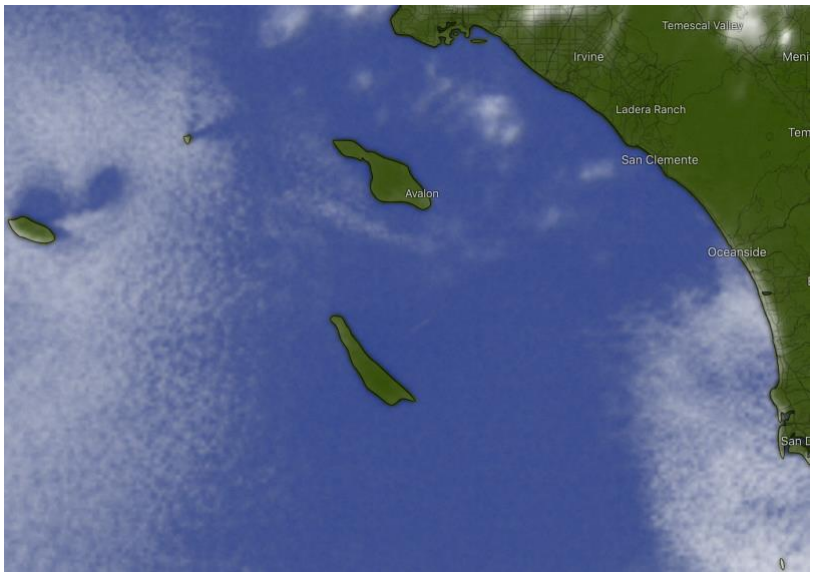
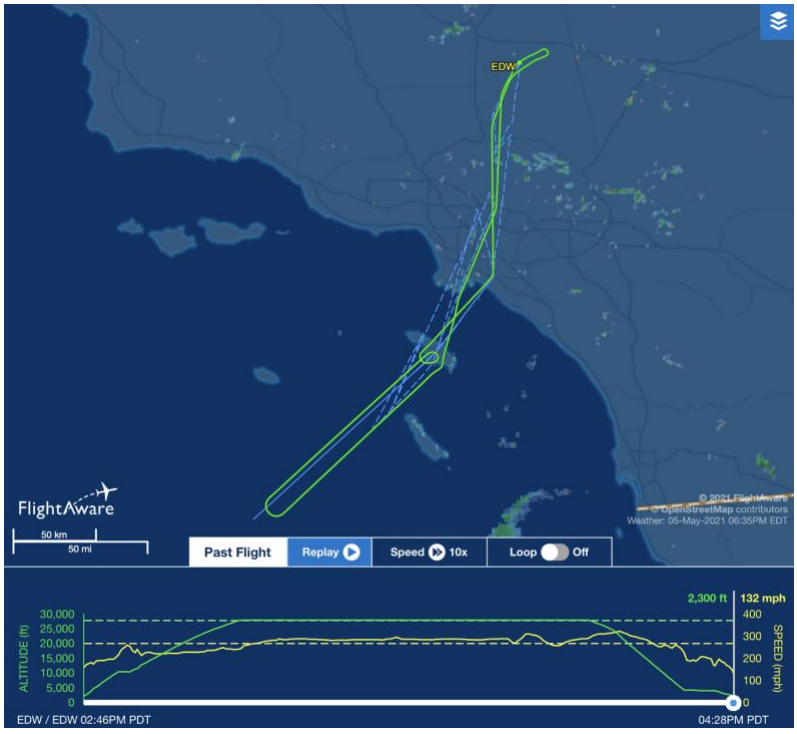
S-MODE Field Experiment Report 2021-05-05

Summary: On May 5, the S-MODE team attempted the first joint collection with four instruments: DopplerScatt (JPL), MOSES (UCLA), a wave glider (WHOI), and the newcomer MASS instrument from UCSD SIO. The weather in the Southern California Bight has entered into the yearly May Gray (a precursor to June Gloom): early morning fog fights against the sun, and many times ends up clearing in the late afternoon. Since both MOSES and MASS carry optical instruments, clouds and fog can be very problematic to making good measurements. The initial outlook was good: the GOES satellite showed clearing offshore and the experiment team decided to try their luck. The MASS instrument attempted unsuccessfully to penetrate below the clouds (they can fly as low as 600 ft above the ocean using a Twin Otter airplane from Twin Otter International), but could not find an opening and headed home. DopplerScatt, which uses cloud-penetrating radar, completed one racetrack over the WHOI wave glider and headed home as well to save flying time for the next opportunity. Meanwhile, the team on the ground has been making quick look data products, which are shown below. The data results will be the subject of our next update. All instruments appear healthy, are collecting good data, and are ready to fly on the next opportunity.

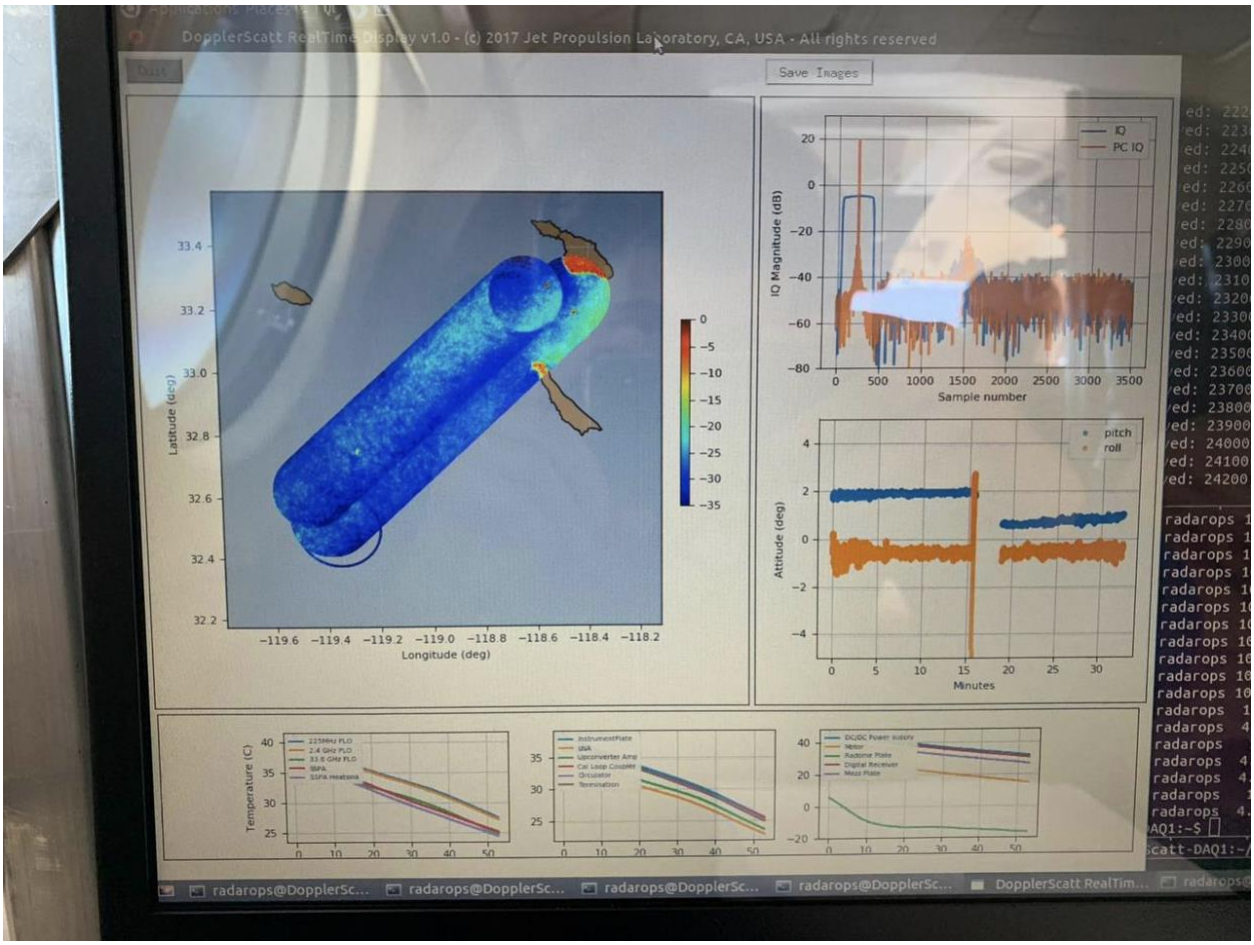


This was the cloud cover when the planes took off.

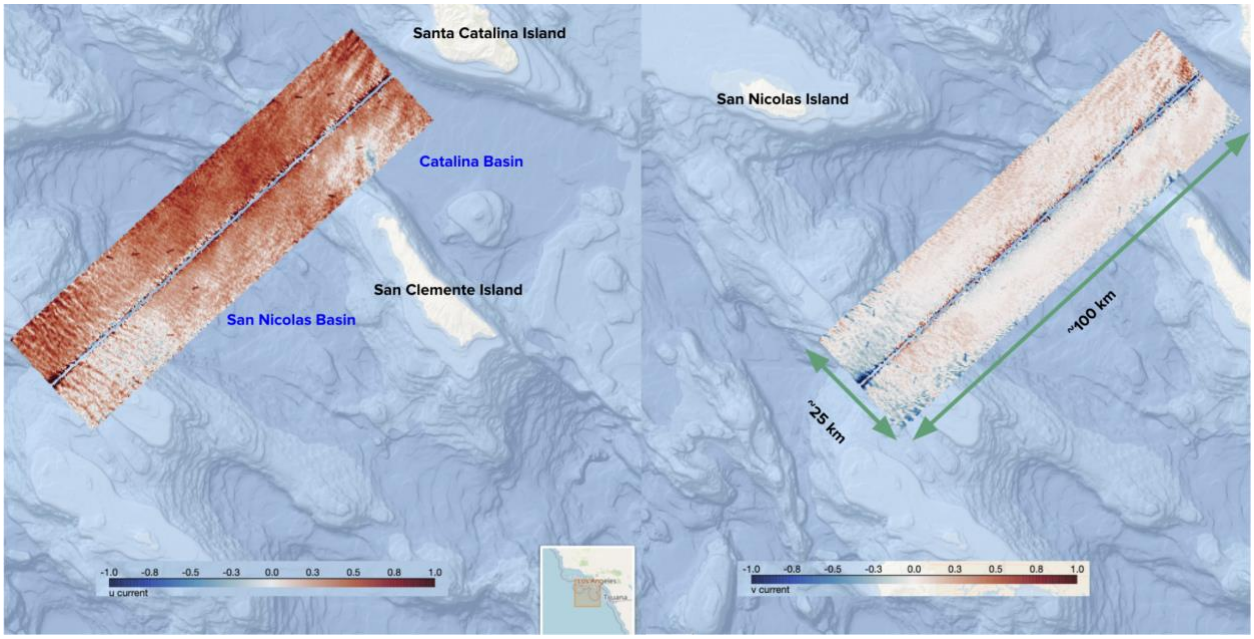
This is the cloud cover the MASS Twin Otter found on arrival.
No way to get in, time to go home!



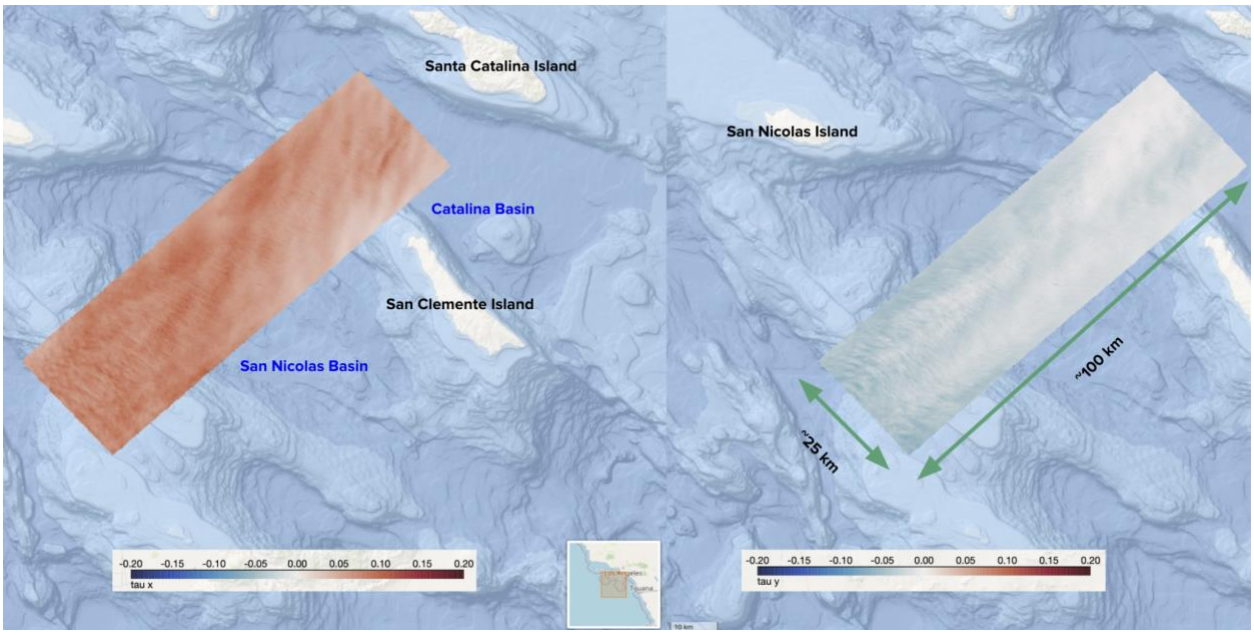
This was the racetrack flown by the NASA 801.
The WHOI glider was imaged from both sides.



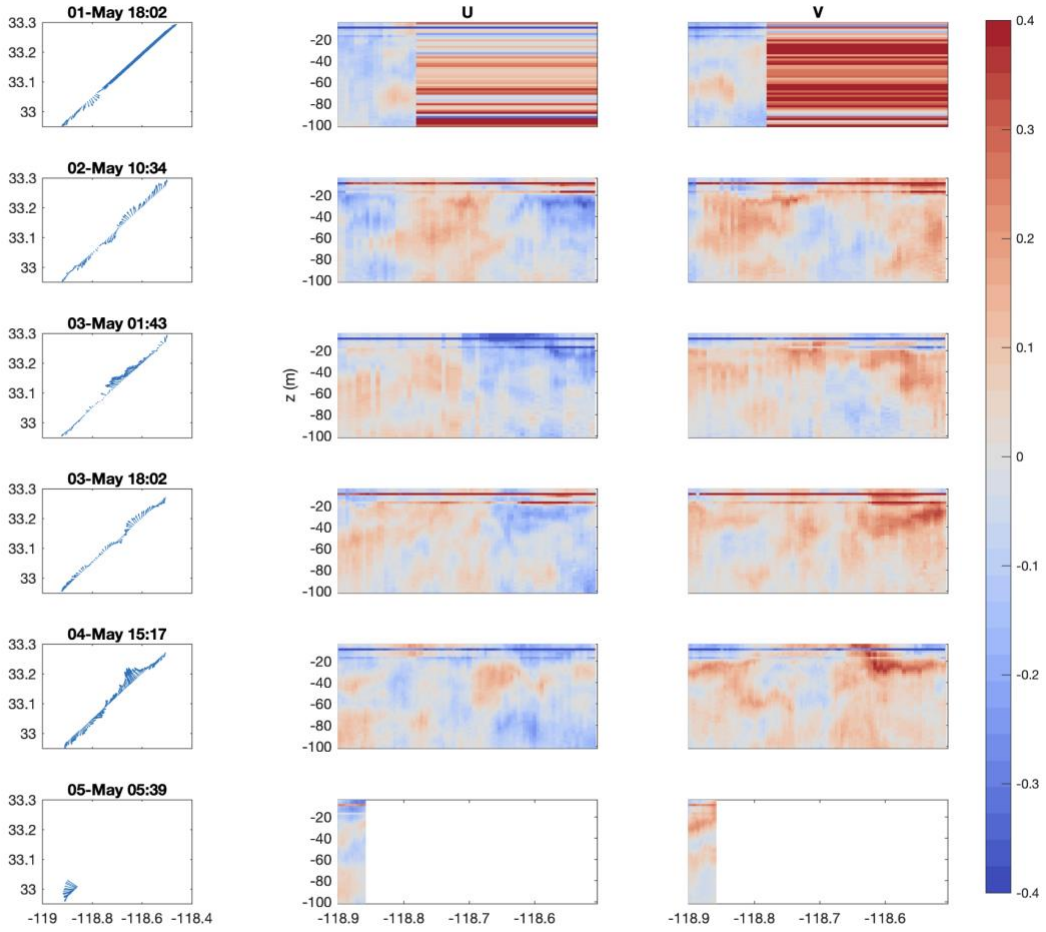
The winds were low, but the cloud-penetrating DopplerScatt instrument could still collect good data, as shown in this real-time display of the radar return signal.



DopplerScatt quick-look data products for the surface current components collected on 2021-05-03. The left panel shows the eastward surface current component (in m/s), while the right panel shows the northward component. At the time of measurement, the current was heading mostly east, with a small northern component. Wave-like features (possibly Internal Gravity Waves) can be seen in the south-werstern part of the swath. While the DopplerScatt instrument has not been calibrated yet (these were calibration flights) and the precise GPS/IMU solutions are not yet available, these early results are quite encouraging.



DoppleScatt quick-look data products for the wind stress; i.e., the force per unit area exerted by the winds on the currents. The left panel shows the eastward wind stress component (in N/m²) , while the right panel shows the northward component. At the time of measurement, the winds were pushing the currents towards the south-east. The simultaneous measurement of winds and currents helps us understand air-sea interaction at sub-mesoscales.



Current components measured as a function of depth (y-axis) and longitude (x-axis) using the Acoustic Doppler Current Profiler (ADCP) on the WHOI wave glider that was in the swath of the DopplerScatt and MOSES measurements on May 3 and May 5. The left column shows the associated current vectors. The ADCP provides the structure in depth not captured by

the radar and near-surface current measurements that can be used to validate DopplerScatt currents.