SPURS-2 observations & analysis: Near-surface salinity and mixing from the SSP, USPS, and CFT

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Science focus

• Near-surface salinity structure due to rain
  • Strength and persistence of fresh layers
  • Vertical salinity gradients
  • Horizontal variability as a function of depth

• Near-surface mixing
  • Relationship of turbulence to surface forcing and ocean conditions
  • How mixing affects the fate of fresh layers

• Ultimately...
  • How fresh layers evolve to produce the observed SSS structure
  • Implications of rain for satellite SSS
  • Improving model parameterizations of rainfall impacts on the ocean
  • Improving empirical models of rain impacts on satellite data (e.g., RIM)
Surface Salinity Profiler (SSP)

- 20 deployments in 2016, 16 in 2017
- Temperature and salinity from the surface to 1 m
- Turbulence estimates from microstructure and ADCP + ADV (2017)

→ Examine the formation and evolution of fresh lenses in terms of salinity and mixing
→ Link forcing and ocean conditions to fresh layer properties
Controlled Flux Technique (CFT)

- Infrared imagery with laser pulsing during all SSP deployments
- Provides estimate of dissipation rate at the surface

→ Link surface turbulence to rain, wind, waves
Underway Salinity Profiling System (USPS)

• Continuous temperature and salinity at 2 and 3 m depth (in addition to ship’s 5-m TSG)

→ Statistics on vertical salinity gradients from rain
→ Vertical structure of horizontal variability
1-d modeling

• Use generalized ocean turbulence model (GOTM) to explore 1-d evolution of fresh layers

• Use SSP observations to assess/improve parameterizations of rain
Lady Amber Profiling System (LAPS)

- CTDs at 1 and 2m on the Lady Amber + surface snake + met data
- > 24 hours joint sampling with Revelle during 2017 cruise
  - Validate sailboat sampling
  - Characterize horizontal salinity variability
- Numerous rain events encountered during LA cruises between San Diego/Honolulu/La Paz
  - Statistics on vertical salinity gradients from rain, vertical structure of horizontal salinity variability
Analysis activities

We are working to understand the impacts of small-scale forcing (rain, wind, wave) on the structure and evolution of the upper 5 m of the ocean.

• Linking properties and evolution of fresh layers to forcing and ocean structure using SSP, USPS, Lady Amber data (Drushka, Asher, Thompson)

• Estimating dissipation rate from CFT data (Asher)

• Dissipation rate from microstructure/ADCP, model parameterization of rainfall (Iyer)

• 1-d modeling and using SPURS-2 data to improve RIM (Drushka, Asher)

• Horizontal salinity variability as a function of depth from USPS and Lady Amber (Asher, Drushka)