LRAUV Deployment plan for Compact Models Field Demonstration

Chief Scientists or Engineers

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Vehicles

Daphne

- all operations

We'd like to use *Daphne* for this demonstration because we've seen evidence she is performing better than *Tethys* in terms of dead reckoning navigation.

Other resources

Small Boat

- LRAUV launch & recovery operations

Preparation

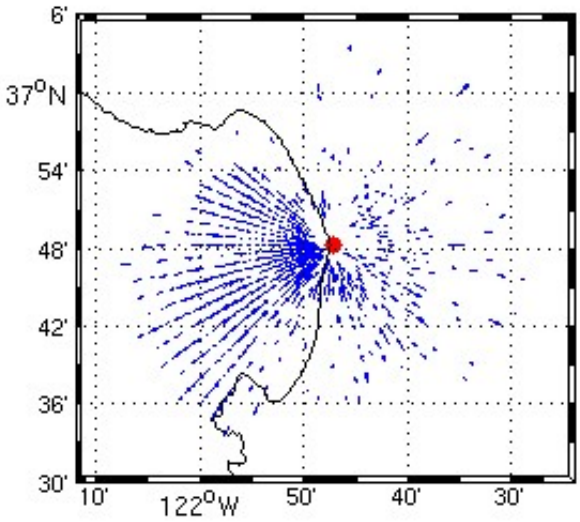
Daphne

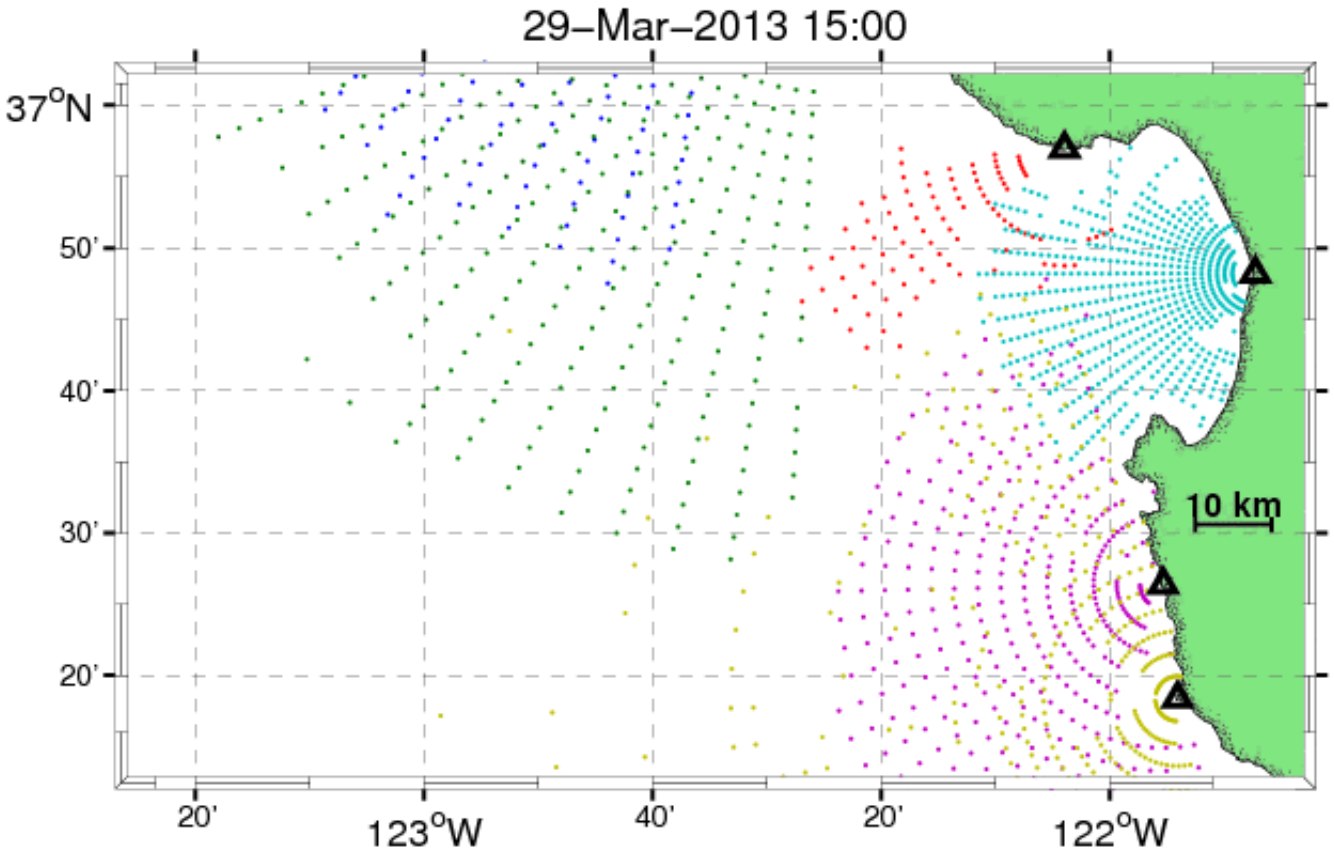
- standard short-nose configuration
- expansion coefficient (EC) timeseries for recent past in `Data/HFRadarModel` on vehicle
    - set up an hourly `cron` job from `tellum`
    - confirm functionality using `Missions/Demo/HFRadarModelTest.xml`
    - confirm outputs in draft mission (probably named something like `Missions/Engineering/testSurfaceCurentCompactModel.xml`)

- ISUS optional (for supplementary science)

Location

- On-shelf -- continuous bottom lock for comparison
- near MBARI -- minimal transit time
- West-Northwest of Moss Landing
    - North of Monterey Canyon
    - East of Soquel Canyon (mostly)
    - Southwest of the line between ML and the Point on East Cliff near Moran Lake -- it seems like HF radar coverage Northwest of that line is spotty at best, and this is consistent with the signal plots from the ML HF radar ground station (Figure 1) and the radial data locations from the local radar stations plotted at CenCalCurrents (Figure 2).





Mission

The goal of this deployment is to demonstrate onboard capability with the Compact Models code. This demonstration will use the Compact Models trained by HF radar measurements to predict surface currents. This first test case will focus on vehicle localization, comparing position estimates computed with and without benefit of the surface current information.

This means that the vehicle will be running the Compact Model code and recording its outputs, but will *not* be using those outputs in realtime. We want to make sure the outputs are reasonable before we integrate them into the navigation and control loops to let them drive the vehicle.

- reciprocal **10 km** line at **3 meters depth**
    - shallow since the Compact Models will predict *surface* currents and not *subsurface* currents -- want to operate where surface currents are most relevant
    - starting at or near **(36.830, -121.870)**
    - running Northwest at bearing **300**
    - turning around at or near **(36.875, -121.965)**
- repeat line running deeper, as time permits (e.g., 9, 12, 15 meters)
- repeat line with YoYos between 3 and 23 meters

    - relatively arbitrary envelope, could use some input *if* this fits into time constraints.
- repeat lap, surfacing periodically for GPS, but *not* correcting cross-track drift
    - Can we achieve this using a 'run at bearing' mode instead of waypoint?
- circles at varying radii and depths around (36.839, -121.889) until transit to recovery
    - Stay in good HF radar coverage area gathering more data until it's time to come home.

Post-processing and evaluation

Compare observed GPS positions and standard dead reckoning estimated positions to estimates from several different methods:

- existing dead reckoning using water lock
- existing dead reckoning using water lock and adjusting for surface current predicted *a priori* by Compact Model
- existing dead reckoning using water lock and adjusting for surface current estimated and interpolated *a posteriori* by Open-boundary Modal Analysis (OMA)
- dead reckoning using propeller model -- 'counting turns'
- dead reckoning using propeller model and adjusting for surface current predicted *a priori* by Compact Model
- dead reckoning using propeller model and adjusting for surface current estimated and interpolated *a posteriori* by OMA
- as time permits, dead reckoning using water lock or propeller model and adjusting for subsurface current output from Regional Ocean Modeling System (ROMS)
- as time permits, probabilistic dead reckoning within a sigma point Kalman filter framework using various combinations of the inputs above

Conclusion

Write a paper and present at OCEANS, AGU, AUV, UUST, or some other appropriate venue.

Relax.

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