Wave Gliders in SPURS

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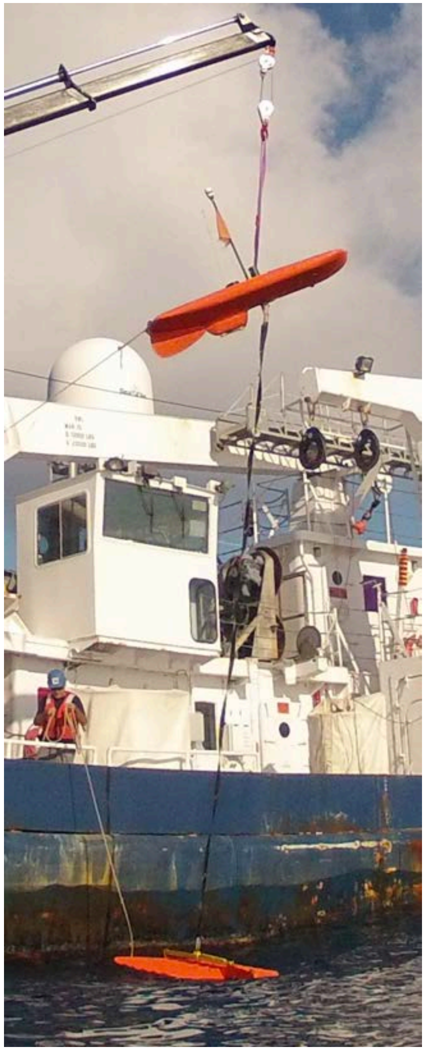
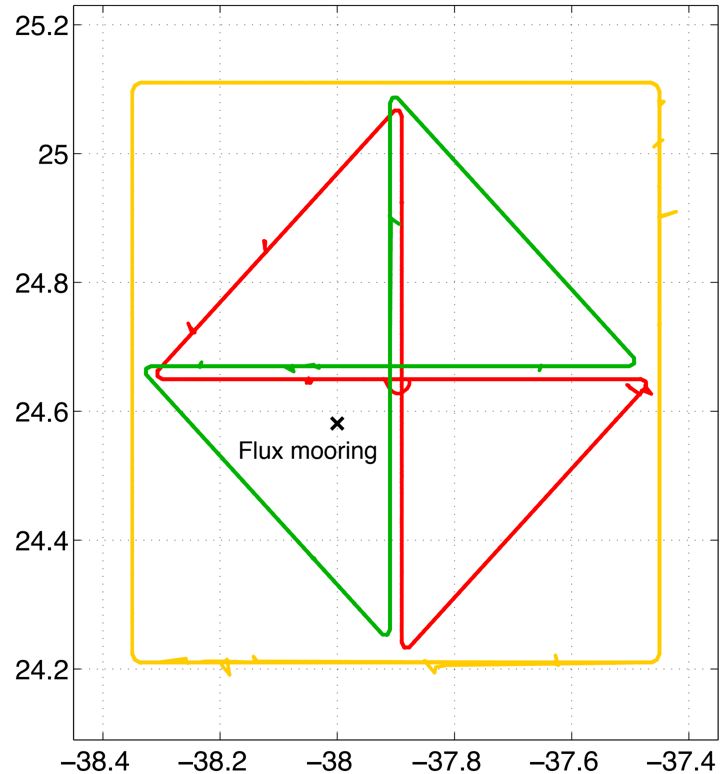
SPURS-1 Wave Glider operations





- 3 vehicles (SV-2 WG's)
  - "Red"
  - "Yellow"
  - "Green"
- 100-km square
- 1 year
- Sea-Bird GPCTDs
  - 30 cm/6.5 m
  - 1-2 minute sampling (~50-100 m)
  - >2M samples
- Wind (Airmar PB200)
- Surface current

	Red	Yellow	Green
Laps, Sep '12 – Mar '13	14	15	35
Laps Apr '13 – Sep '13	20	22	25

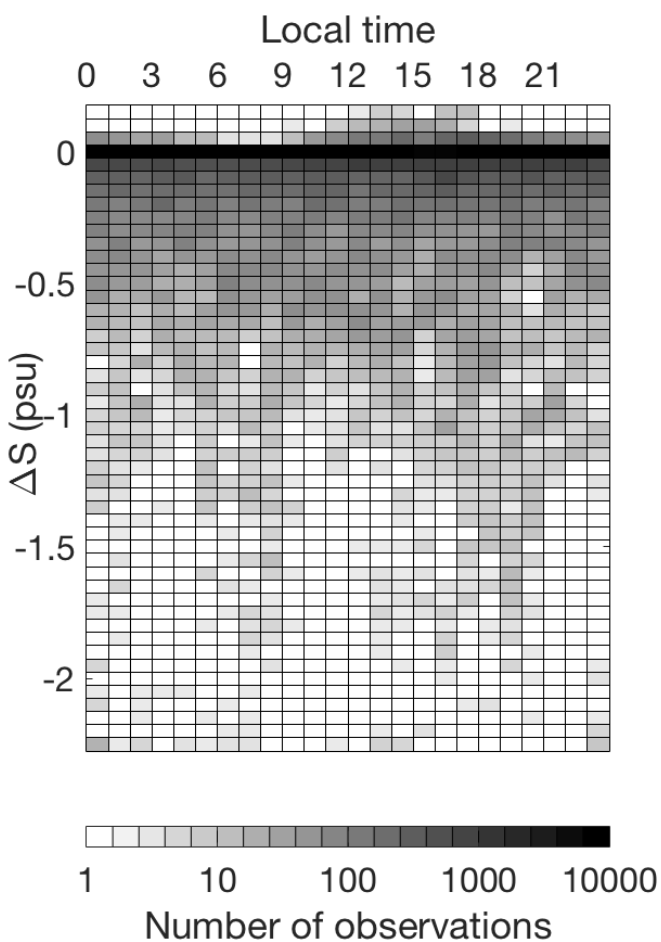
= 43,000 km

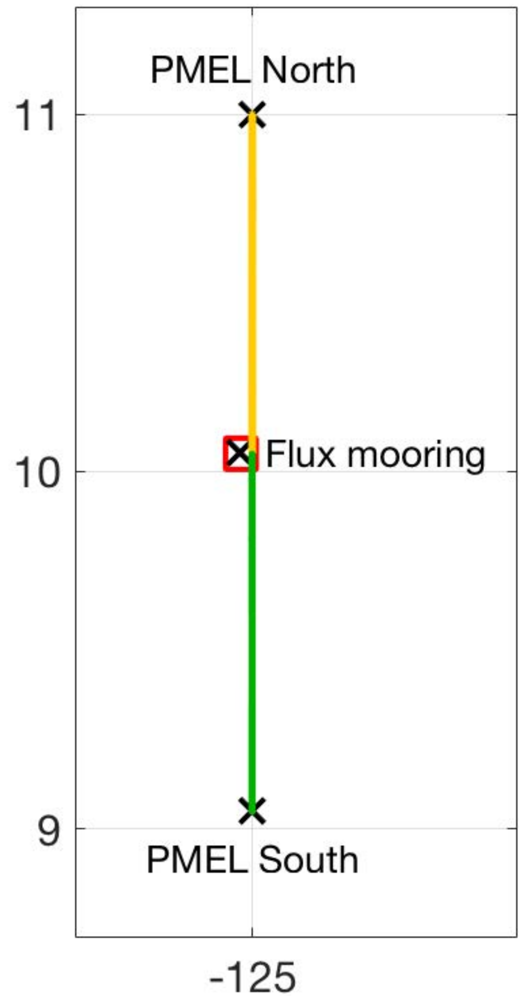
SPURS-2 Wave Glider operations

Meridional transect

Lagrangian experiment

Salinity Rake





3 vehicles (SV-2 WG's)
- "Red"
- "Yellow"
- "Green"

200-km transect

9 months (so far)

Sea-Bird GPCTDs
- 30 cm/6.5 m
- 2-minute sampling (~100 m)
- ~1M samples

Wind (Airmar WX200)

Surface current

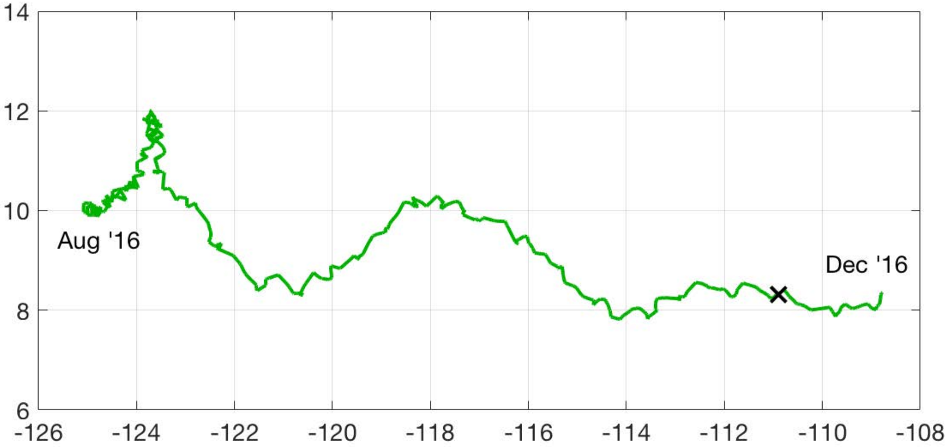
SBE-56

SPURS-2 Wave Glider operations

Meridional transect

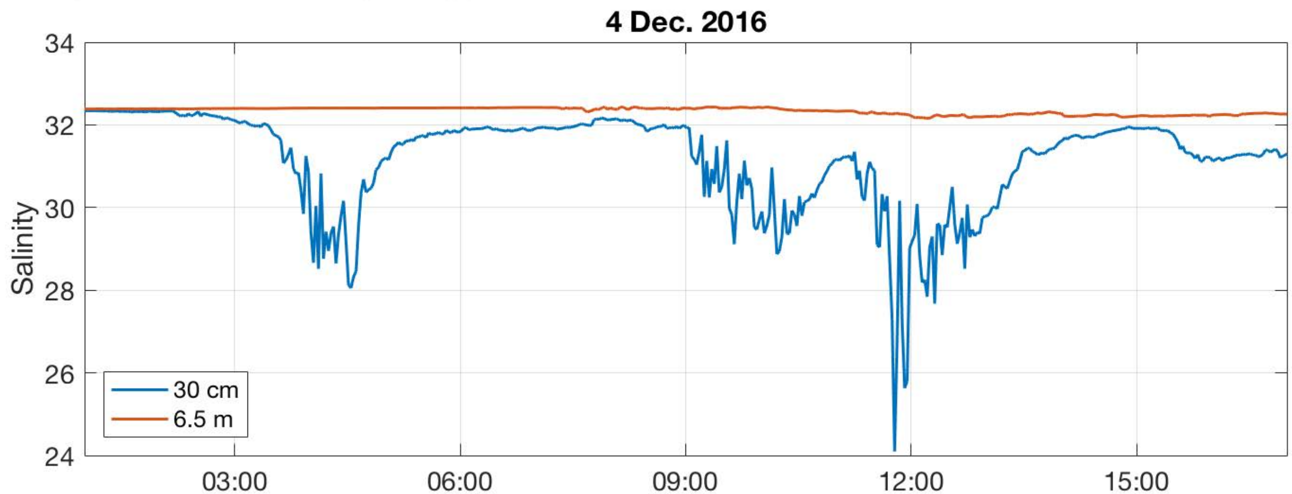
Lagrangian experiment

Salinity Rake



"Green" spent >3 months with Lagrangian array

- Followed MLF ~1600 km east
- Attempted to repeatedly intercept MLF along O(10km) transects with varying headings
- Planned and piloted mainly by Andrey S.
- Whisked back to SPURS-2 site by R/V Lady Amber



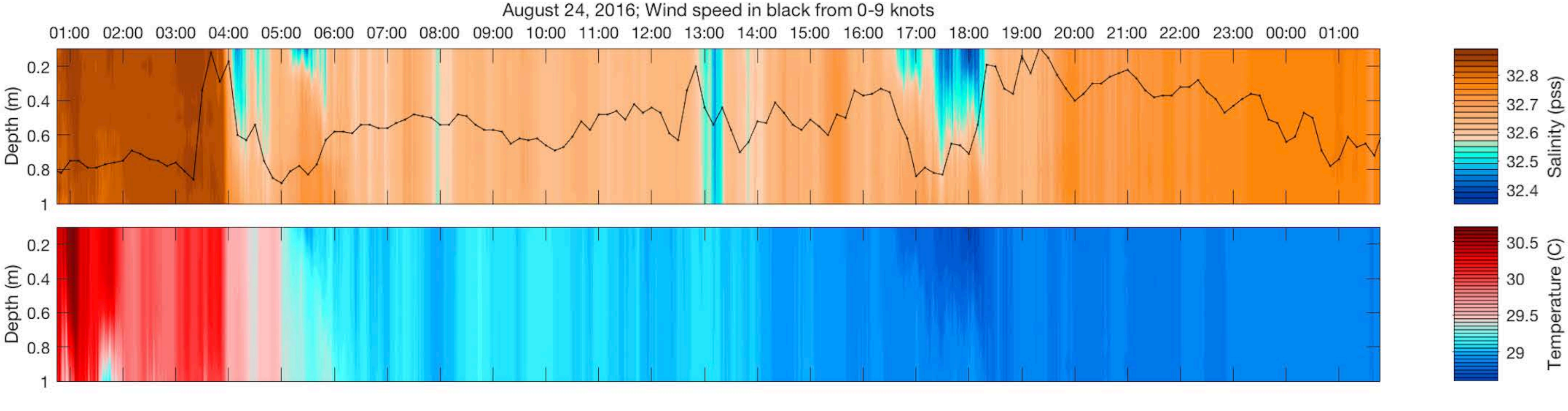
SPURS-2 Wave Glider operations

Meridional transect

Lagrangian experiment

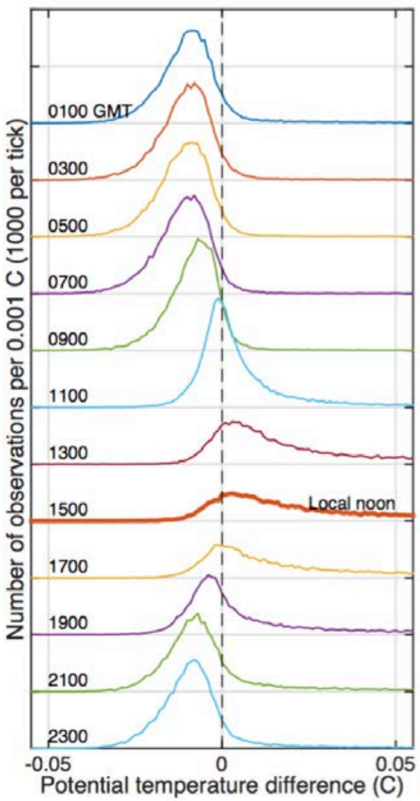
Salinity rake

- Intended to resolve structure of shallow "fresh puddles"
- 10 NBOSI CT sensors
    - 10-cm spacing over upper meter
    - 1-Hz sampling
    - UV antifouling
    - On-board data logging
- One day of sampling at 10-cm resolution, 4 days at 20-cm
- *Ray Schmitt, Bob Petitt, Glenn McDonald*

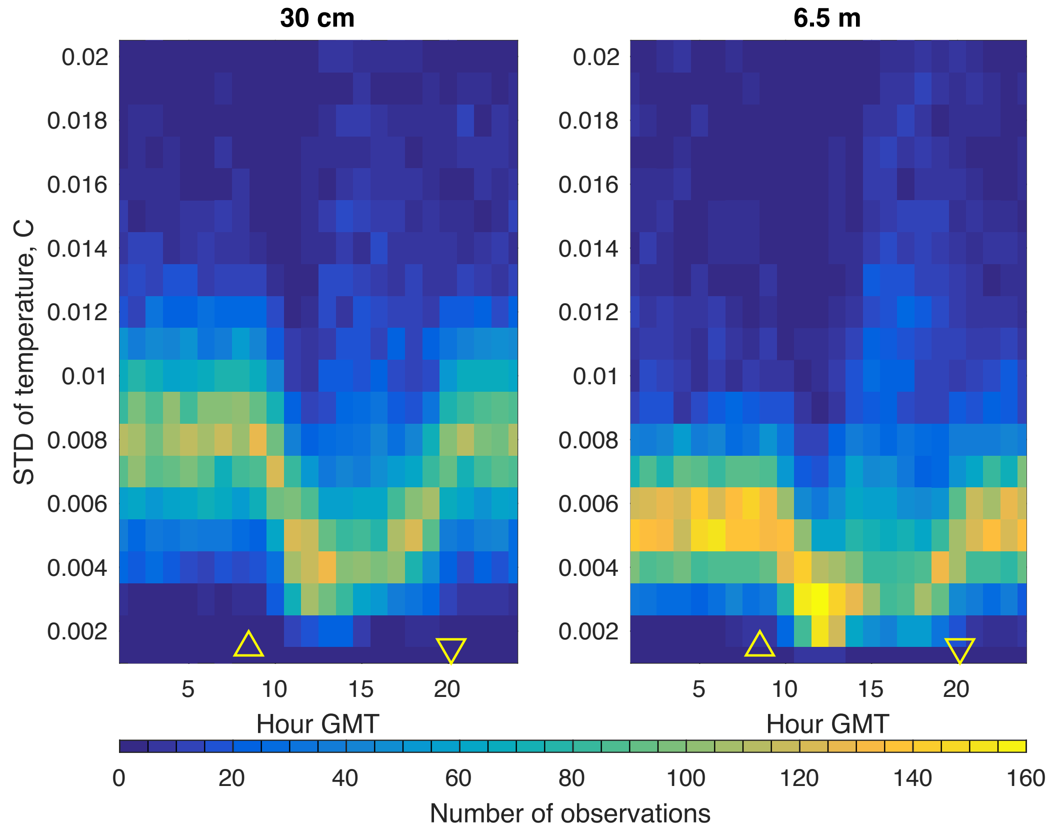


SPURS-1: Diurnal cycle of temperature structure

Statically unstable potential temperature gradient between top and bottom of WG at night (~0.01°C)



More fuzz at night at both top and bottom



Nocturnal convection: surface cooling creates cold plumes which are not resolved by 1-min sampling, but contribute to the standard deviation of temperature

SPURS-2: A closer look at nocturnal convection: motivation

Evolution of shallow fresh "puddles" is a subject of interest, partly due to remote sensing implications (time scale of hours).

Where $\overline{E - P} \neq 0$ (SPURS-1 box, SPURS-2 box, pretty much any box) the net freshwater flux across the surface must be balanced, in steady state, by fluxes through the sides of the box (time scale of years).

Mixing plays a role in both these processes (together with advection).

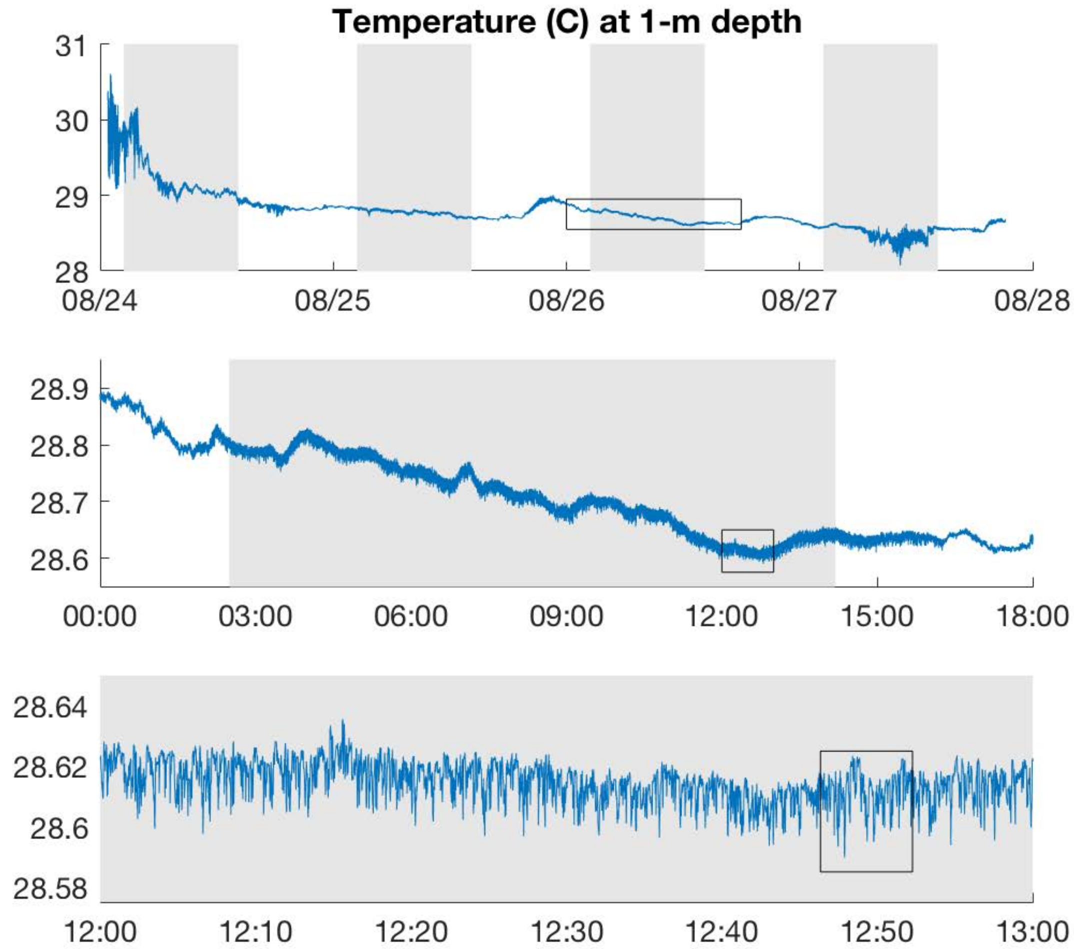
The energy driving mixing is supplied by: wind; mean flow shear; internal waves; rain; *convection; ...*

Salinity rake observations provide a chance to look at convective plumes in SPURS-2.

Convection

Resolving the temperature signature of convection is challenging:
- Small signal magnitude (~0.01°C)
- Small scale, intermittent
- Subject to corruption by measurement platform-induced mixing

Are plumes resolved in the 1-Hz (~70 cm) rake data?

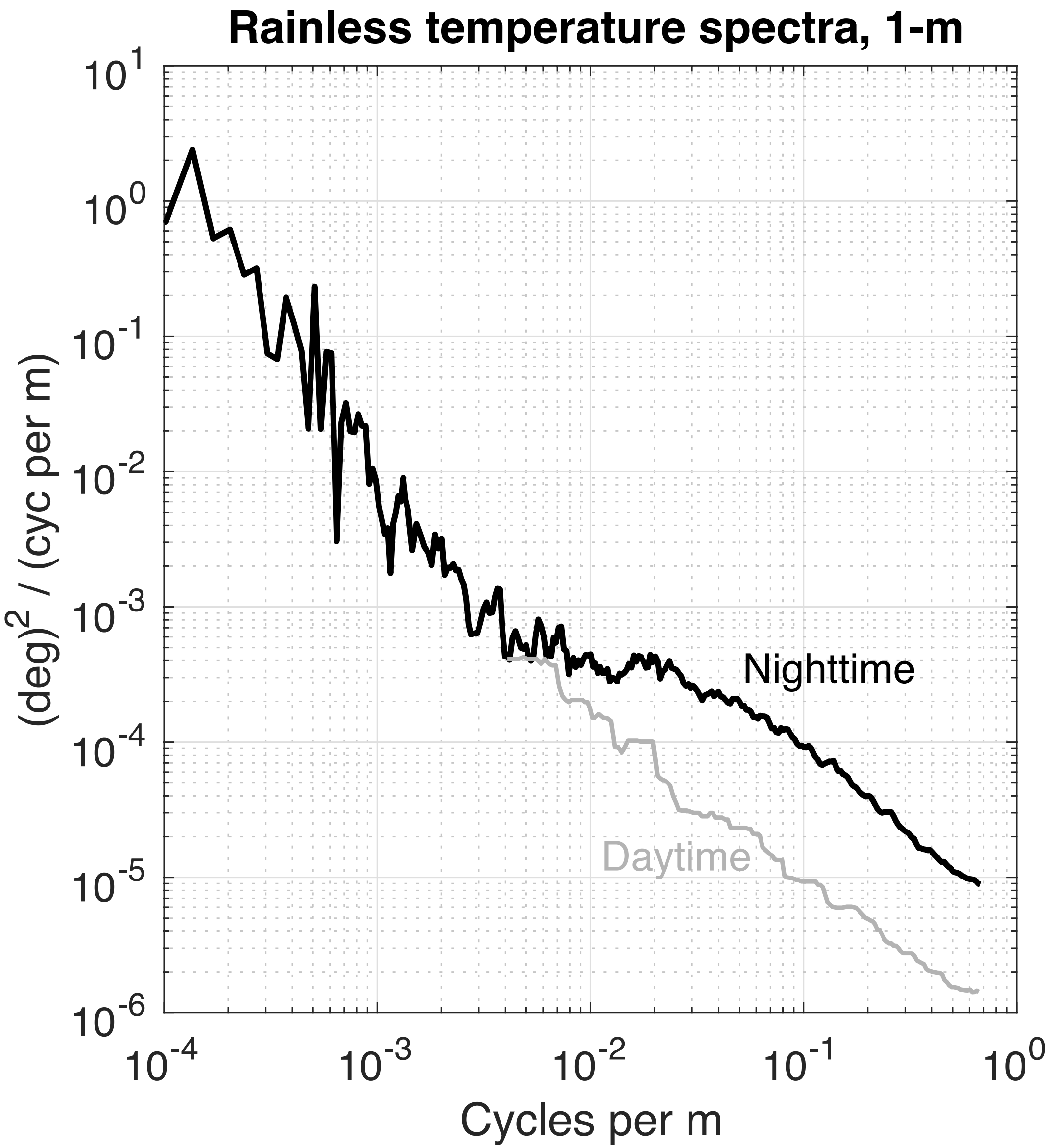


Convection

Convection appears to add a broad spectral hump below scales of ~50 m (relative to rain-free daytime spectrum).

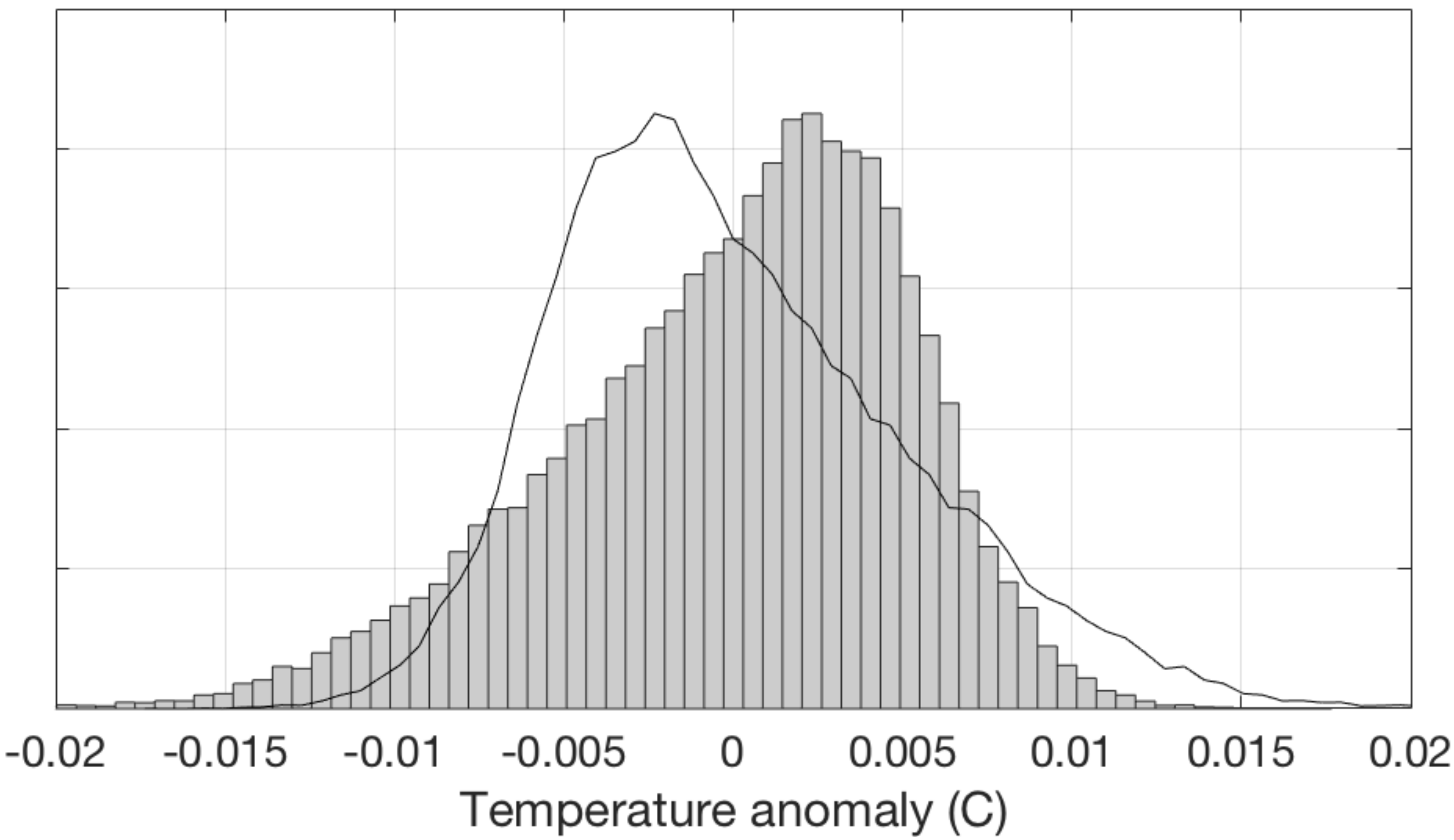
Roughly consistent with eyeball characteristic plume spacing (~30 s, ~20 m).

To look at the statistics of temperature fluctuations associated with convection, high pass the temperature timeseries at 70 s (~50 m).



Convection

High-passed nighttime temperature record is strongly skewed.
Daytime distributions (not shown) are nearly symmetrical.



Questions

How deep do convective plumes penetrate?

How are they organized in 3 dimensions? Cells?

What sets the horizontal scales?

Is there coupling to the surface wave field?

Langmuir?

Can the associated salt flux be estimated?

What is the contribution to TKE?