Recommendations from the Air-Sea Transition Zone Study Group

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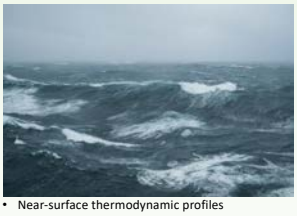
The ASTZ

Marine atmospheric boundary layer (MABL)

- Turbulence and mixing in the MABL
- Temperature, humidity, wind profiles
- Convection, clouds, and precipitation

Wave-influenced atmospheric surface layer



- Near-surface thermodynamic profiles
- Sea spray

Air-sea interface

- SST, SSS, SSH, currents, wave spectra
- Direct covariance fluxes

Wave-influenced ocean surface layer

- Near-surface temperature, salinity, and currents
- Bubbles and white caps
- Freshwater lens production by precipitation and river outflow

Ocean mixed layer

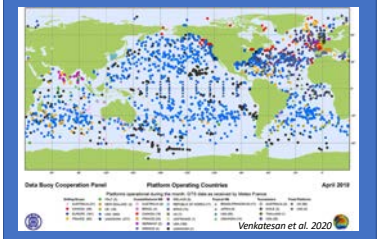
- Kinematic and thermodynamic profiles at ~1m resolution
- Shear, buoyancy, and turbulent mixing profiles

ASTZ Sampling Strategies

Integrated sampling at Supersites

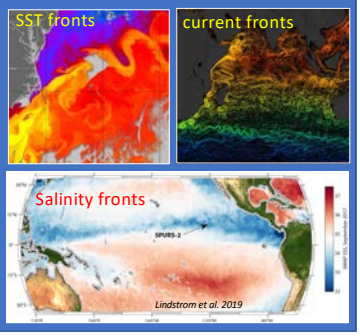
- Sustained sampling at highly instrumented sites
- Sites located at key locations to sample multiple regimes
- Needed for process understanding, data assimilation development, model validation

Global sampling of surface variables

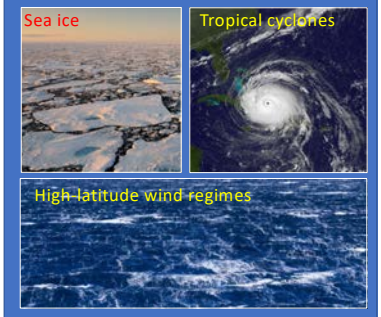


- Need all variables to compute bulk surface fluxes
- Some, but not all, are currently measured by drifters, and moorings
- Needed to validate satellite retrievals, models

Sampling across ocean fronts



Sampling extremes



Technology Needs to Implement Observing Strategies

- Stable, powered platforms for extended unattended sampling
- Reductions in instrument weight, footprint, power needs, and costs
- Increases in instrument durability, battery life
- Reliable deployment and charging of unpiloted platforms from hub platforms

Meeting the Charge: A New Paradigm for Observing and Thinking about the ASTZ

- Design, develop, and deploy observing systems appropriate for harnessing coupled Earth system predictability
  - Process studies to test sensor and platform technology
  - Transfer tested technologies to robust, unattended, inexpensive, observing strategies (above)
- Collect observations to improve Earth system predictability
  - Obtain error statistics required for coupled data assimilation
  - Verify and improve parameterization in models
- Encourage and adopt inclusive practices among scientists, forecasters, ASTZ experts and trainees, private industry, and persons of marginalized identities
  - Fund ocean-atmosphere research, rather than atmospheric or oceanic research
  - Support data sharing to engage diverse research efforts
  - Foster collaborations between academics, government labs, environmental prediction centers, and private industry

The Charge

Develop a well-defined strategy to advance observing and modeling capabilities and understanding of air-sea interaction at all scales required for harnessing Earth System Prediction

- Identify current capabilities and key gaps
- Assess the relative importance to ESP to resolve various space and time scales
- Build upon recent and potential future advances in sensor/platform technology
- Explore possibilities of using modern statistical and modeling tools and co-designing air-sea observing and data assimilation (DA) systems
- Liaise and coordinate with other relevant US and international activities
- Produce strategy document providing system recommendations

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