

S-MODE Science Report: Nov 1-5, 2021

Science Highlights:

- The S-MODE science team dubbed the final three days of the campaign the “*velocity extravaganza*”. The team had all of the platforms that measure surface and subsurface velocity collecting data in a small box inside the operations area, and the weather conditions were amenable to airborne data collection from all sensors.
- Both the B200 and the Twin Otter conducted 4 flights in 3 days, with optimal conditions for data collection from the various instruments.
- We operated the Wave Gliders and Saildrones in kilometer-scale arrays while the ship moved relatively quickly to survey a larger area around the uncrewed vehicles (Figure 1) and the B200 and Twin Otter surveyed the larger region.
- This successful demonstration is what the science team had envisioned before the campaign (Figure 2) as a method to: (1) make quantitative comparisons between velocity measurements from different platforms and (2) compare independent estimates of surface current vorticity and divergence.
- We expect that this mode of operations will be utilized many more times during the Intensive Operating Periods (IOPs) in Fall 2022 and Spring 2023.
- The Level 1 requirements for the Pilot campaign were unambiguously met.

SST, 2021-11-05 10:10, surface currents averaged over +/- 20.0 hr

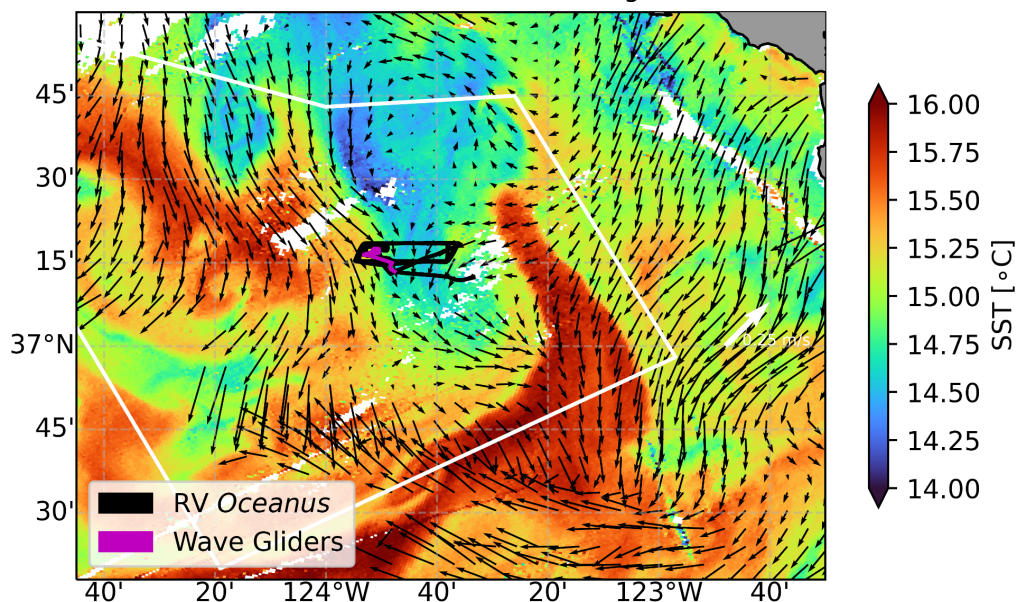


Figure 1: Sea surface temperature (background colors) on the morning of the last day of data collection. The black vectors show the 40-hour average surface currents from the US high-frequency coastal radar network, and the black and magenta lines show the locations of the RV Oceanus and the Wave Gliders during the same time period. DopplerScatt and MASS collected surface current measurements at much higher resolution than provided by the HF Radar data.

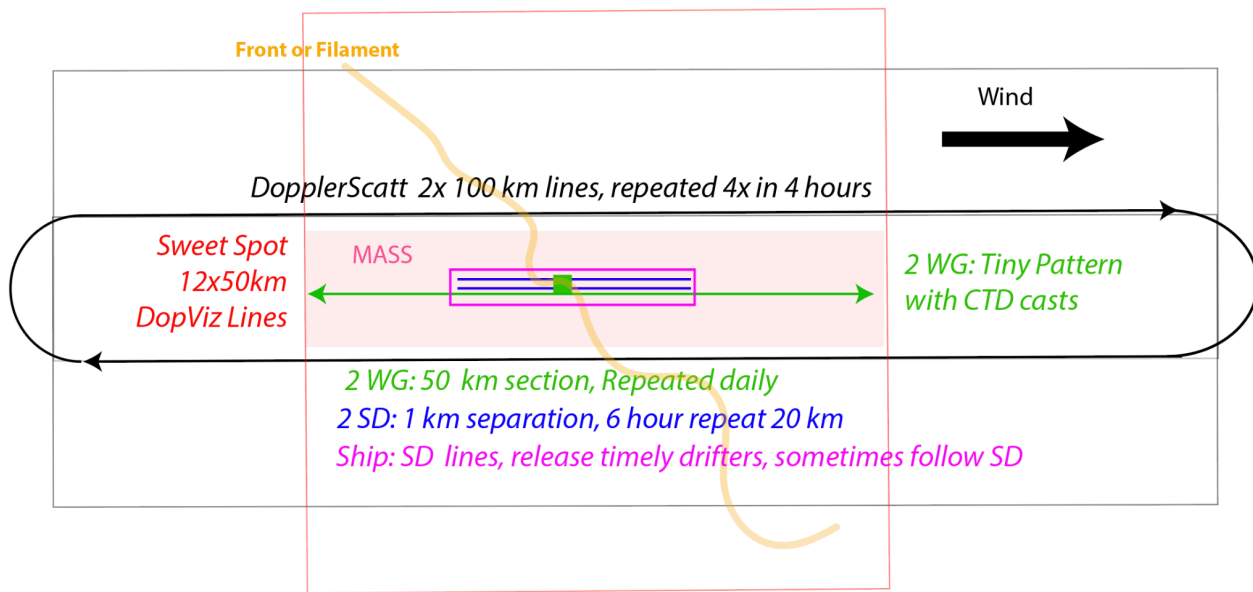


Figure 2: Mockup of multi-platform velocity intercomparison conceived prior to the experiment. The team was able to test this in reality with “velocity extravaganza” operations from Nov 3-5.

R/V Oceanus, Wave Gliders, and Saildrones

- As part of the “velocity extravaganza”, all five Saildrones and three Wave Gliders were formed into arrays while Oceanus circled them in a racetrack. This was the in situ data collection mode for practically all of the final five days of the campaign.
- In total during the campaign, the team on the *Oceanus* collected 1396 profiles of upper-ocean temperature, salinity, oxygen, and chlorophyll fluorescence. (That is a lot!)
- They also collected 87 radiosonde profiles of atmospheric temperature and humidity, including some during the large atmospheric river event.



R/V Oceanus Science Party conducting uCTD operations somewhere out in the Pacific Ocean

AFRC B200

- After a hard down day on Monday and bad weather on Tuesday, the B200 closed out the Pilot campaign with 4 flights in 3 days, during what was probably the most optimal weather conditions of the entire campaign.
- For the four flights, the B200 flew a tight lawnmower pattern back and forth over a compact in situ operations area.
- DopplerScatt continued to collect good data and the team produced surface velocity maps within a few hours of landing. The efficiency with which the team produced these quick look maps is commendable and will be quite valuable during the IOPs.
- MOSES got a few clear days to collect high resolution sea surface temperature data that showed good agreement with other sensors.
- The B200 finished the S-MODE Pilot campaign with 12 science flights over approximately 54 hours.

Twin Otter

- The Otter also completed 4 flights over 3 days and ended the campaign with 10 science flights over approximately 66 hours.



B200 crew from L to R: Sam Habbal (AFRC), Karthik Srinivasan (JPL), Alex Wineteer (JPL), Tracy Phelps (AFRC), Delphine Hypolite (UCLA), David Carbajal (AFRC), Leroy Marsh (AFRC), Tom Lynn (ARC)