

Waveglider-based Communications Hotspot

2014 Status Report

M B A R I



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Revision: 1.2
Date: December 2014

Development efforts in 2014 focused on the growing science application desires including acoustic communication and tracking as well as integration into the new SV3 model Waveglider.

Field Deployments

2014 saw 7 individual deployments specifically for the hotspot payload. Somewhat ironically, the first deployment in February of 2014 was the last and longest for our leased SV2 Waveglider. The SV2 travelled approximately 517nm in total between Station M and Año Nuevo and was the first hotspot mission to integrate an acoustic modem. Underwater acoustic communications has been a major push throughout 2014. One project difference from previous proposals centers on mounting for the acoustics. Originally a towbody was envisioned for acoustic integration, however a skeg-mounted solution proved to be more than adequate acoustically and also alleviated launch and recovery issues as

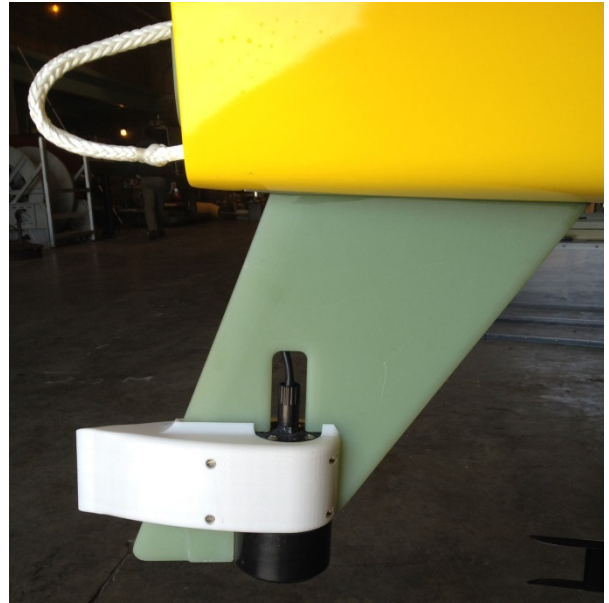


Figure 1 –A Benthos acoustic transducer with fairing mounted on a custom faired skeg.



Figure 2 –The SV3 Waveglider fit nicely in the MBARI truck.

Newport Beach. While the vehicle certainly could have transited on its own bottom to station off Newport, there was not adequate science desire to offset the risk. Thus, we transported the SV3 by truck and launched alongside the LRAUV Daphne from the R/V Nerissa. Operations for the Waveglider went smoothly and it proved to be a very valuable asset allowing us to remotely log in to LRAUV Daphne for troubleshooting purposes while both vehicles were at sea.

The final deployment of the year was to support the fall CANON experiment and the Hotspot was able to play a vital role. While not originally proposed as a specific payload in 2014, it became evident that the CANON experiment could benefit greatly from having the ability to track an LRAUV that remained underwater for days at a time. This would allow the LRAUV to stay within the ammonia maximum and allow the ship to return to that maximum each day for

as well as head localization complications when a USBL was integrated. Acoustic communications in small craft advisory conditions from the Waveglider were just as good as from the Paragon on a calm day.

The hotspot platform was quickly transitioned to our new (and bigger) Waveglider the SV3. Despite initial concerns about size, operations are routine and have gone smoothly with the SV3 from the R/V Paragon as well as other ships.

The first science mission of the SV3 vehicle was unique in that it was on location in

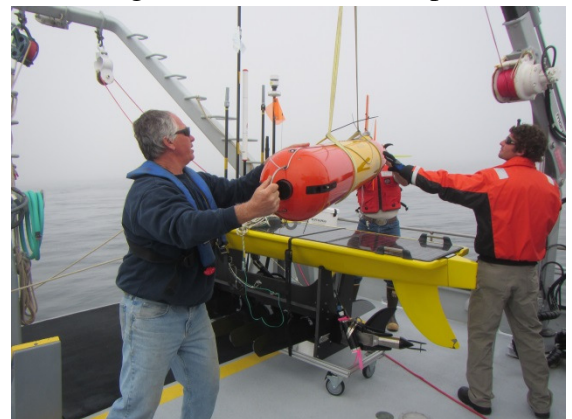


Figure 3 – LRAUV Daphne and the SV3 just prior to launch on the R/V Nerissa

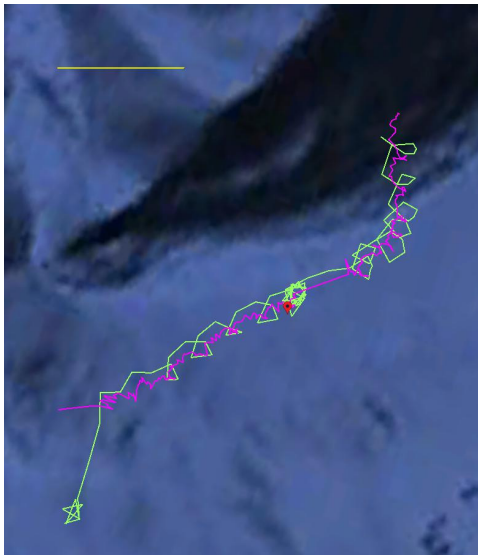


Figure 4 – Waveglider (grn) following LRAUV Makai (magenta). 500m yellow line for scale.

sampling. Software, electrical, and mechanical integration of a Benthos DAT (iUSBL) was done quickly late in the summer and an autonomous method for commanding the vehicle to follow a tracked asset was developed. Despite some complications with running the tracking script through a shoreside server, the SV3 was able to continuously track LRAUV Daphne and Makai throughout the experiment. A short animation can be seen here:

\\atlas\ProjectLibrary\901411.HotSpot\FieldDeployments\2014_09_CANON\CANON Fall 2014 Project.mp4

This allowed the R/V Rachel Carson to steam directly to station without engaging in any time intensive acoustic searching for the underwater LRAUV. Casts could begin almost immediately allowing for more sampling both in and around the patch. Future work with tracking/following in 2015 will focus on running the entire application onboard the SV3. At the time of the experiment, this was not possible due

to the need for equipment upgrades from LRI which are being performed this month.

A summary of all 2014 deployments:

<u>Deployment</u>	<u>Primary Agenda</u>
2 - Station M	Rover geolocation
3 - EcoHAB trial (Monterey Bay)	Prep for EcoHAB Newport Beach
4- EcoHAB (Newport Beach)	Surface data link for LRAUV daphne
5 – BEDs (Monterey Bay)	Acoustic data recovery
6 – Smooth Ridge	Prep for Station M and Rover comms/geolocation
7 – CANON trial	Prep for CANON Monterey Bay
8 – CANON	Acoustic tracking and following of LRAUV(s)

Development and Future Work

Throughout 2014 demand for the Hotspot and its varied applications grew. The team looks forward to firming up the available Hotspot hardware configurations to support some new unanticipated opportunities to support science. Additionally, the first publication will be submitted to Oceans Genoa in the spring. We have multiple collaborative opportunities with the project in the coming year as well and hope to capitalize on what others have done with the platform, as well as contribute to the greater community. Vehicles and payloads such as this one will continue to play a vital role in coordinated and persistent ocean observing.



Figure 5 – Even autonomous vehicles need help from humans sometimes. Kelp removal from the SV3 during the fall 2014 CANON experiment.