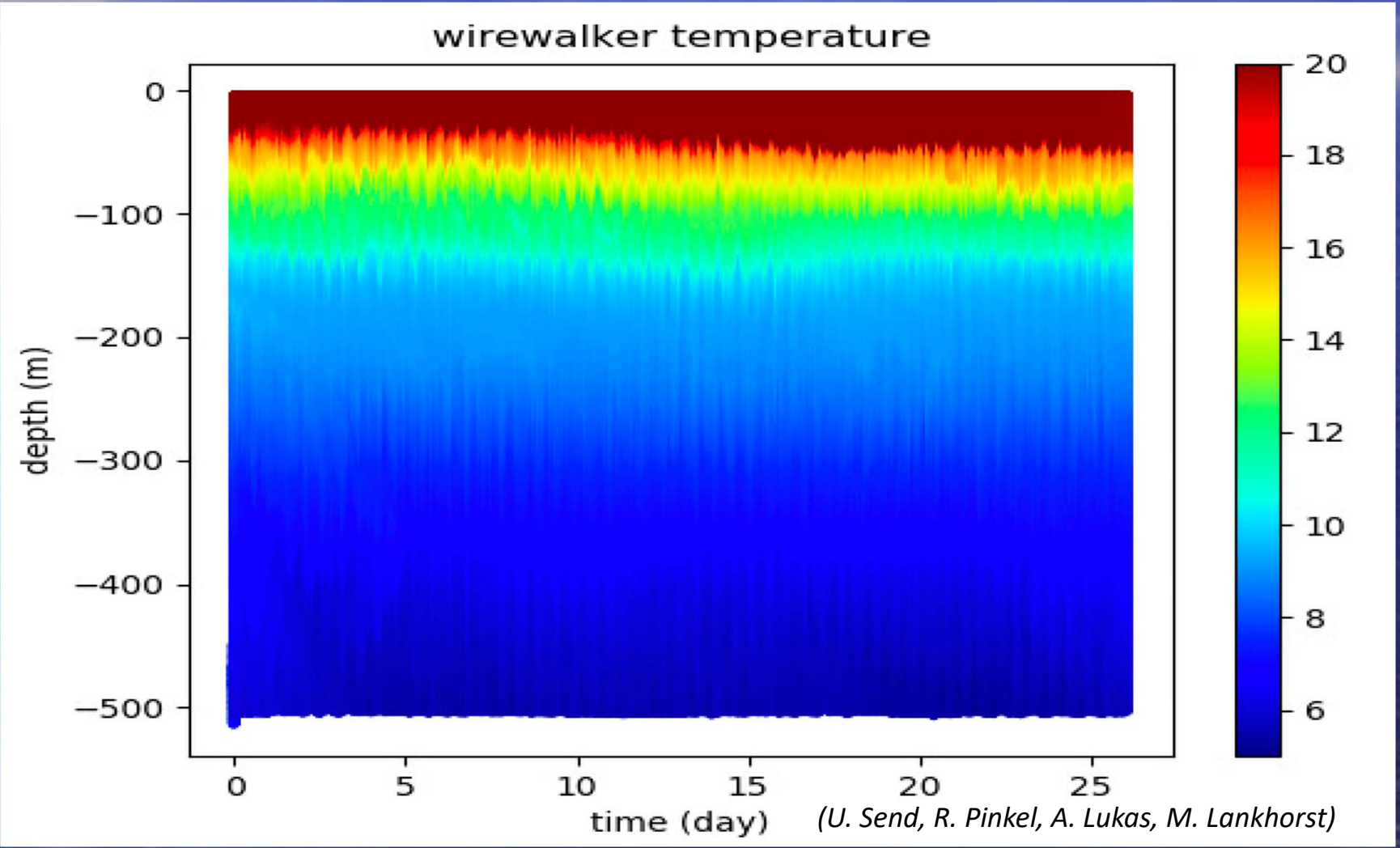
Experiment Objectives

- Test the closure of determining SSH with GPS buoy, CTD mooring, and BPR.
- Test the sampling of the scales of SSH variability not resolved by conventional altimeters such as Sentinel 3A (S3A).
- 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.
- Assess the information content of the in-situ observations:
  - Continuation of the S3A wavenumber spectrum to the SWOT regime
  - Evaluate the reconstruction of the upper ocean circulation
- Provide information for the design of the post-launch in-situ observing system.

SIO R/V Sproul – a 125 foot ship

Sept 1-8, 2019

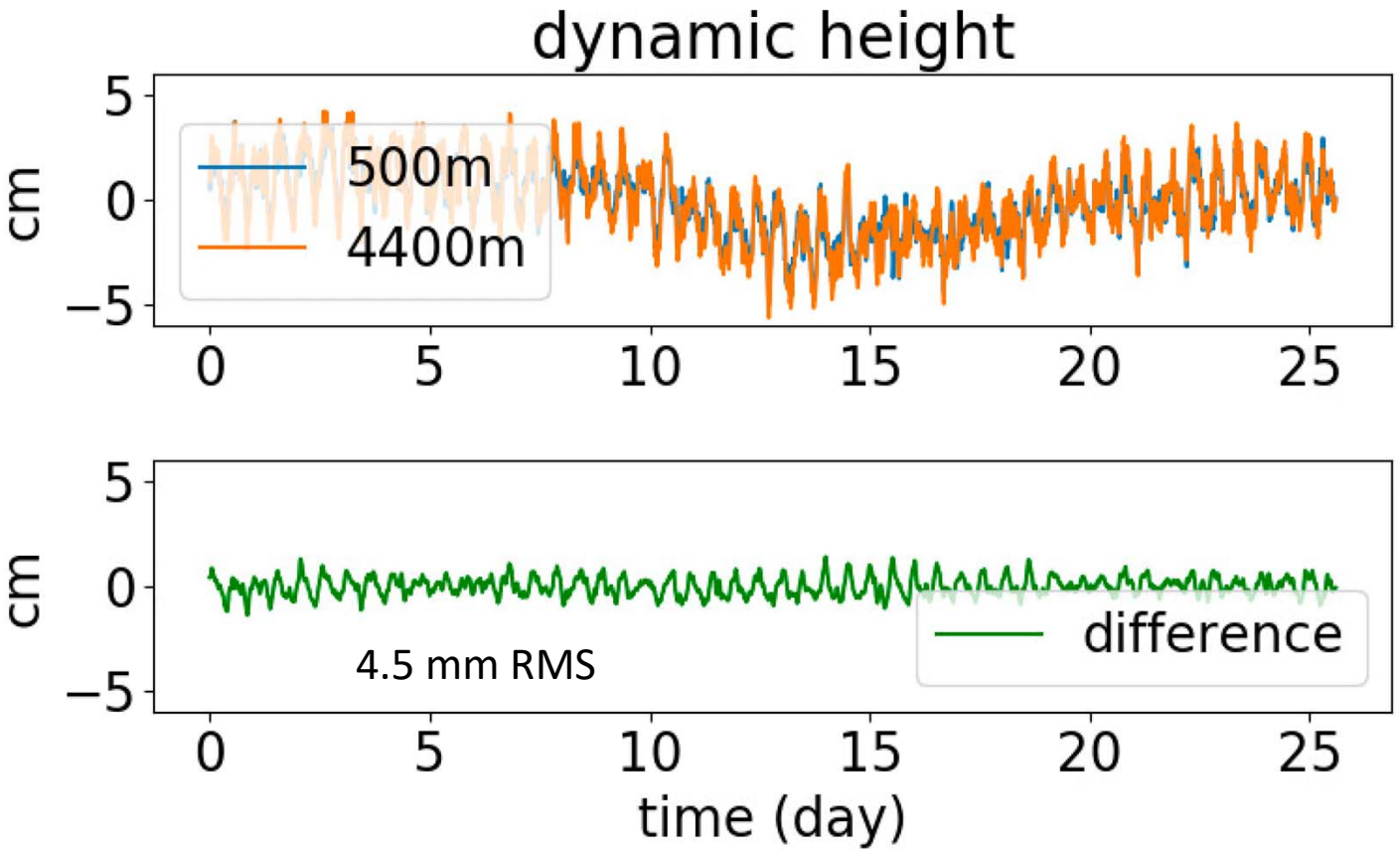
SIO hybrid mooring- Wire-walker upper 500 m, 7 microcats below

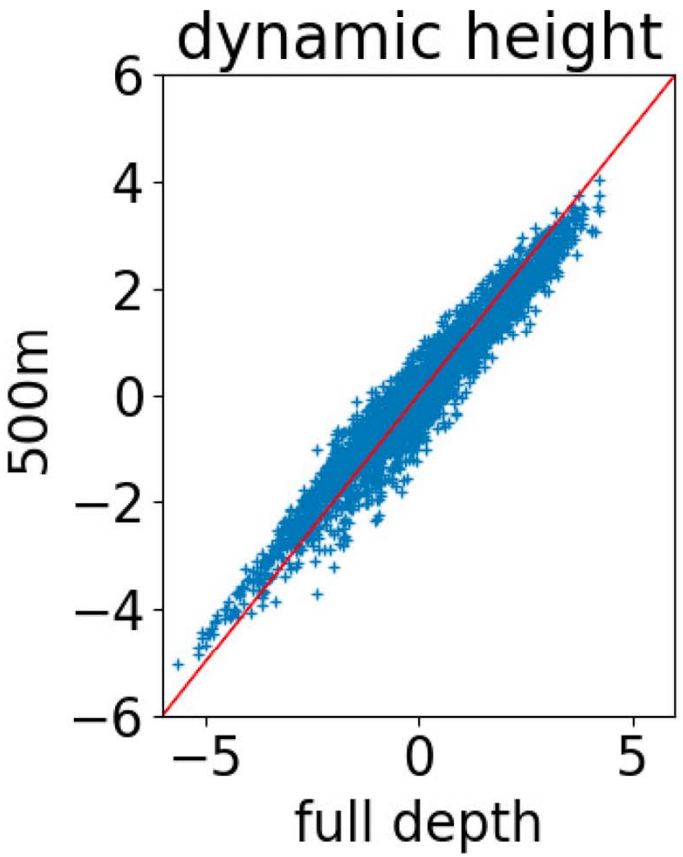


(U. Send, R. Pinkel, A. Lukas, M. Lankhorst)

SIO hybrid mooring- Wire-walker upper 500 m, 7 microcats below

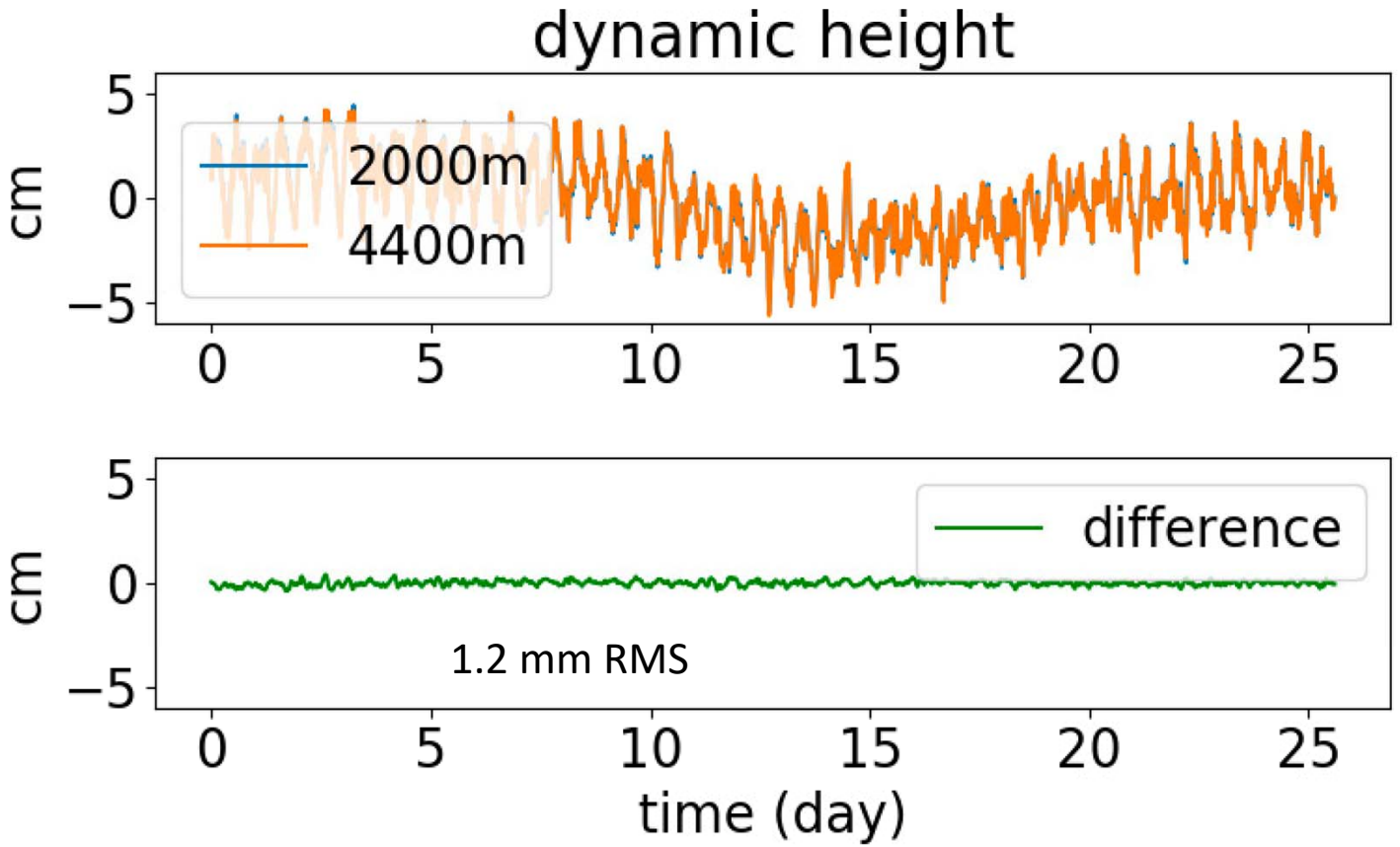
Upper 500 m vs full depth dynamic height

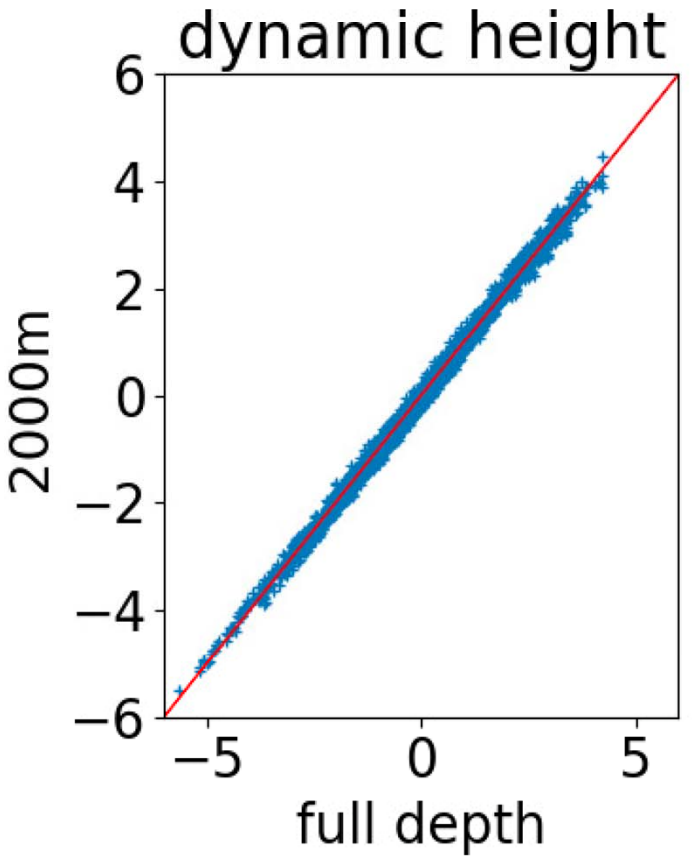




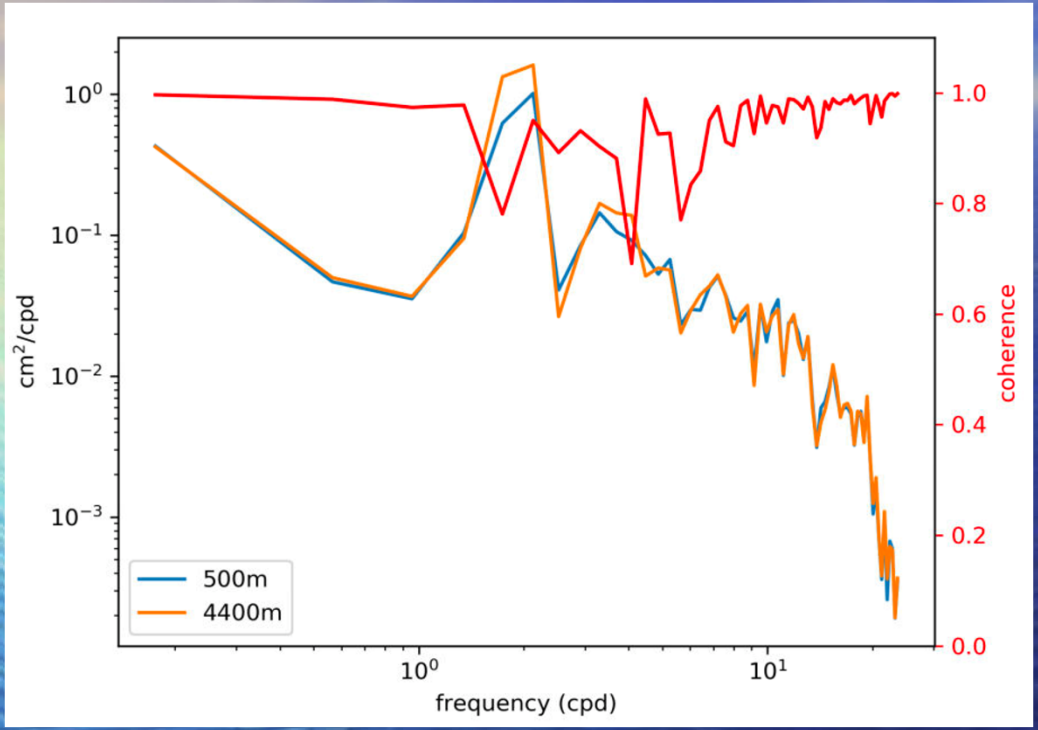
SIO hybrid mooring- Wire-walker upper 500 m, 7 microcats below

Upper 2000 m vs full depth dynamic height

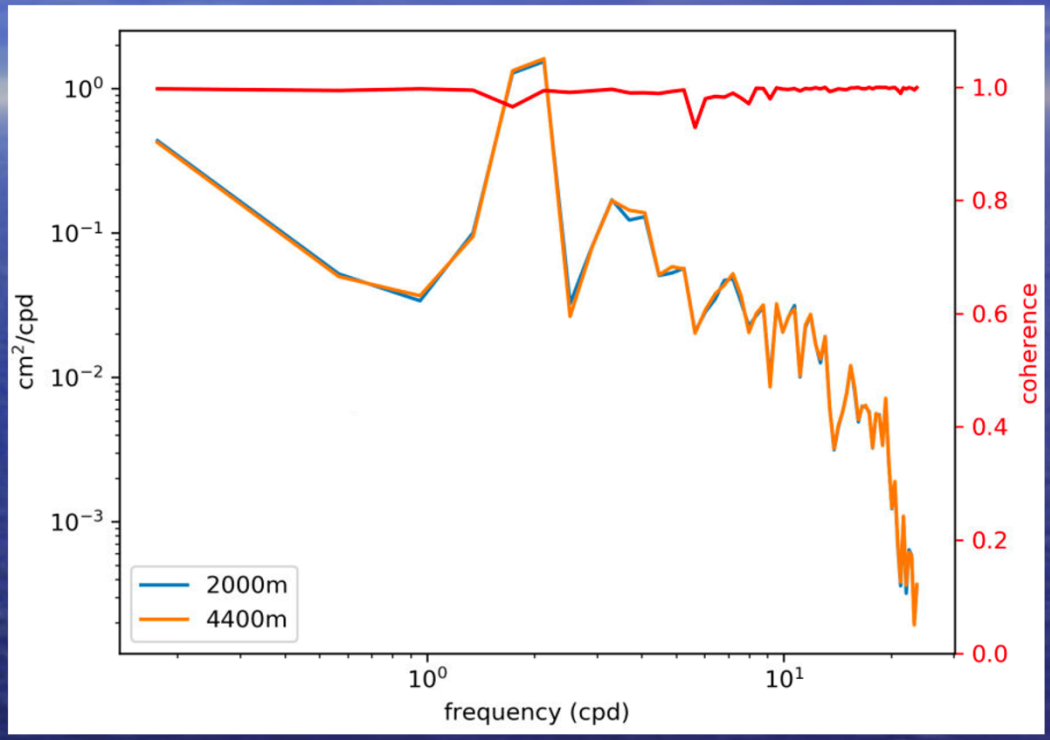




Spectral analysis of the SIO hybrid mooring data

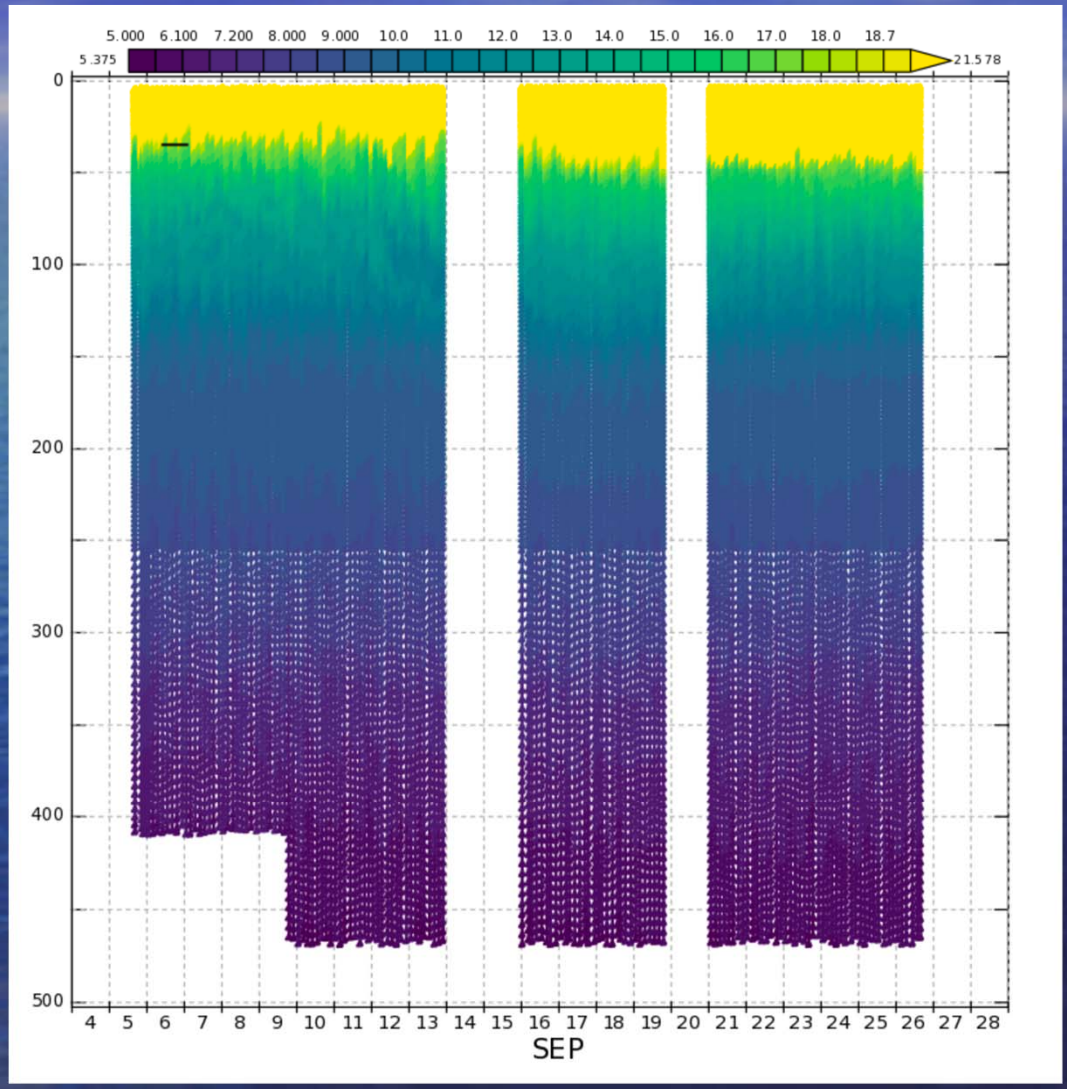


- The spectrum of the dynamic height of the upper 500m (blue) and full depth (orange). Degree of freedom=10.
- Red line: the coherence between 500m and full-depth dynamic height. The y-axis is on the right.

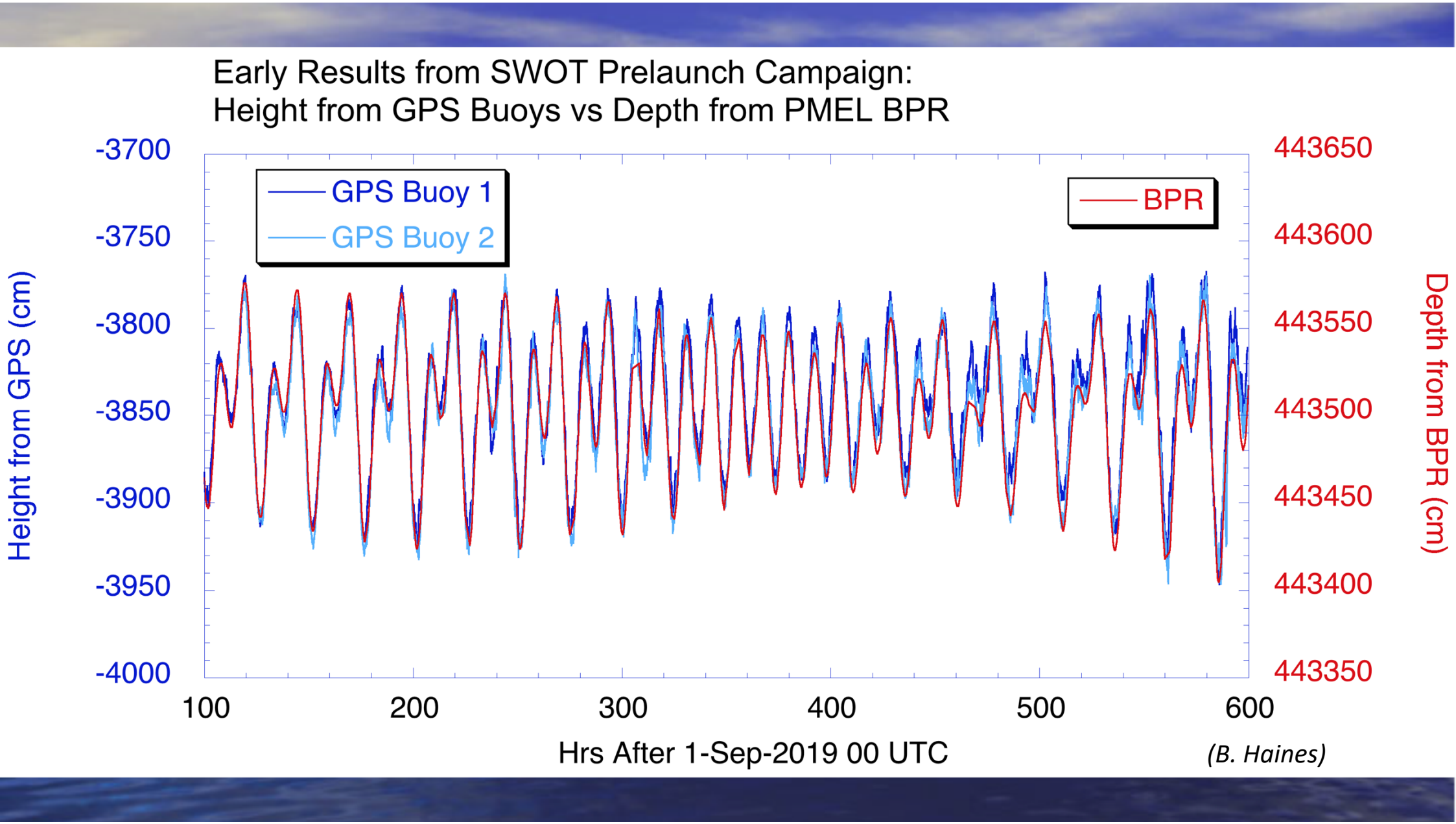


- The spectrum of the dynamic height of the upper 2000m (blue) and full depth (orange).
- Red line: the coherence between 2000m and full-depth dynamic height. The y-axis is on the right.

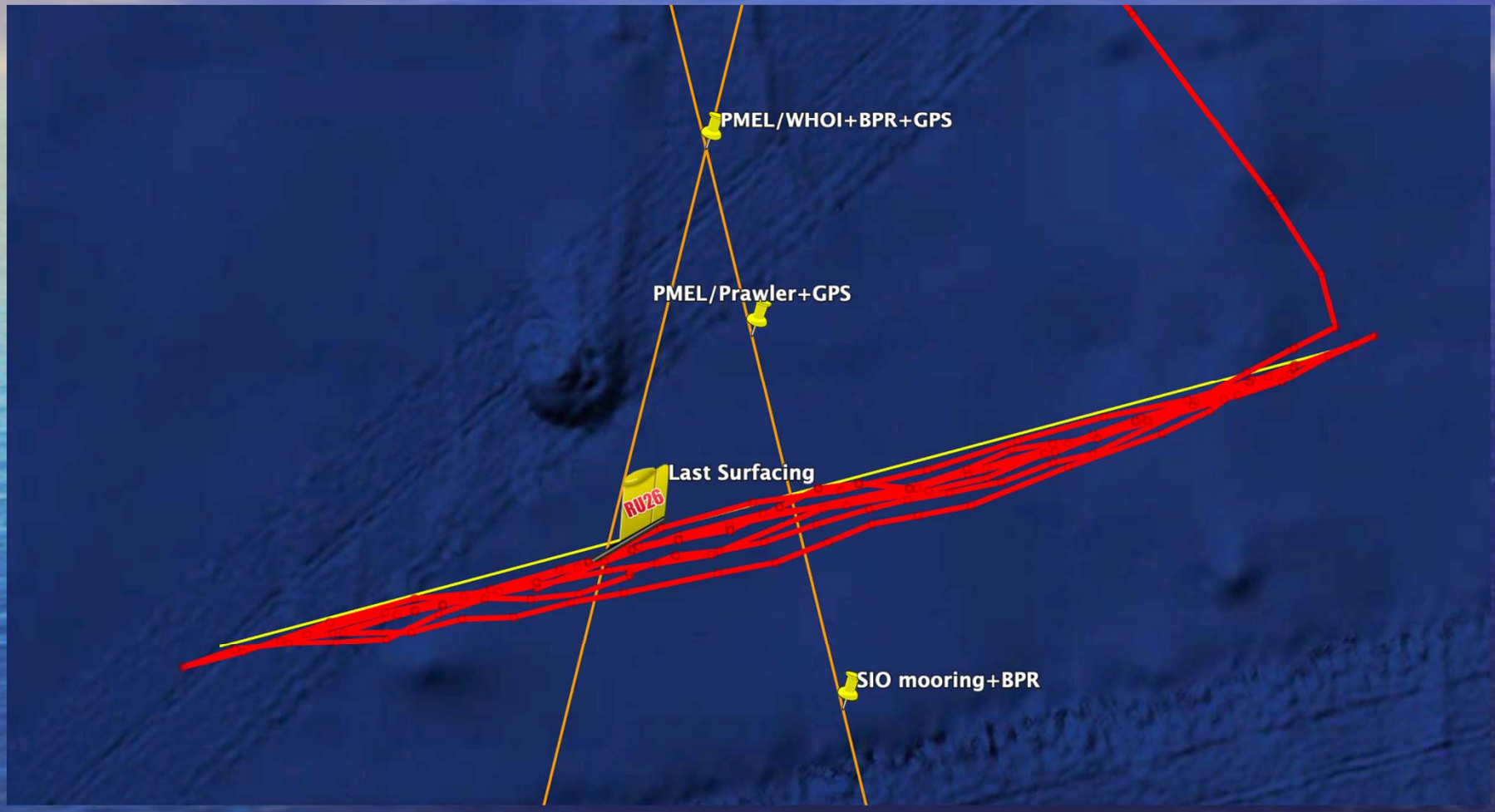
Sample NOAA Prawler Data (T)148 profiles



(C. Meining)


Early Results from SWOT Prelaunch Campaign:
Height from GPS Buoys vs Depth from PMEL BPR
GPS Buoy 1
GPS Buoy 2
BPR
-3700
-3750
-3800
-3850
-3900
-3950
-4000
443650
443600
443550
443500
443450
443400
443350
100
200
300
400
500
600
Height from GPS (cm)
Depth from BPR (cm)
Hrs After 1-Sep-2019 00 UTC
(B. Haines)

Glider Tracks



(O. Schofield, D. Aragon)