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

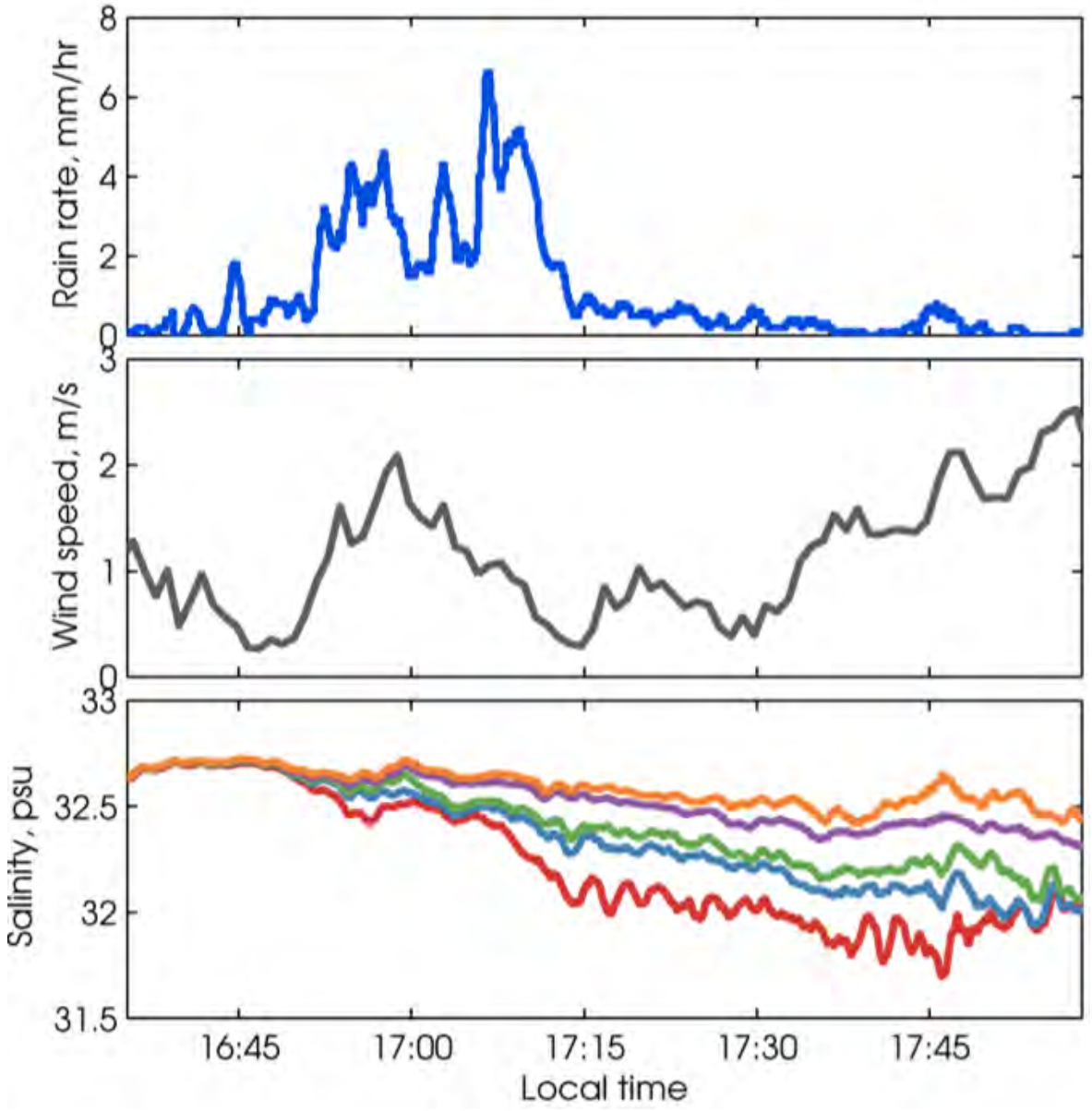
- Ultimately…
  - How fresh layers evolve to produce the observed SSS structure
  - Implications of rain for satellite SSS
  - Improving model parameterizations of rainfall impacts on the ocean
  - Improving empirical models of rain impacts on satellite data (e.g., RIM)

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

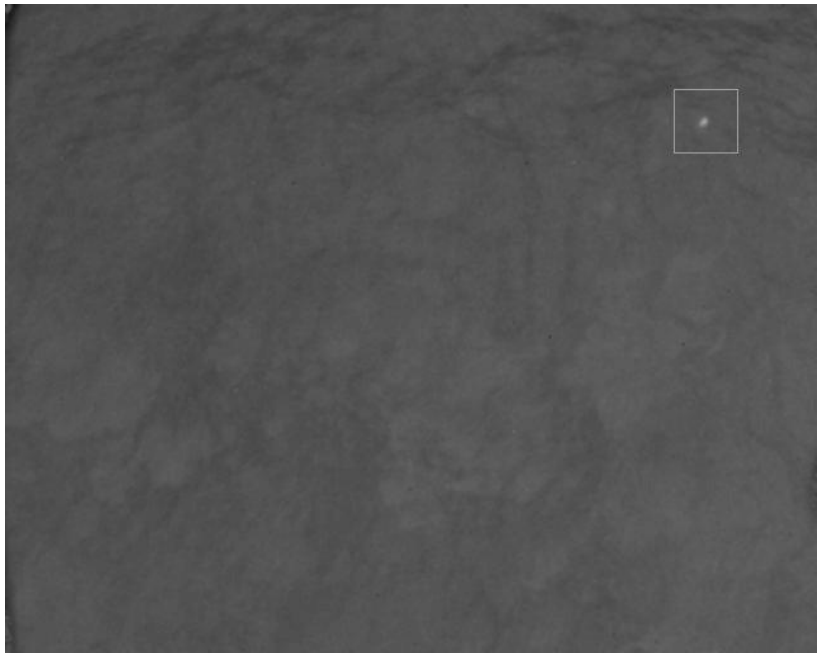
→ Link forcing and ocean conditions to fresh layer properties

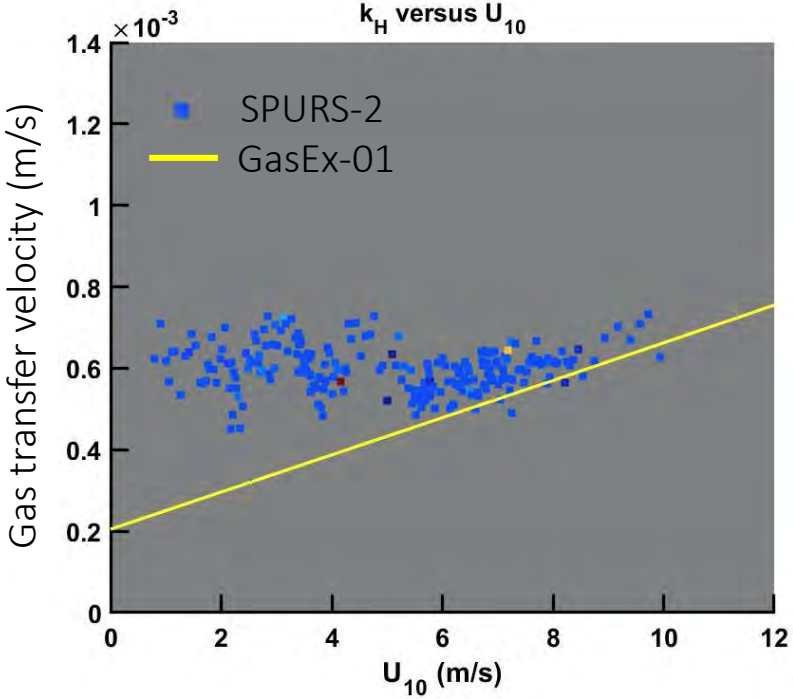


Controlled Flux Technique (CFT)

- 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)

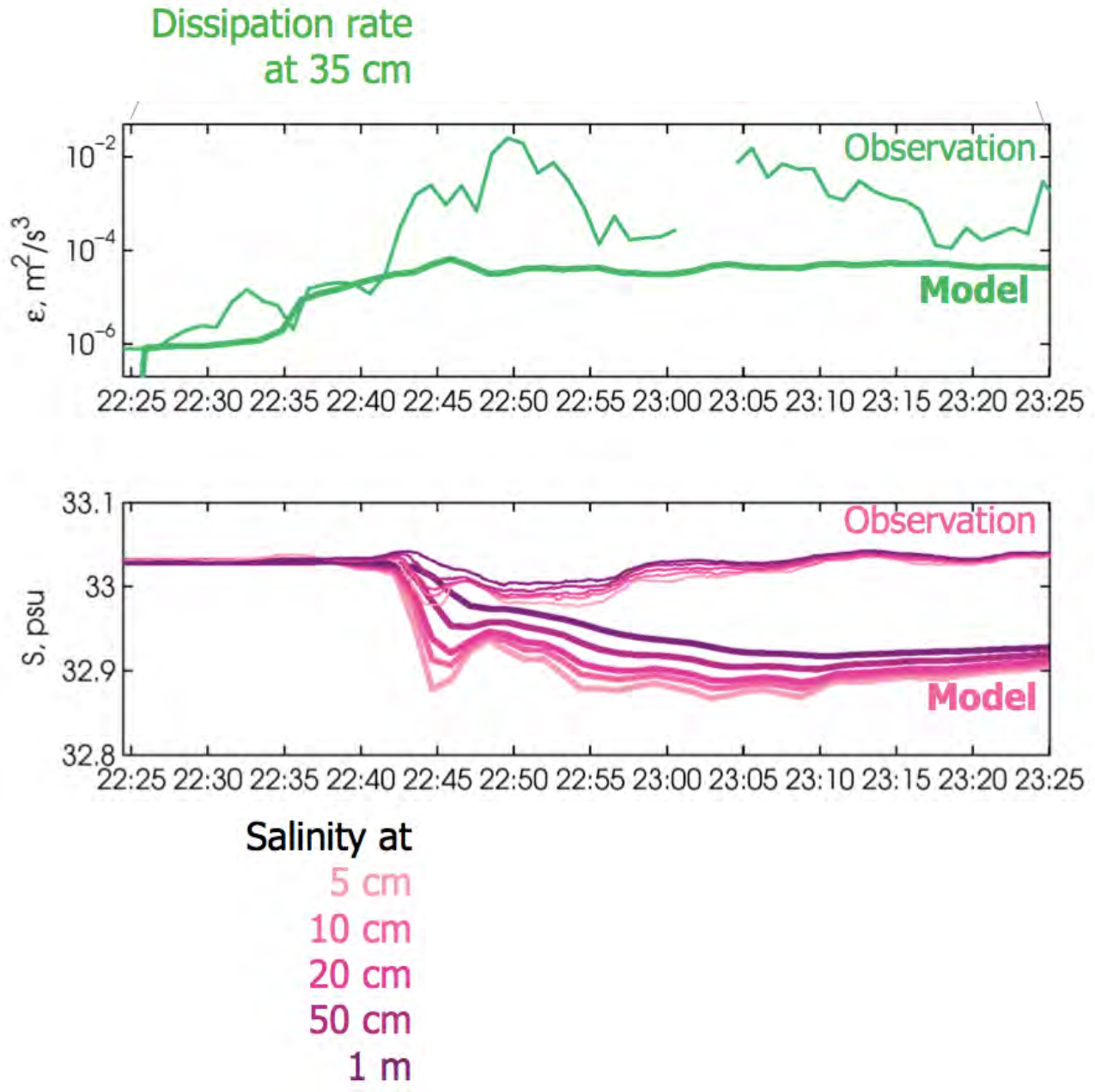
- Continuous temperature and salinity at 2 and 3 m depth (in addition to ship's 5-m TSG)

→ 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

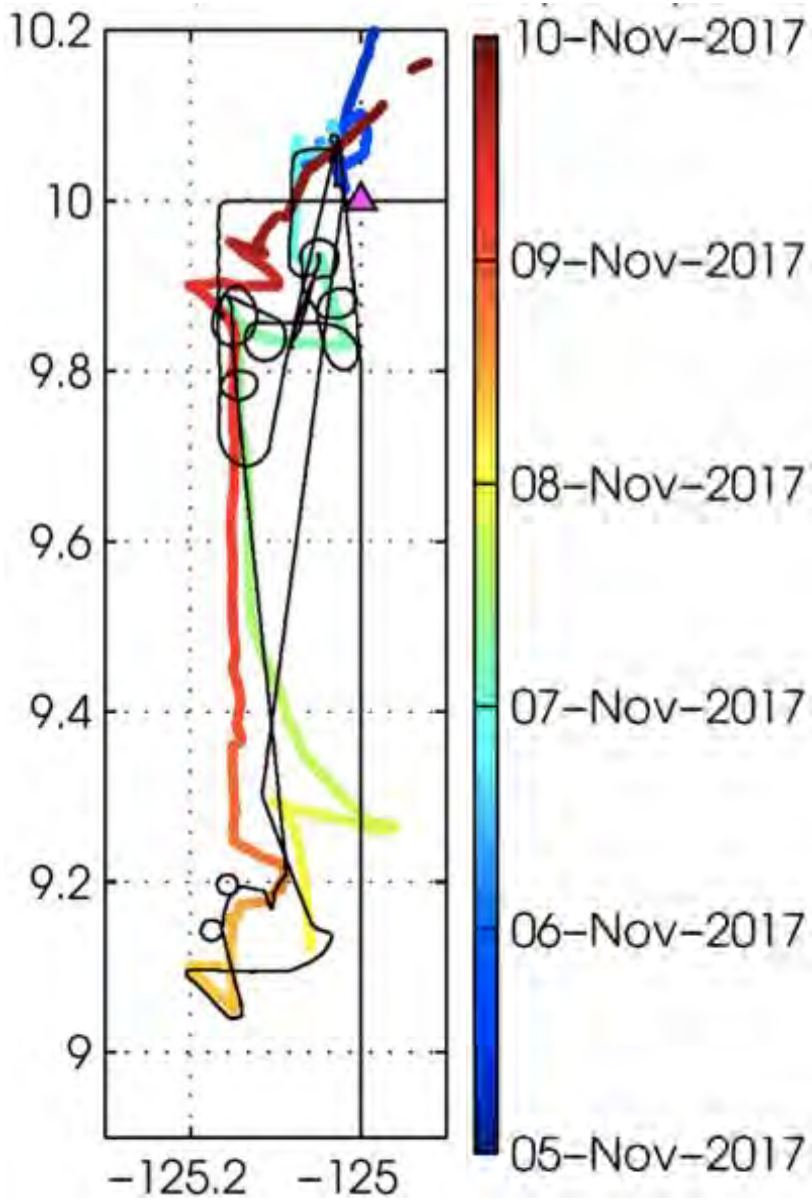


Lady Amber Profiling System (LAPS)

- 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

Lady Amber (colored by date) and Revelle track (black)



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)