Adaptive Sampling of Rain and Ocean Salinity from Autonomous Seagliders

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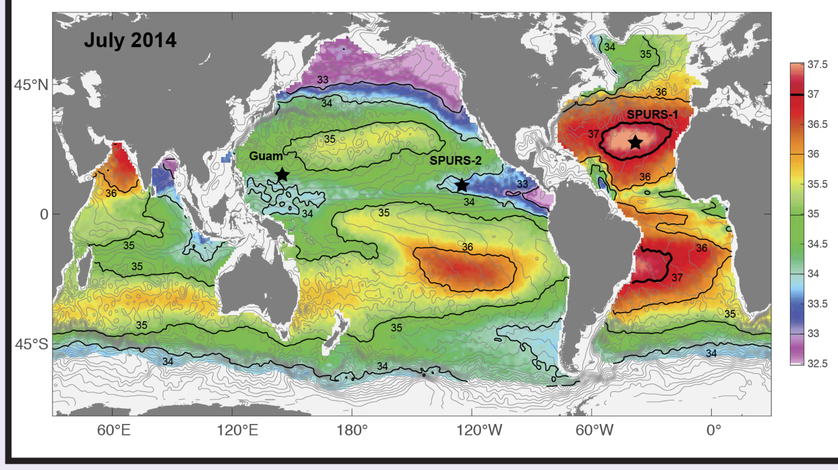
Science Objectives

Analysis of simultaneous observations of ocean salinity profiles and rain

- Determine the spatial and time variability of precipitation in several regions.
- Determine the spatial and time variability of the surface freshwater anomalies
- How does the dependence of freshwater anomaly on rain rate vary when the history of the rain rate is taken into account?
- Determine the signature of the rain events (estimates of rainfall and freshwater signal) in remote sensing products.

Analysis of simultaneous observations of ocean salinity profiles and rain:

- Using satellite and local information for adaptive sampling from autonomous platforms.
- Adaptative glider navigation and profiling



Monthly average of sea surface salinity for July 2014, from Aquarius. Location of the SPURS field campaigns, and of the Guam deployment referred to in this proposal are indicated by black stars. Contours of absolute sea surface height from satellite altimetry are shown in gray (0.1 m intervals).

Seagliders with PAAM

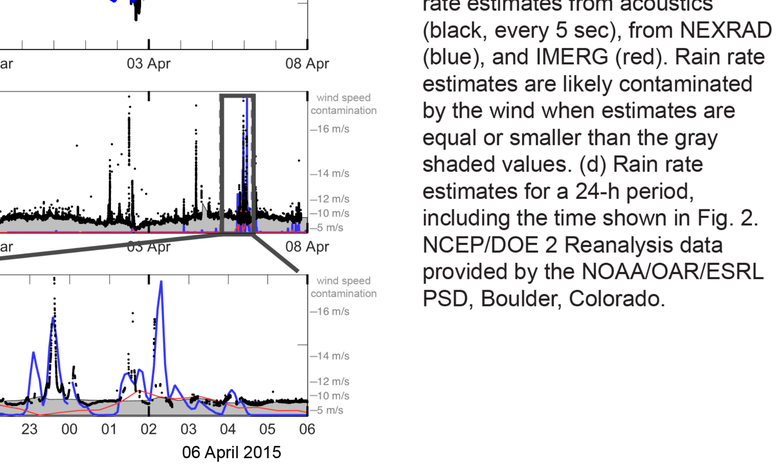
Long-endurance, autonomous Seagliders have been deployed in several locations to test passive acoustic recorders with high sampling rates (200 kHz), primarily for marine mammal monitoring.

Seagliders:

- profile to 1000m 4-6 times per day
- real time data transmission
- travel 20 km per day
- sample temperature, salinity, cholrophyll, ...
- 6-month + deployments
- controled remotely
- adaptive sampling

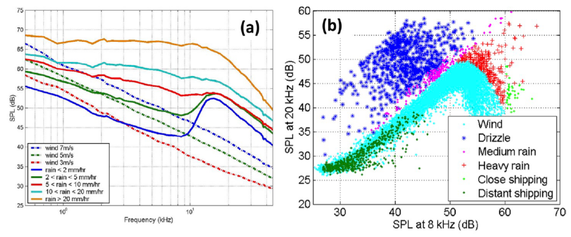
Deployments were conducted by the Acoustic Seaglider Group of APL/UW (Neil Bogue, Jim Luby, Bill Jump, Sean Lastuka and Geoff Shilling), under sub-contract to Cooperative Institute for Marine Resource Studies (CIMRS) of Oregon State University

Wind speed and **rain rate** from NCEP along the glider tracks.

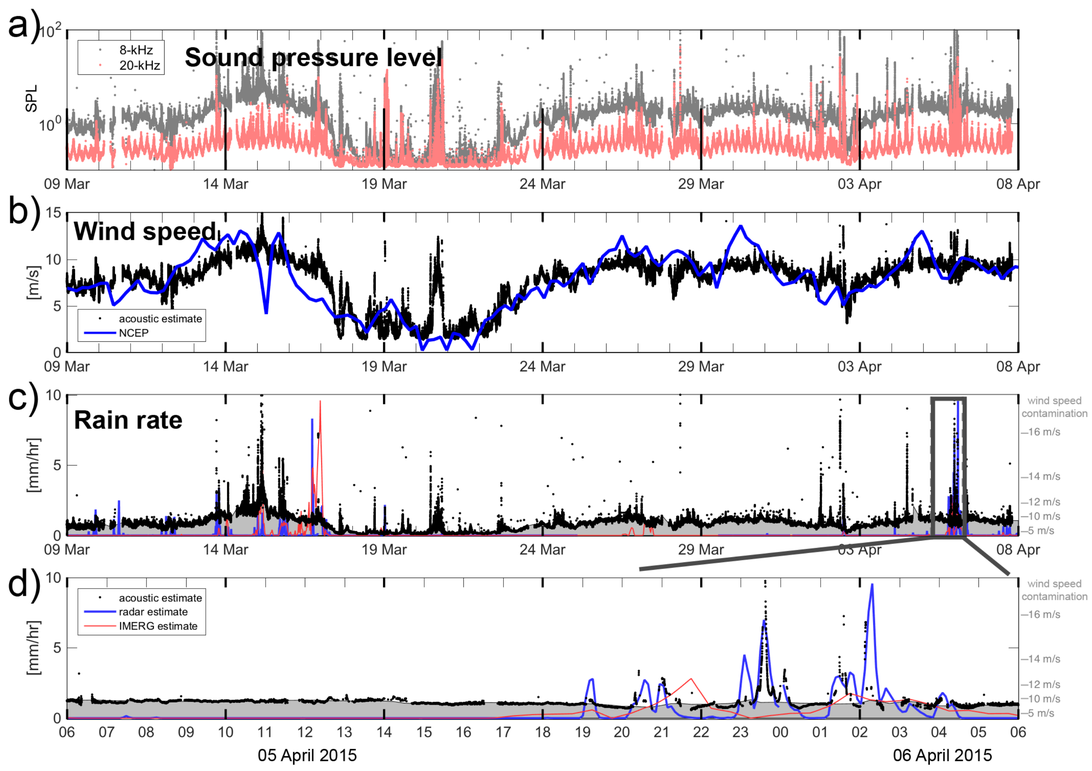


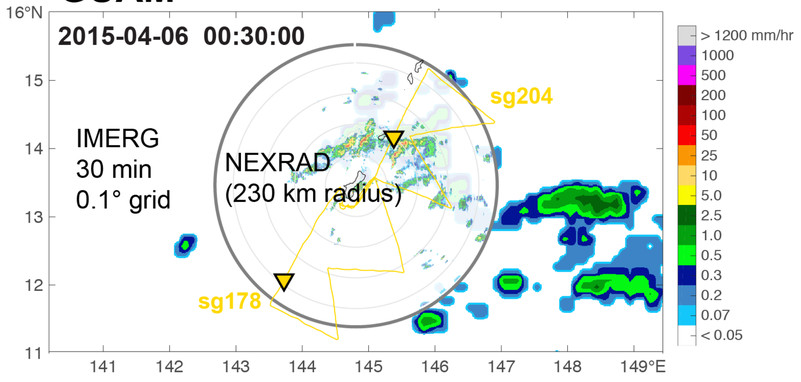
Acoustic Rain Gauge from Gliders

In addition to measuring the water column, the gliders provide direct estimates of in-situ rain rate and wind speed from the passive acoustic sensor.



Ambient sound spectra for different wind speeds and rain rates. Reproduced from Yang et al. (2015)

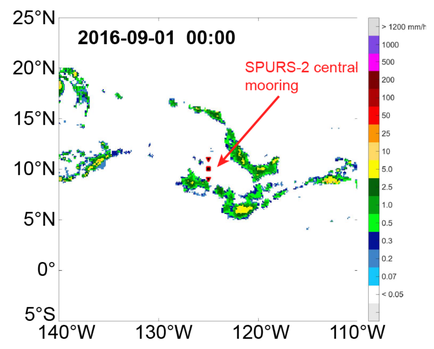


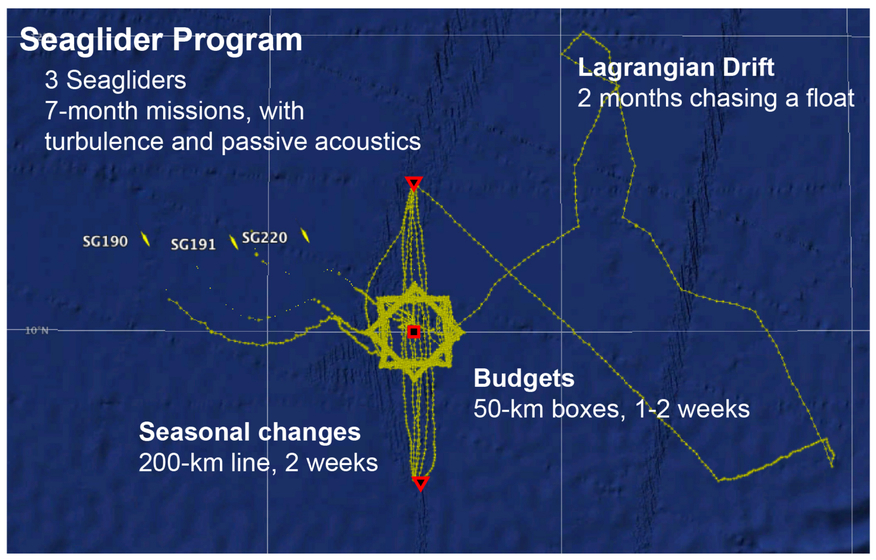


For the sg204, deployed on the northern side of Guam in March and April 2015, (a) Sound pressure level in two frequency bands, (b) Acoustic estimates of wind speed (black, every 5 sec) and NCEP-R2 time series estimates at the location of the glider (blue), (c) Rain rate estimates from acoustics (black, every 5 sec), from NEXRAD (blue), and IMERG (red). Rain rate estimates are likely contaminated by the wind when estimates are equal or smaller than the gray shaded values. (d) Rain rate estimates for a 24-h period, including the time shown in Fig. 2. NCEP/DOE 2 Reanalysis data provided by the NOAA/OAR/ESRL PSD, Boulder, Colorado.

SPURS-2

The SPURS-2 gliders are carrying acoustic rain gauges, doing spot sampling.



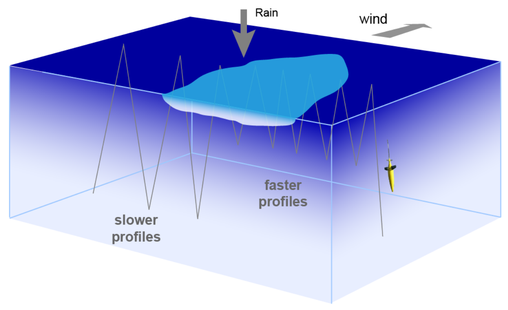


Summary

Selective and adaptive sampling is possible by combining autonomous gliders and remote sensing.

Measuring ocean salinity and in-situ precipitation over long time periods can provide new insights in the evolution of upper ocean salinity.

These concepts are being tested in SPURS-2 and future deployments.



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