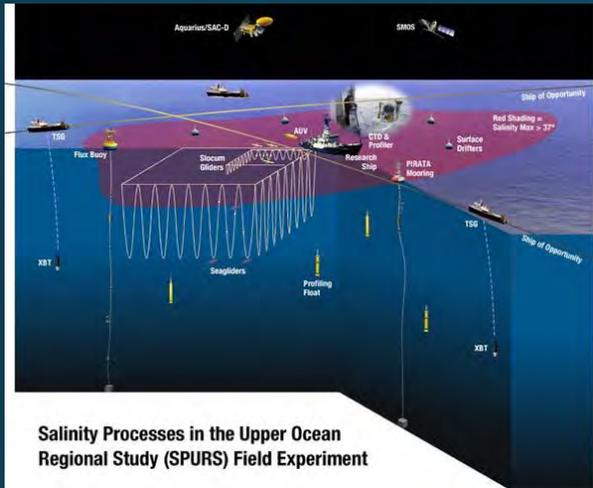




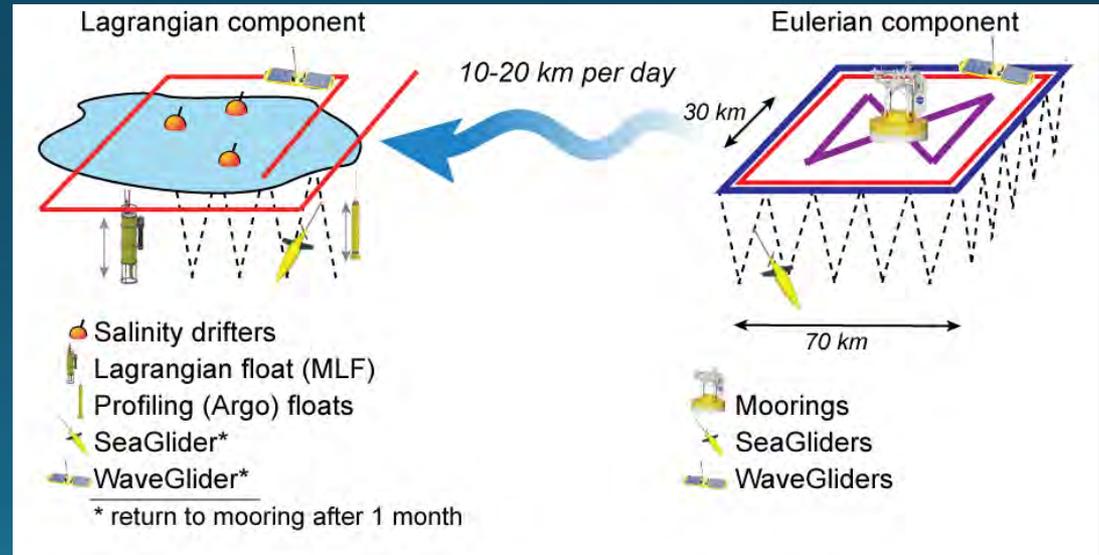
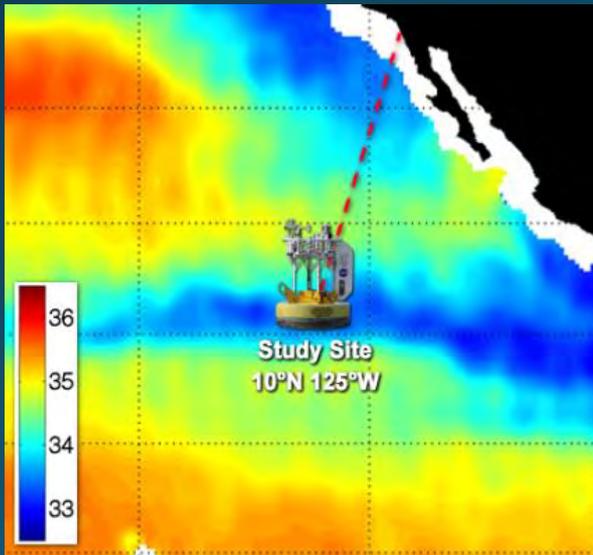
Studies of Near-Surface Salinity with Surface Lagrangian Drifters in support of SPURS-2

Verena Hormann & Luca Centurioni
w/ Nikolai Maximenko & Yi Chao
vhormann@ucsd.edu

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

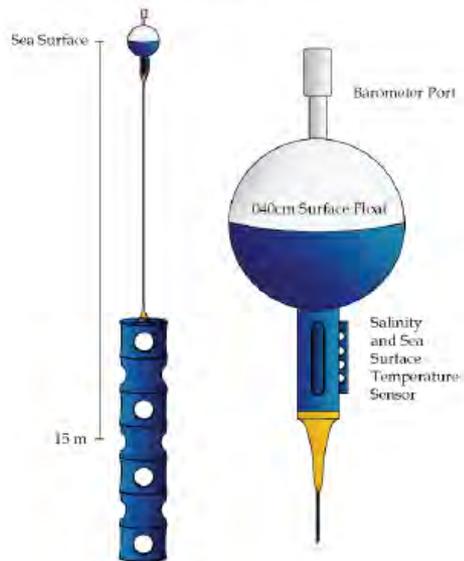
- “Where does the freshwater go?”
 - Investigating the effect of the large-scale circulation on the development and location of the salinity minimum, and the dispersion of patchy “puddles” of freshwater in the northeastern tropical Pacific

- “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

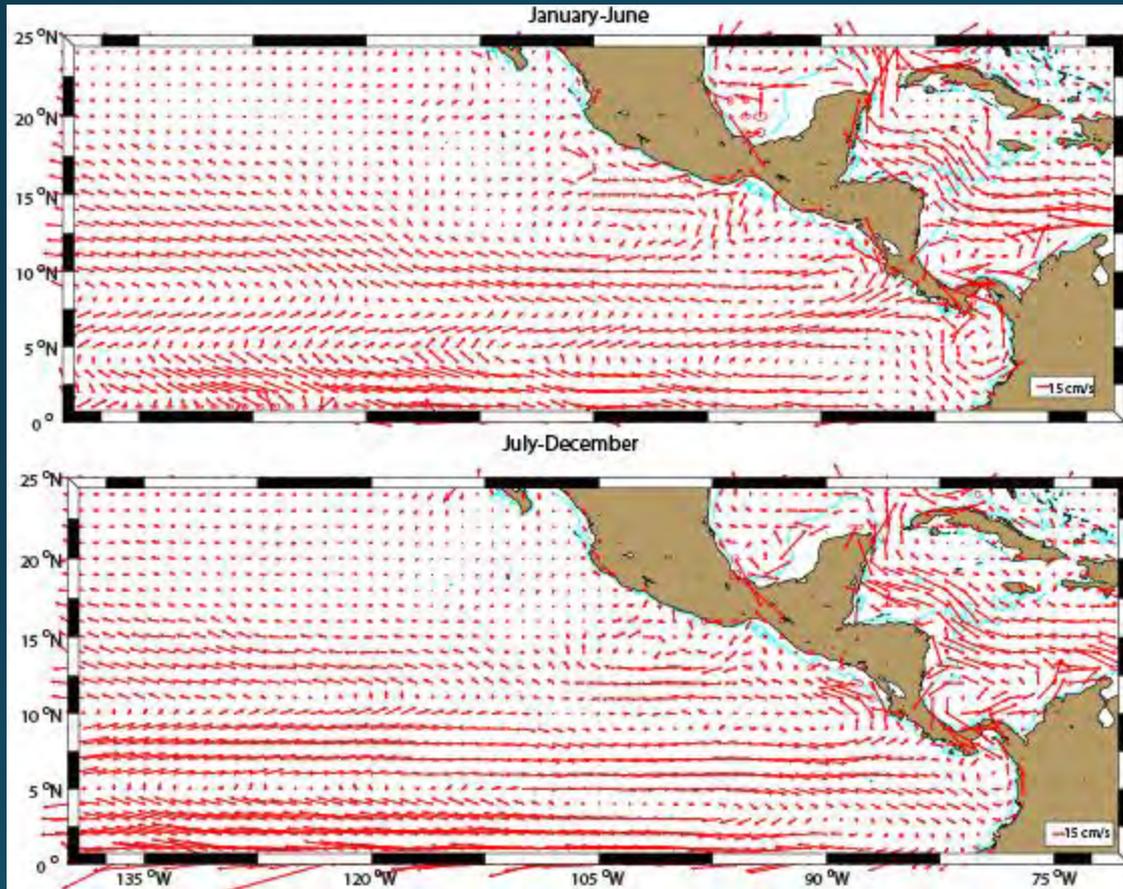


Salinity Drifter



- ❑ 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: $\pm 0.002^{\circ}\text{C}$
- ❑ Air pressure (optional): ± 0.5 hPa
- ❑ Endurance: ~ 1 -2 yrs

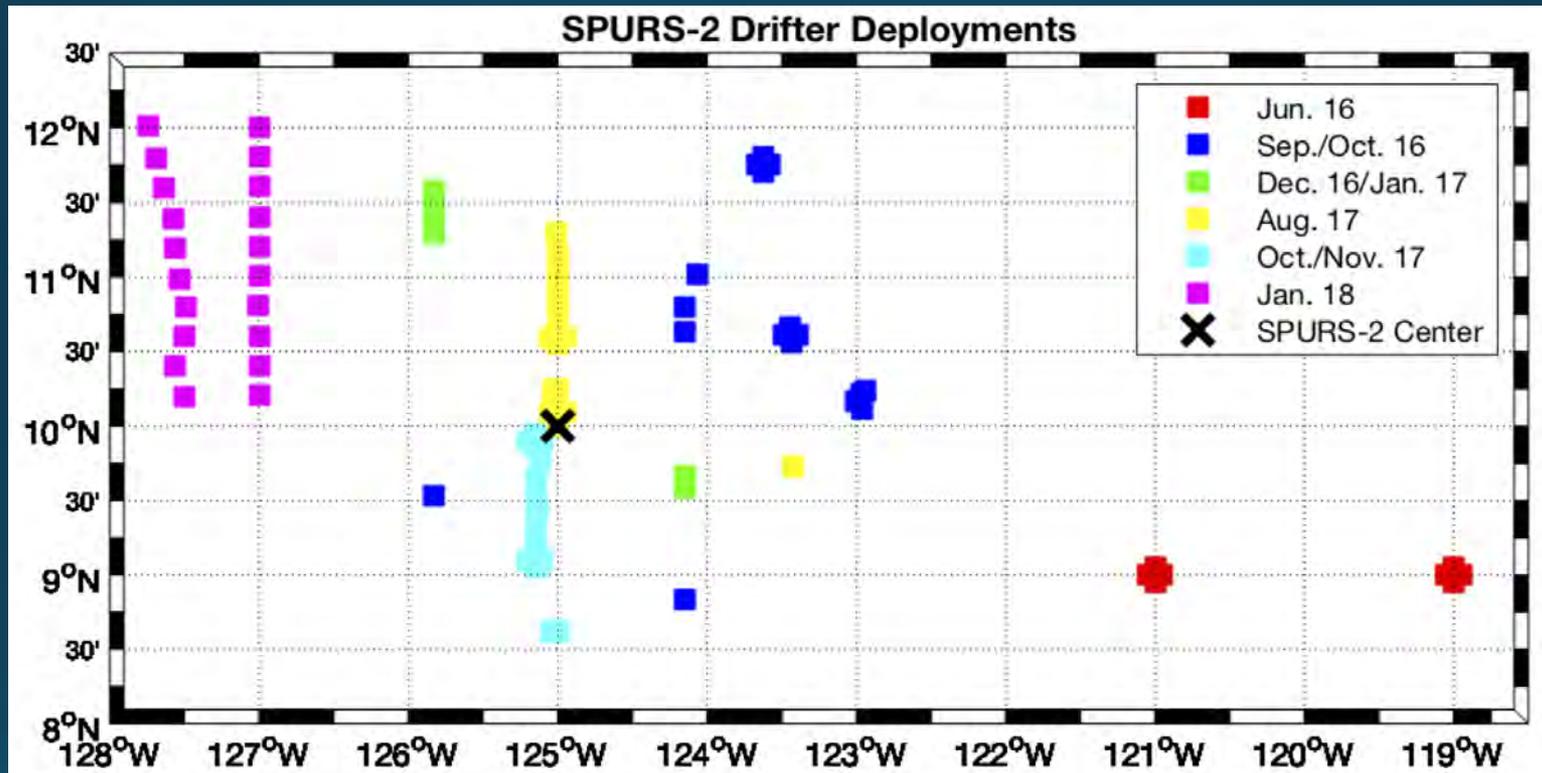
Seasonal Variability



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

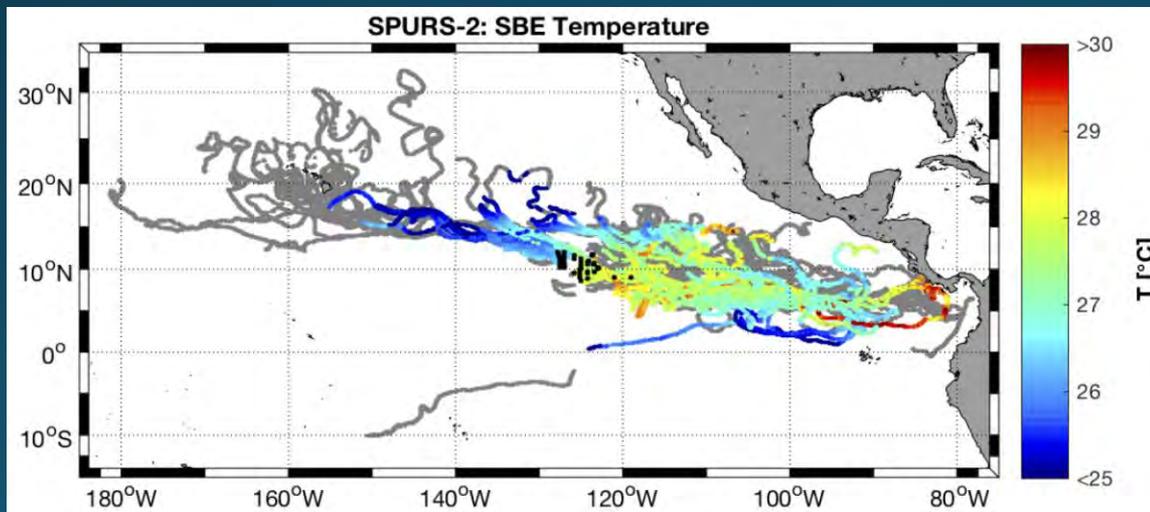
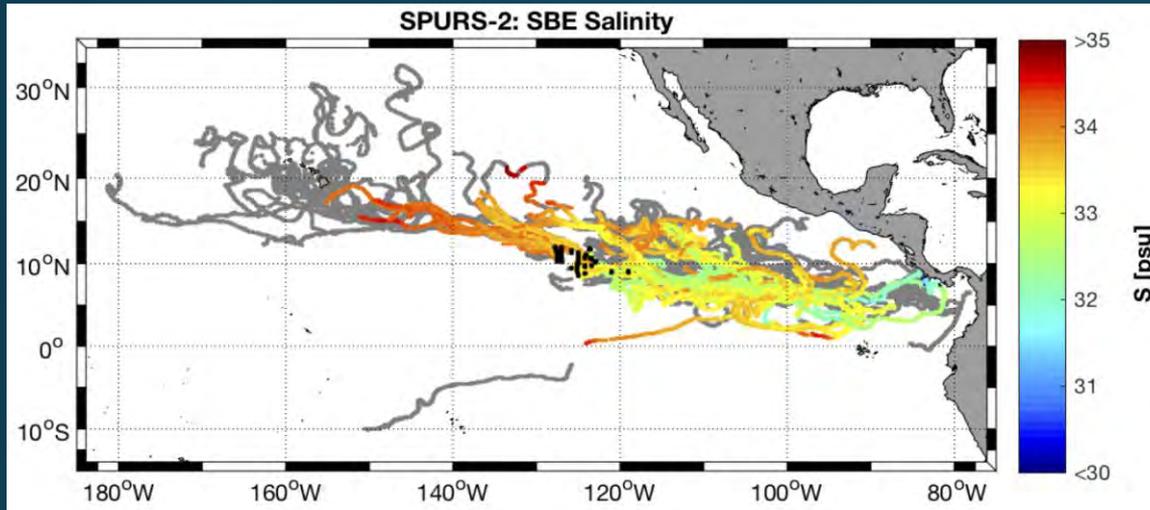
Drifter velocities at 15-m depth binned at $1^\circ \times 1^\circ$ for winter/spring and summer/fall seasons

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

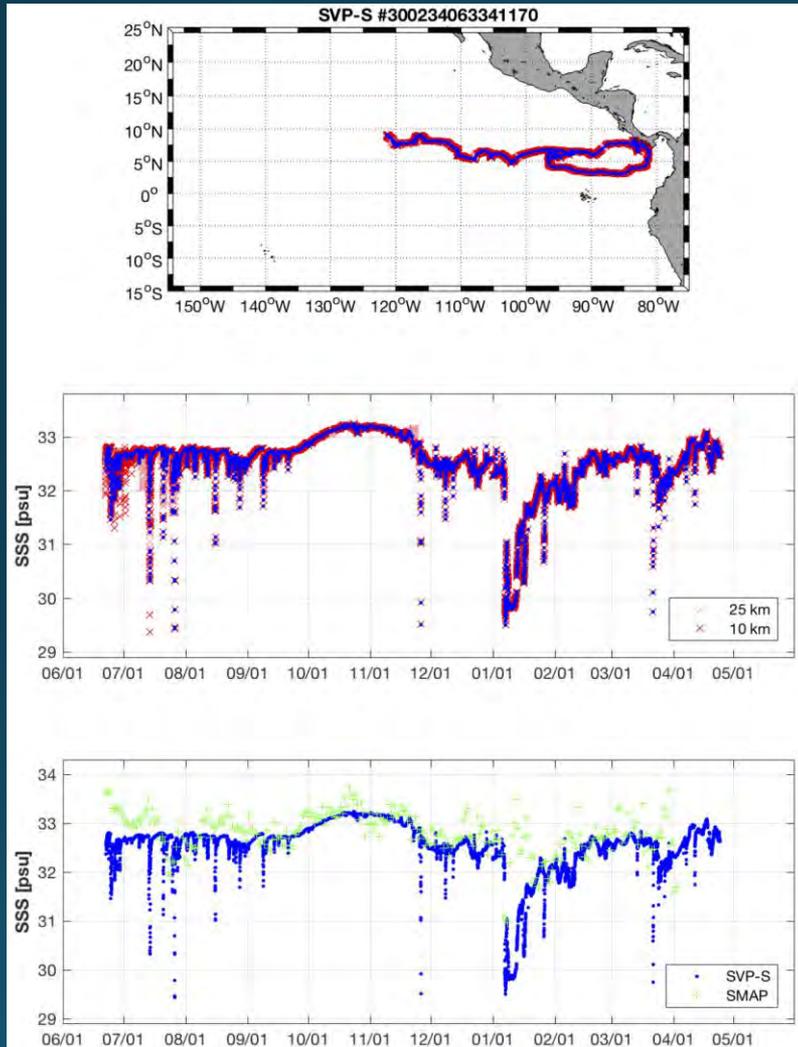
Spatiotemporal Variability



□ Drifters mainly spread either south-eastward or north-westward

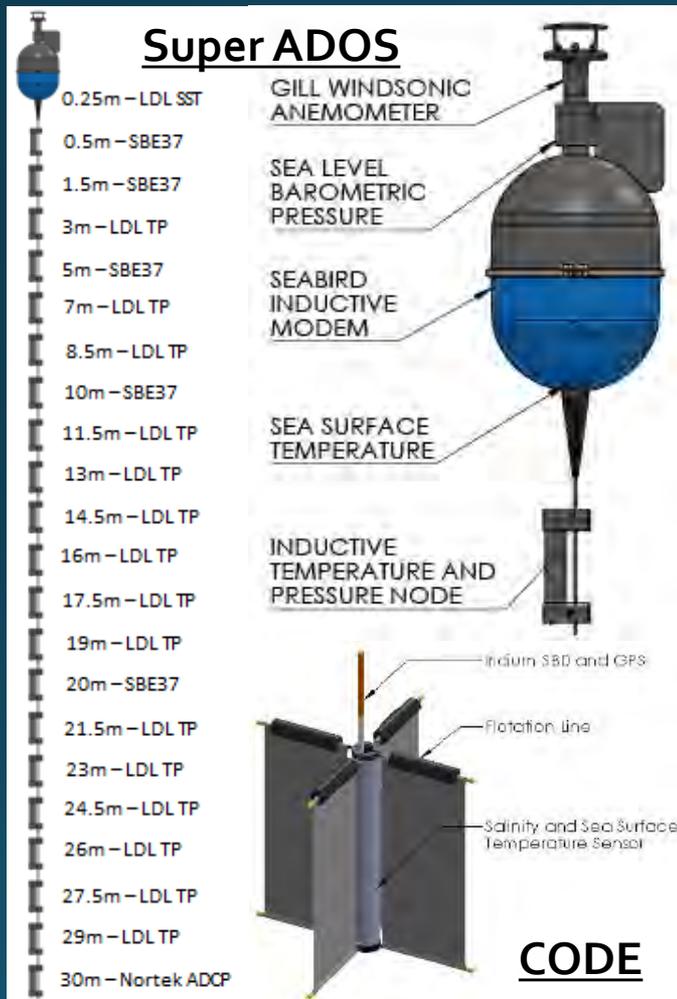
□ Pronounced variability in both SSS and SST, with saltier and colder waters in the northwest during winter

Salinity Validation



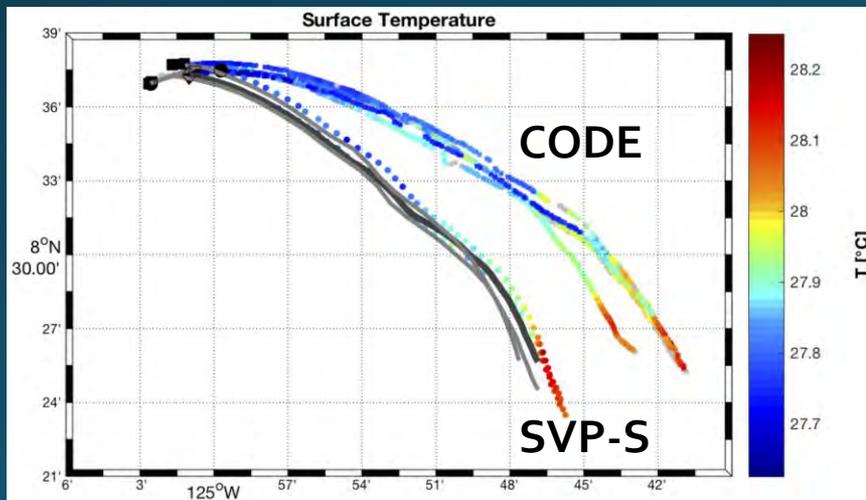
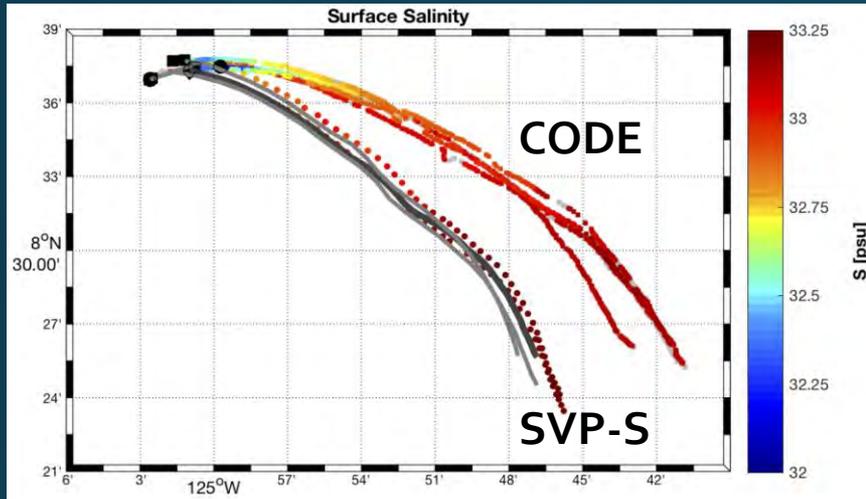
- Verification of individual drifter salinities by inter-comparisons with nearby drifters shows overall good agreement
- Drifter comparisons with remotely-sensed SMAP SSS are generally within the satellite's accuracy in the SPURS-2 region

2017 Field Campaign



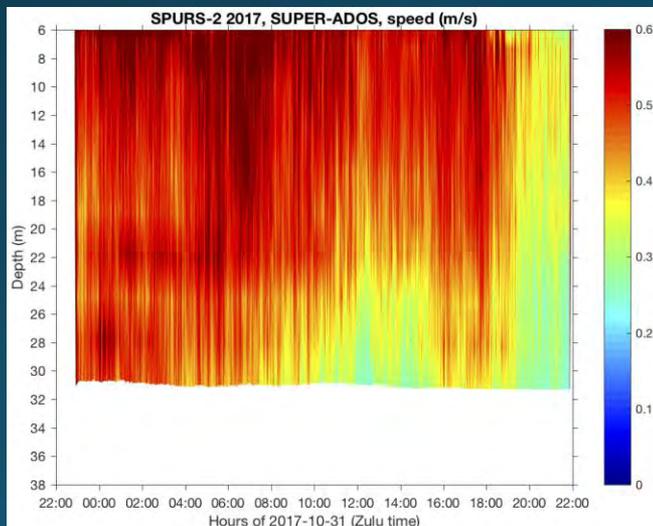
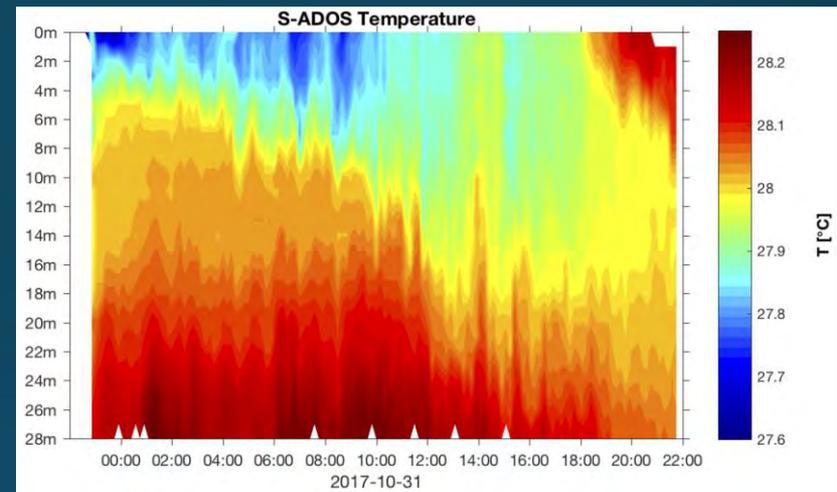
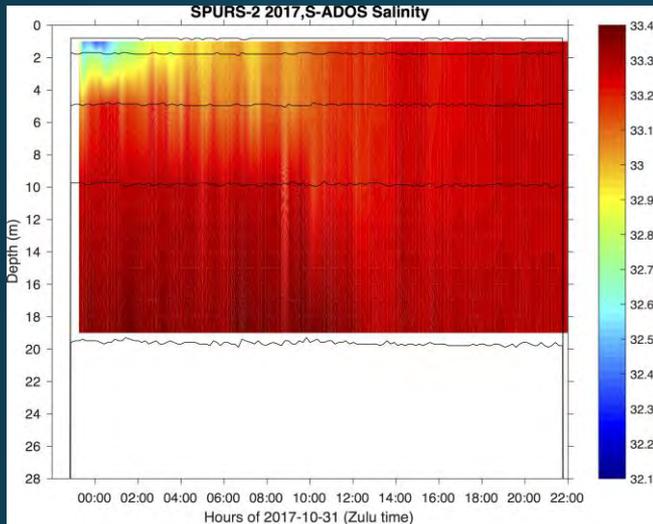
- Contributing to the R/V Roger Revelle drifter experiment in Oct./Nov. 2017 to measure the response of the near-surface fresh layer to the wind and the spread of patchy “rain puddles”:
 - 2 SVP plus 2 SVP-S drifters
 - 5 CODE-type drifters, with a Valeport conductivity sensor
 - 1 Super ADOS drifter,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

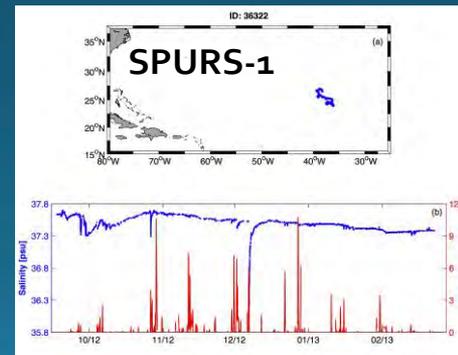
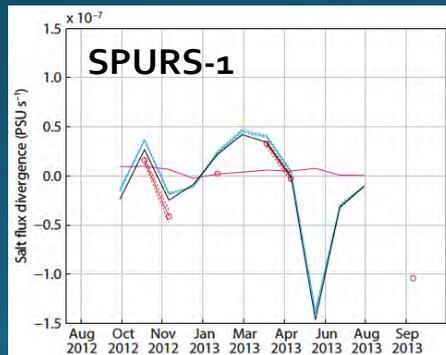


- High-resolution (10 min) measurements of upper-ocean temperature and salinity over about 23 hours
- “Rain puddle” reached depths of nearly 5 m and lasted for at least 3 hours

Summary

- 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*

