Studies of Near-Surface Salinity with Surface Lagrangian Drifters in support of SPURS-2

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SPURS-2 Analysis and Synthesis Meeting, 12 Mar. 2018, La Jolla, CA
SPURS-2 Concept

- SPURS-2 designed as a coordinated experiment to achieve sampling over a large spatial footprint
- Drifters provide an expanding context to observations at the central mooring site
SPURS-2 Scientific Objectives

- “Where does the freshwater go?”
  - Investigating the effect of the large-scale circulation on the development and location of the salinity minimum, and the dispersion of patchy “puddles” of freshwater in the northeastern tropical Pacific

- “What impact will this horizontal and vertical variability have on the performance of satellite based measurements of sea surface salinity (SSS)?”
  - Measuring the horizontal variability of SSS on multiple spatial scales, and examining the impact of this horizontal variability on satellite-retrieved salinity
SVP/SVP-S Specifications

- Iridium with GPS (accuracy: ± 50 m)
- Drogue on/off sensor: strain gauge
- Lagrangian currents at 15 m
- Sea Surface Temperature (SST)
  - Thermistor: ± 0.05-0.1°C
- Salinity at 0.5 m
  - Standard sampling: every 30 min.
- SBE37-SI (unpumped, poisoned cell)
  - Conductivity: ± 0.0003 S/m
  - Temperature: ± 0.002°C
- Air pressure (optional): ± 0.5 hPa
- Endurance: ~ 1-2 yrs
Seasonal Variability

Mean drifter currents show large seasonal differences in the SPURS-2 region, with both the SEC and NECC intensifying in summer/fall.

Drifter velocities at 15-m depth binned at 1° x 1° for winter/spring and summer/fall seasons.
2016-18 Deployments

- Ongoing releases of typically 10-20 drifters – largely organized in clusters of five – have begun in June 2016 from the R/V Lady Amber, with two deployment cruises remaining.
Drifters mainly spread either south-eastward or north-westward.

Pronounced variability in both SSS and SST, with saltier and colder waters in the northwest during winter.
Verification of individual drifter salinities by inter-comparisons with nearby drifters shows overall good agreement.

Drifter comparisons with remotely-sensed SMAP SSS are generally within the satellite’s accuracy in the SPURS-2 region.
2017 Field Campaign

- Contributing to the R/V Roger Revelle drifter experiment in Oct./Nov. 2017 to measure the response of the near-surface fresh layer to the wind and the spread of patchy "rain puddles":
  - 2 SVP plus 2 SVP-S drifters
  - 5 CODE-type drifters, with a Valeport conductivity sensor
  - 1 Super ADOS drifter, with a 30-m thermistor chain
Drifter Experiment

- Targeted deployment of drifting assets in a rain cell under low-wind and slow-current conditions
- Different spreading of the CODE- (1 m) and SVP-type (15 m) drifters, with the Super ADOS following the SVPs
- Measurements of salinity and temperature clearly indicate a fresh and cold “rain puddle” at the surface
Super ADOS Observations

- High-resolution (10 min) measurements of upper-ocean temperature and salinity over about 23 hours
- “Rain puddle” reached depths of nearly 5 m and lasted for at least 3 hours
Continuing with regular SVP-S/SVP deployments from the R/V Lady Amber (two cruises left) to resolve the seasonal variability in the SPURS-2 region, and quantify the horizontal salt fluxes (as done in SPURS-1) and kinematic properties (e.g., divergence, vorticity) as well as examine details of observed fresh events (e.g., comparisons to rain)

Collaborative analysis of the 2017 drifter experiment to investigate the response of the near-surface fresh layer to the wind and the spread of patchy “rain puddles”

Centurioni, Hormann et al., 2015

Hormann et al., 2015