SPURS Splinter Session: Contributions from the AirSea Lab

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AirSea Lab

Outline

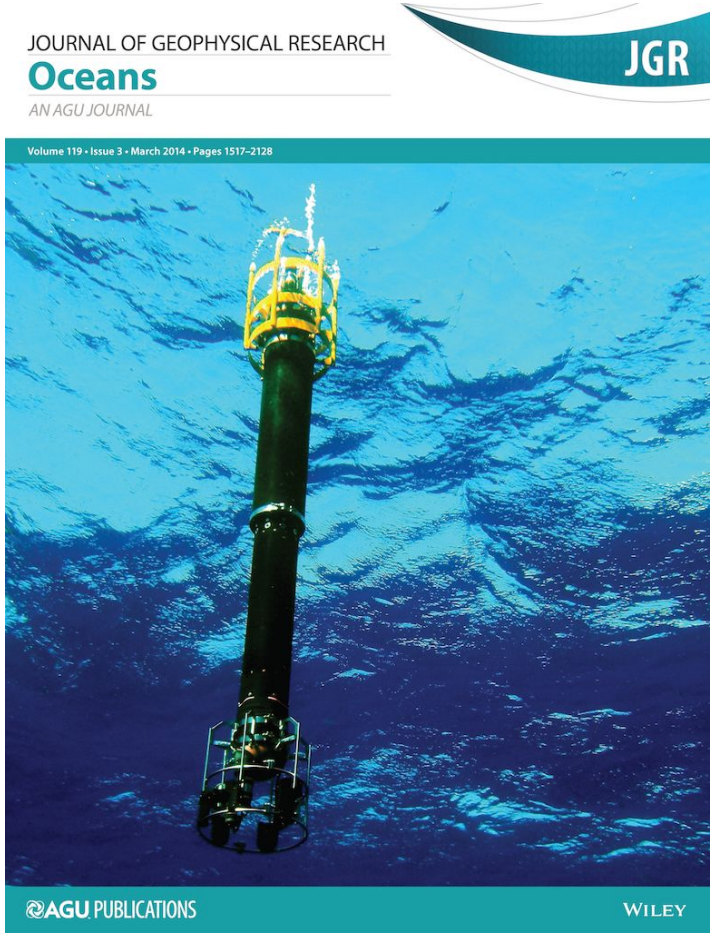
1. The Air-Sea Interaction Profiler (ASIP)
2. Air-sea flux investigations

Measuring upper ocean microstructure

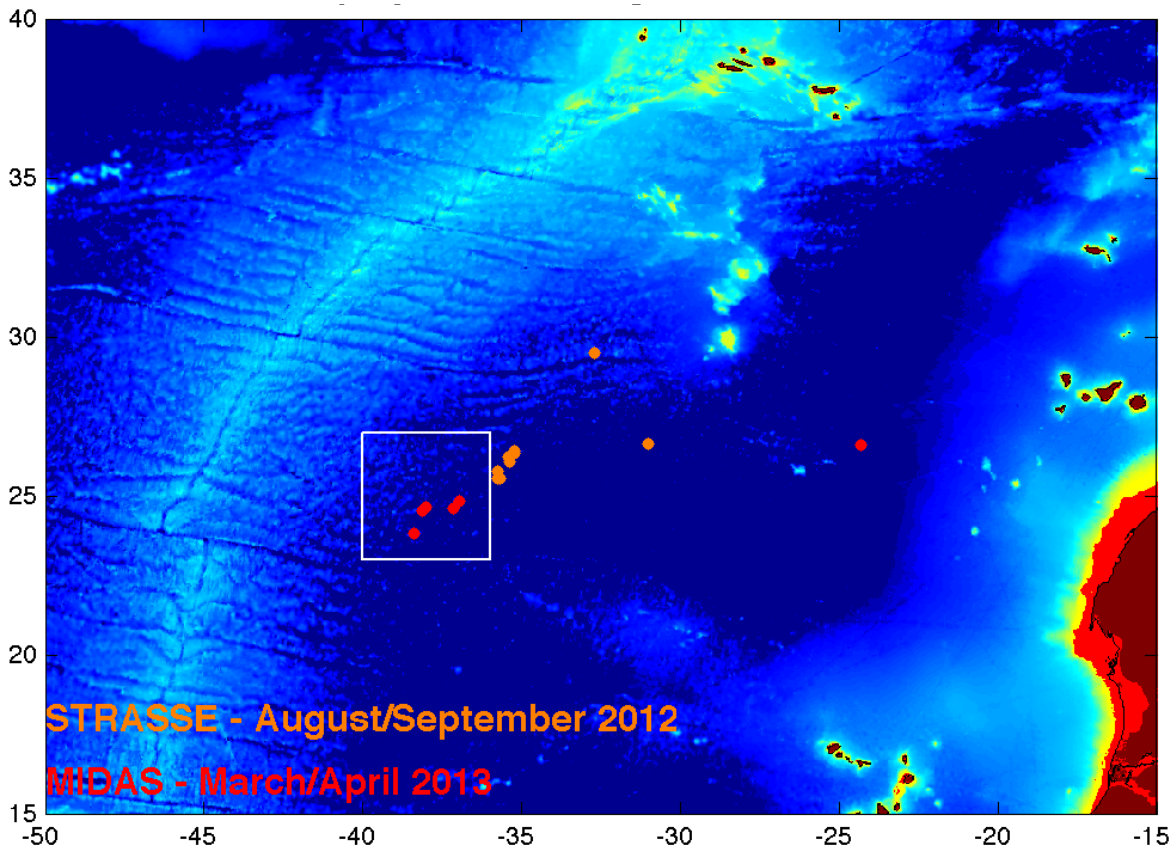
- Microstructure profilers are oceanographic tools for measuring turbulence in the ocean
- But most miss the upper 10 m
- This is the most crucial region for atmosphere-ocean exchanges
- We have developed the Air-Sea Interaction Profiler to capture the fundamental processes at the air-sea interface

The Air-Sea Interaction Profiler (ASIP)

- By profiling vertically towards the air-sea interface, ASIP provides detailed measurements of undisturbed water
- Positively-buoyant instrument submerged with a thruster
- Measurements made during ascent only
- Maximum operational depth: 100 m
- Equipped with instrument suite, including 2 shear probes
- Allow derivation of dissipation rate of TKE (ϵ)



ASIP′s involvement with SPURS



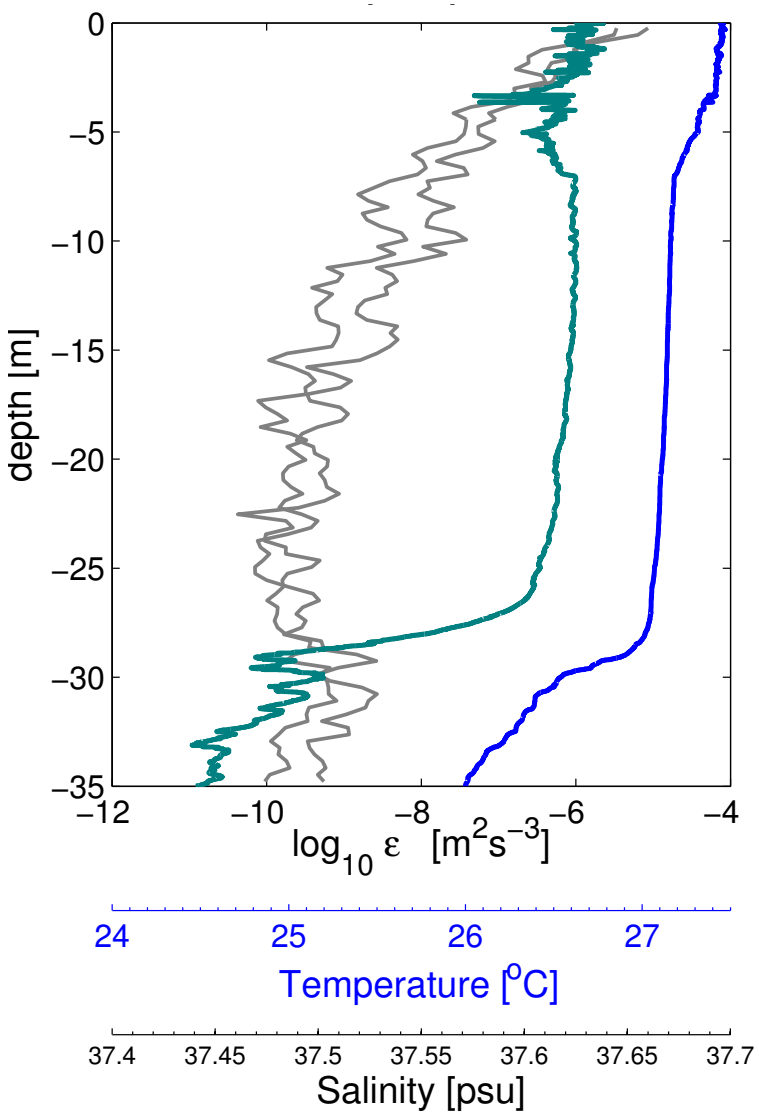
Two cruises to North Atlantic Salinity Maximum Region:

1. Strasse ($\sim$ 500 profiles)
2. Midas ($\sim$ 600 profiles)

Temperature, salinity and ϵ (Anneke ten Doeschate)

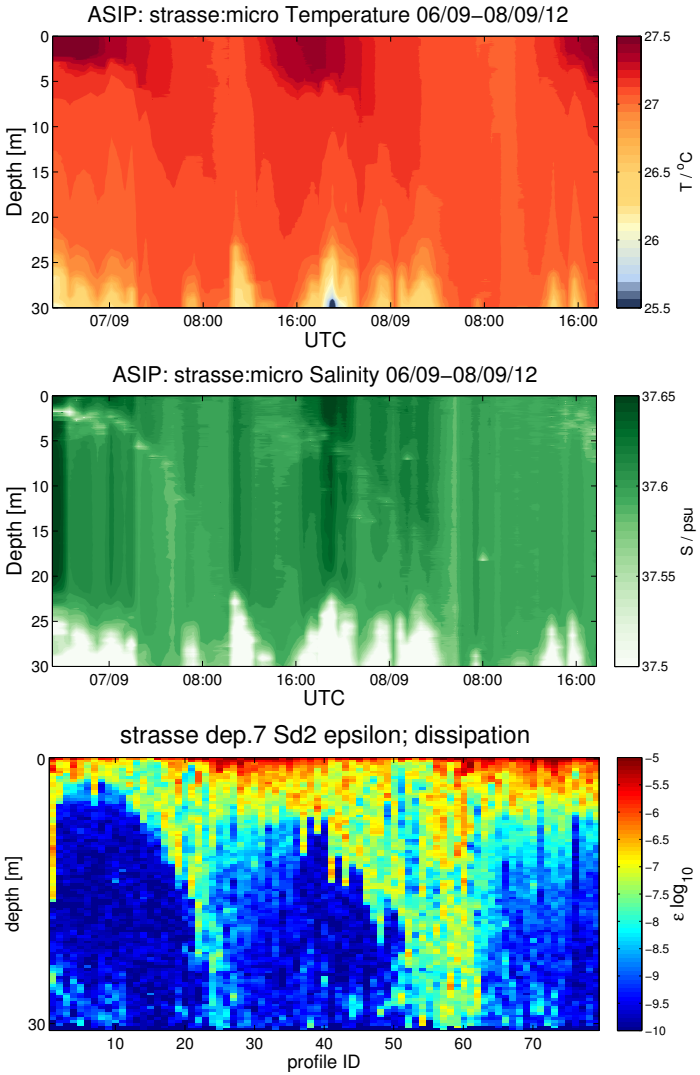
Sample data obtained from a single ASIP profile:

- Fast temperature
- Fast salinity
- Two estimates of dissipation rate of TKE (one from each shear probe)
- Data acquired right up to the air-sea interface

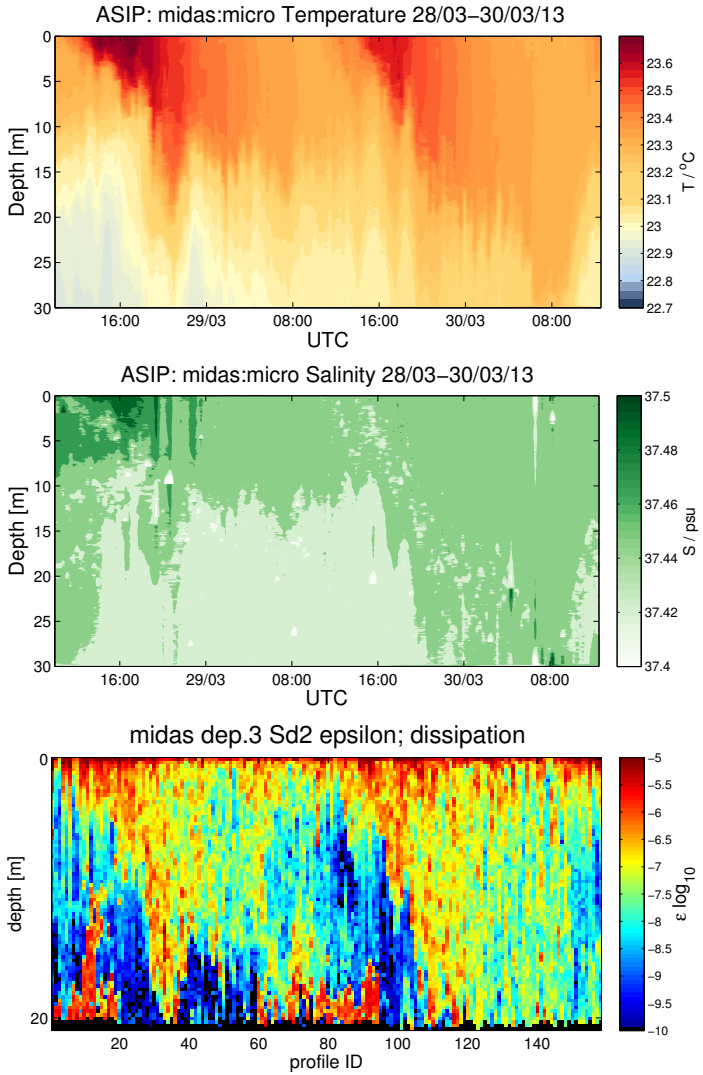


Temperature, salinity and ϵ (Anneke ten Doeschate)

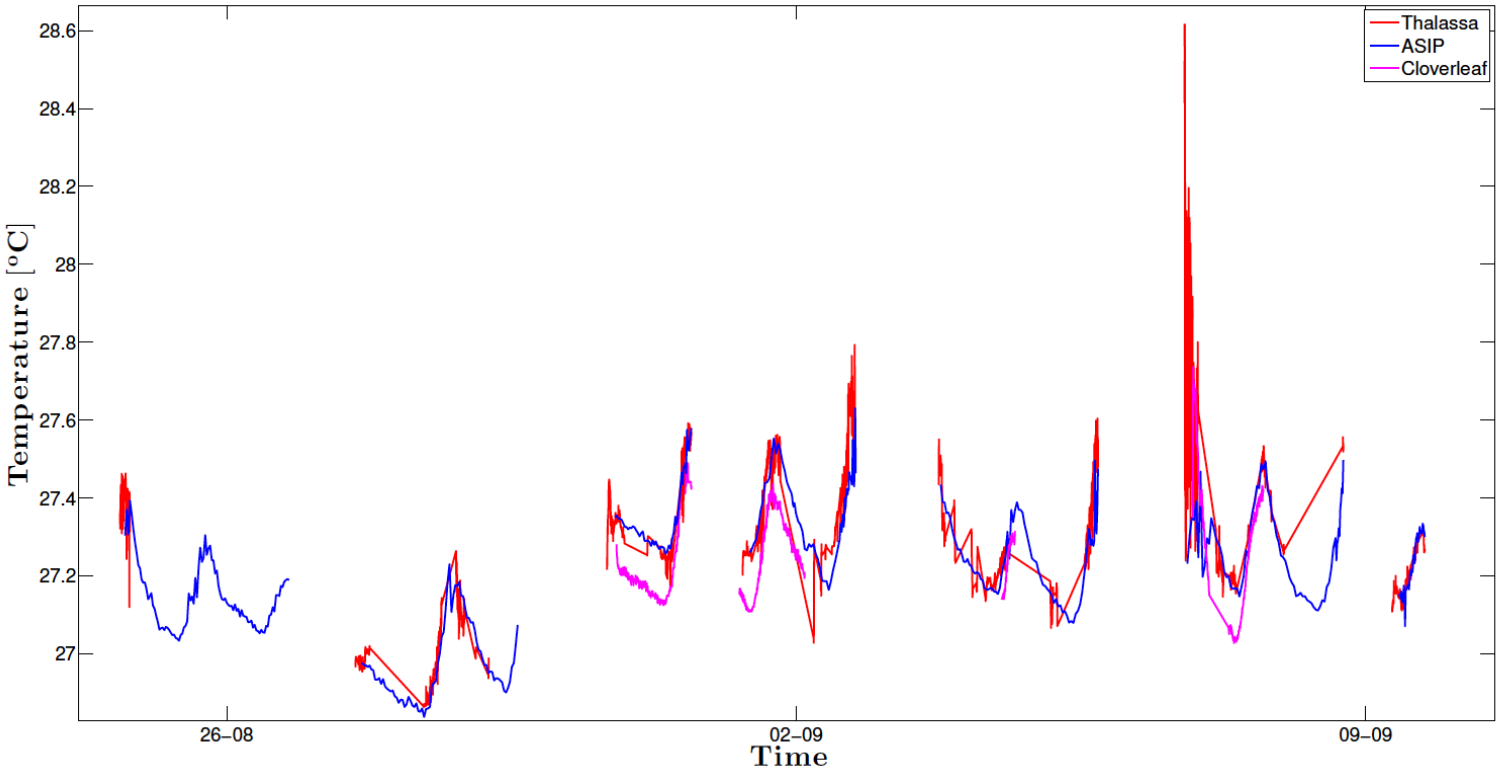
STRASSE deployment 7 (0-30m)



MIDAS deployment 3 (0-30m)

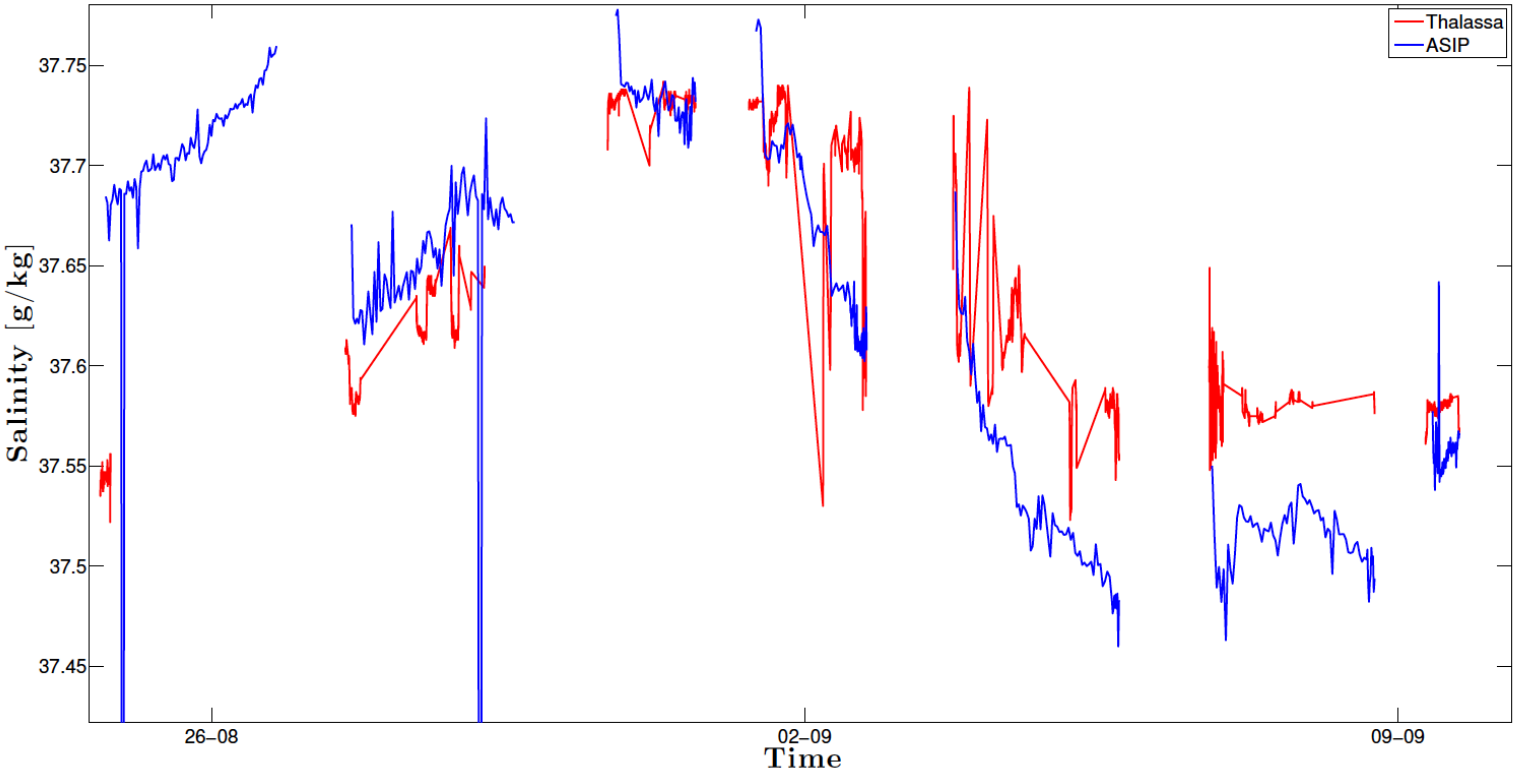


Strasse data comparison - Temperature (Kieran Walesby)



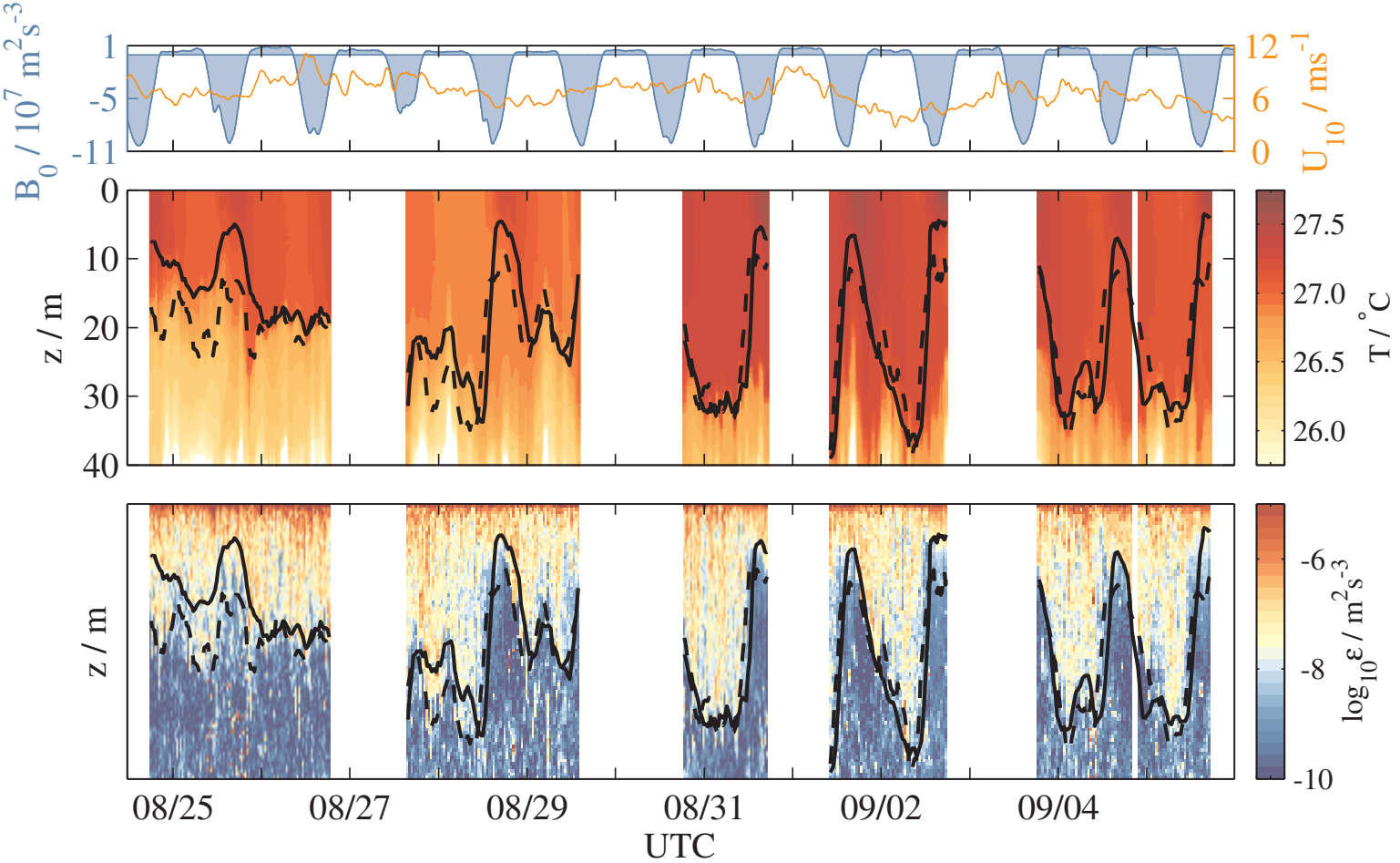
- Coarse comparison between sensors, as part of preliminary data checks
- Application of some spatial and temporal thresholds was required

Strasse data comparison - Salinity (Kieran Walesby)



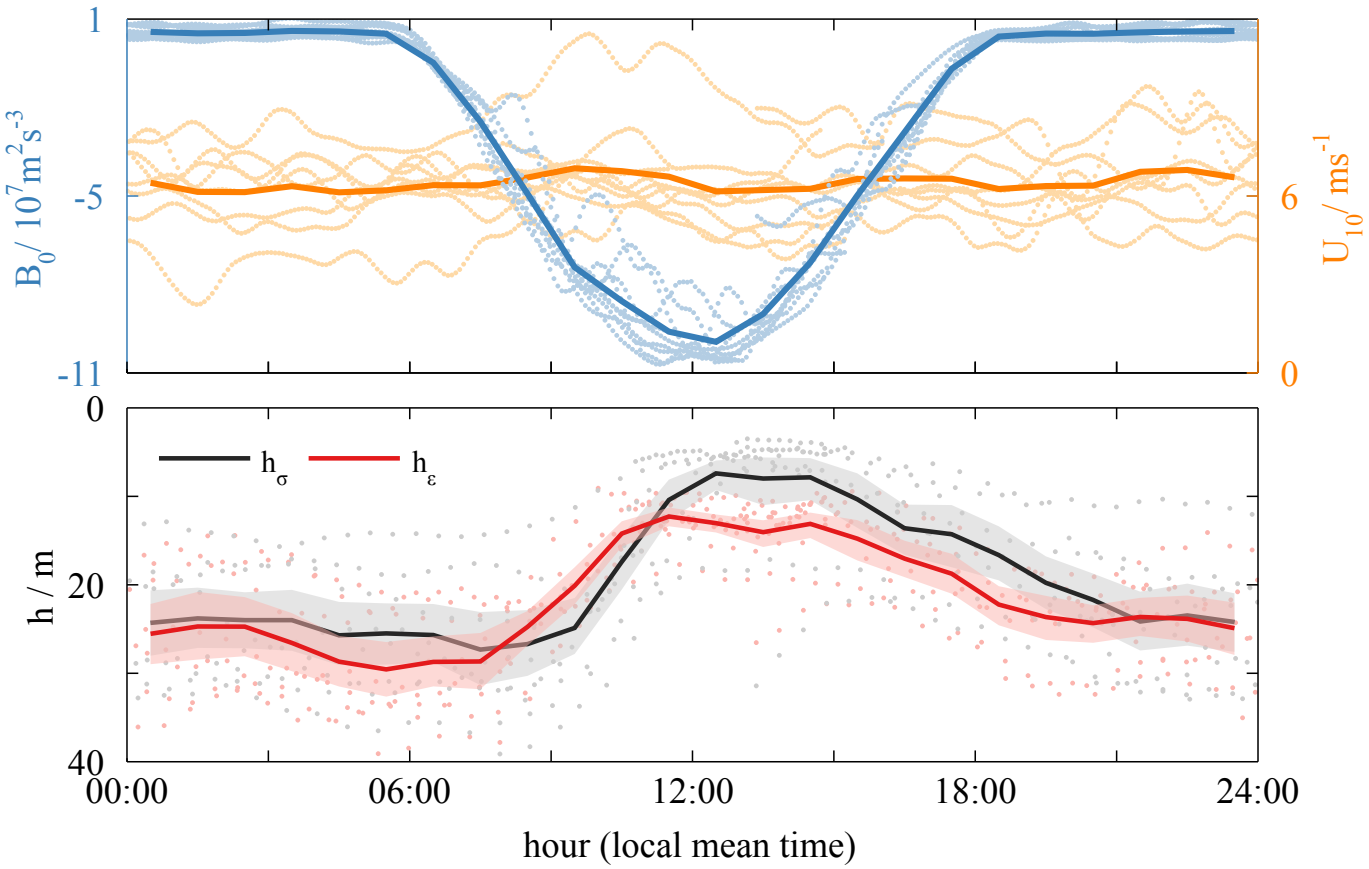
- Similarly for salinity...
- More challenging measurement to make
- No sign of any consistent offset

Strasse observations time series (Graig Sutherland)



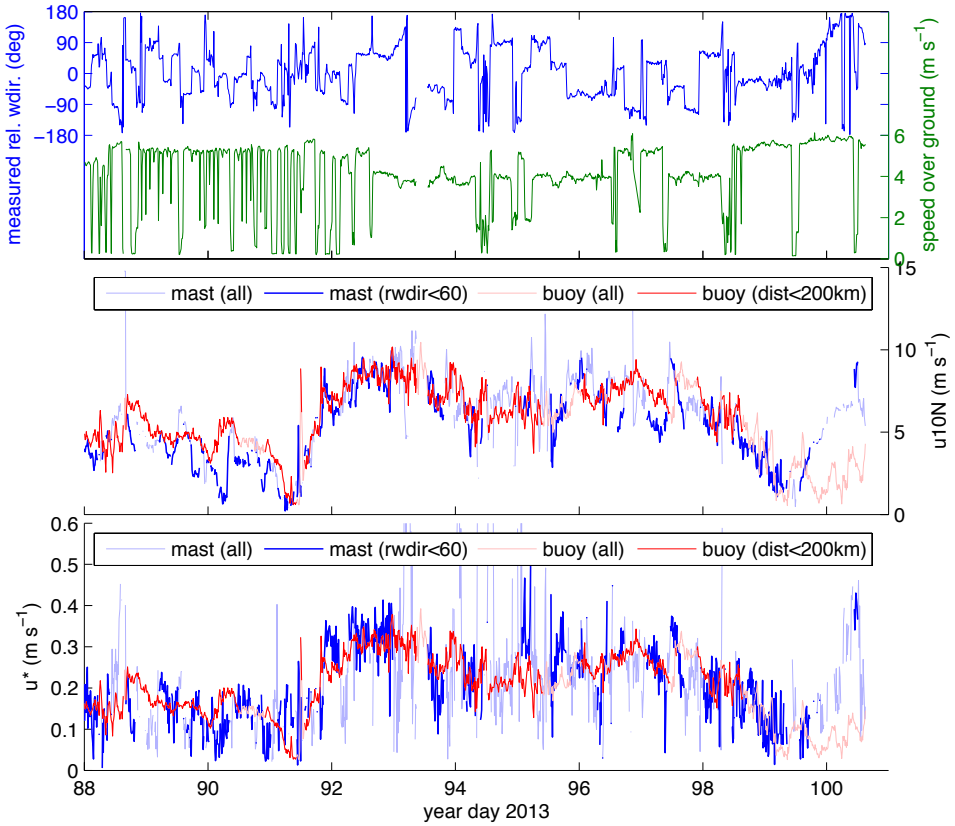
- Investigating differences between the already mixed layer depth and the active mixing layer depth
- Investigate whether difference can be related to dynamical forcing

Strasse composite day (Graig Sutherland)



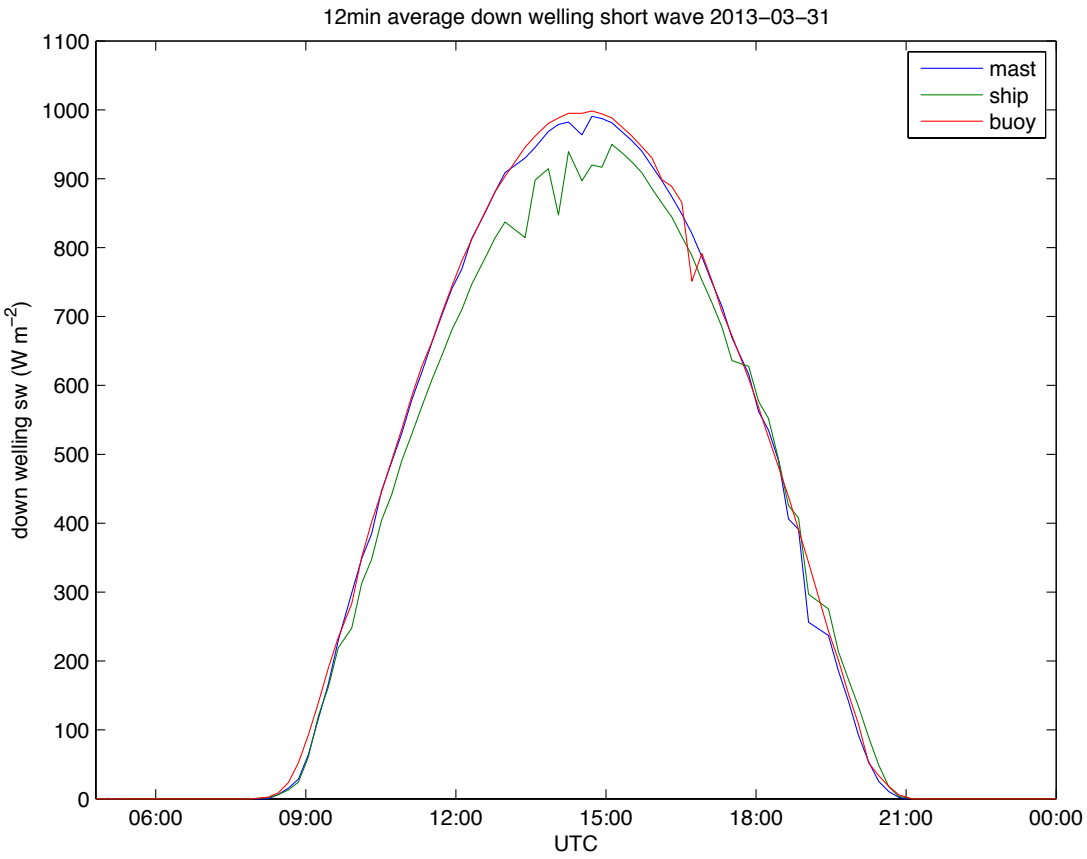
- Bin data from 5 ASIP deployments during Strasse to create a "composite diurnal cycle"
- Upper panel: buoyancy flux (blue), wind speed (orange)
- Lower panel: mixed (black) and mixing (red) layers

Air-sea fluxes (Sebastian Landwehr)



- Time series were filtered to highlight when:
  1. Relative wind direction was below 60°
  2. Ship-buoy spatial separation below 200 km
- Expect to be able to produce direct friction velocity measurements from ship data which are comparable with buoy measurements

Air-sea fluxes (Sebastian Landwehr)



- 31 March, 2013: clear-weather day
- Ship-board measurement of radiation seems to be a systematic underestimate
- Looking into possibility of developing a correction...

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