Thursday, 14 November 2013

SNAKES ON A SHIP

First Results From SPURS SSS

8th Aquarius/SAC-D Science Meeting

Buenos Aires, Argentina

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Sea Snake: A Brief History

- During SPURS I (September 2012):
  - Ecomapper & Wave Gliders saw surface salinity enhancements
  - We were unable to obtain water samples
- During SPURS Miami meeting this was discussed
  - Suggestions that enhancements were just instrument errors
- After talking to Gary Lagerloef (Idea) and Ray Schmitt (Funds and further Ideas), I designed the 'SPURS Surface Salinity Sea Snake'…

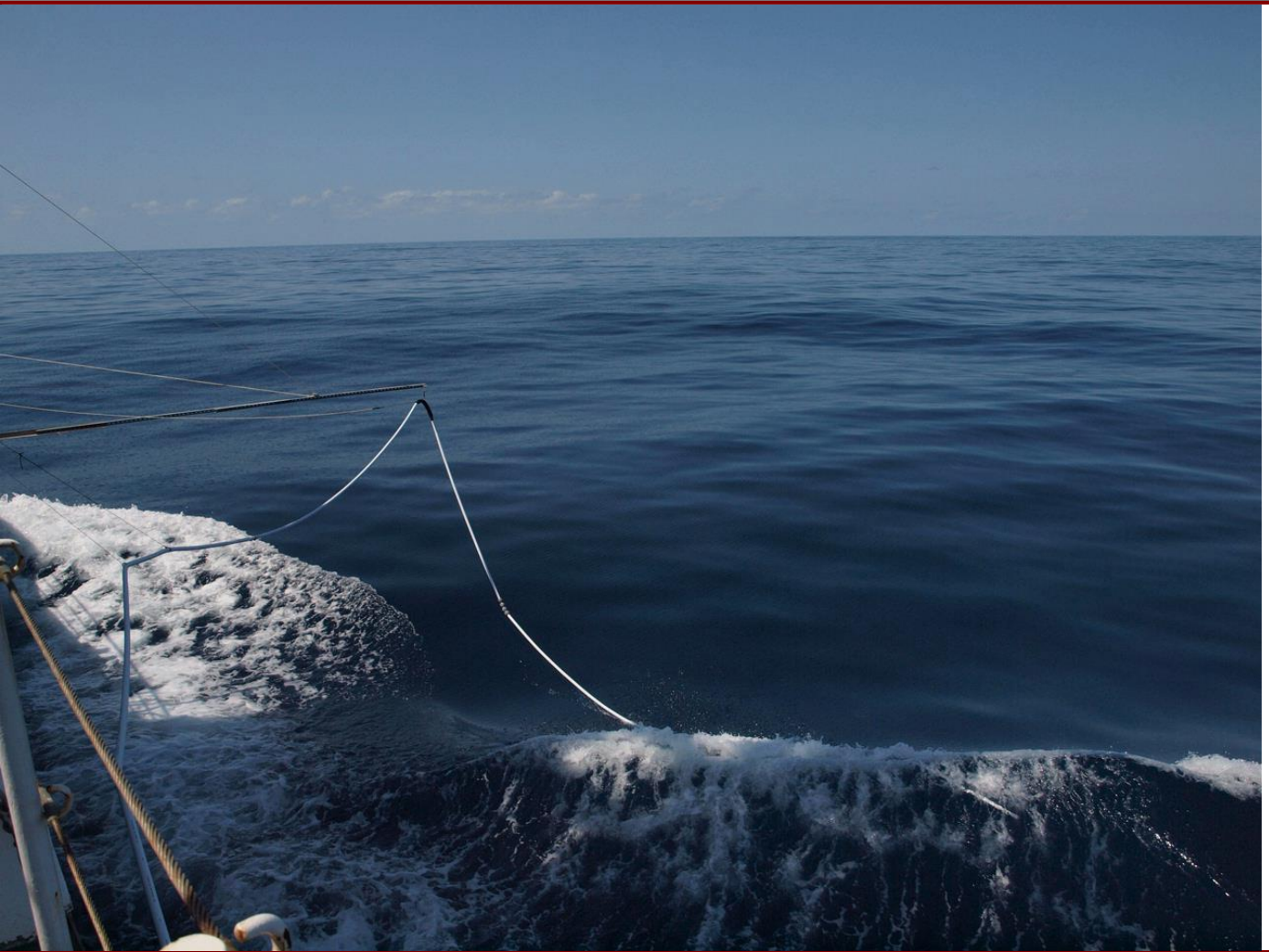
Development

- ‘Sea Snake Test bed
- Towed from same height as R/V Endeavor using composite spar
- Tests from 8-15 kt.

Development

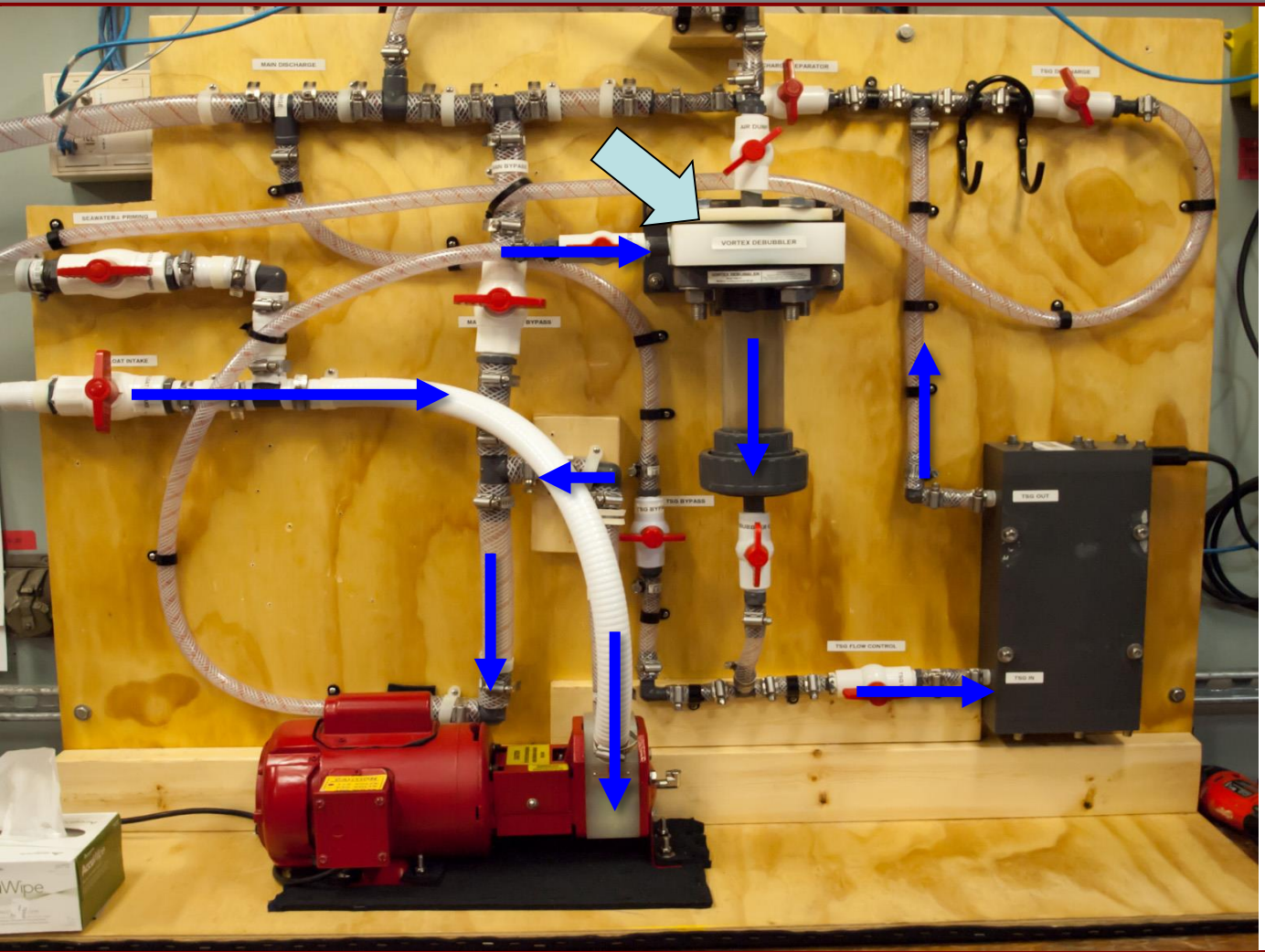
- Early tests: simpler is better
- At 12 knots, board designs proved unstable
- Various designs tested

I Background



- Suction tube mounted on boom with halyard system
- Intake sometimes in the wake
- Longer boom would help

I Background

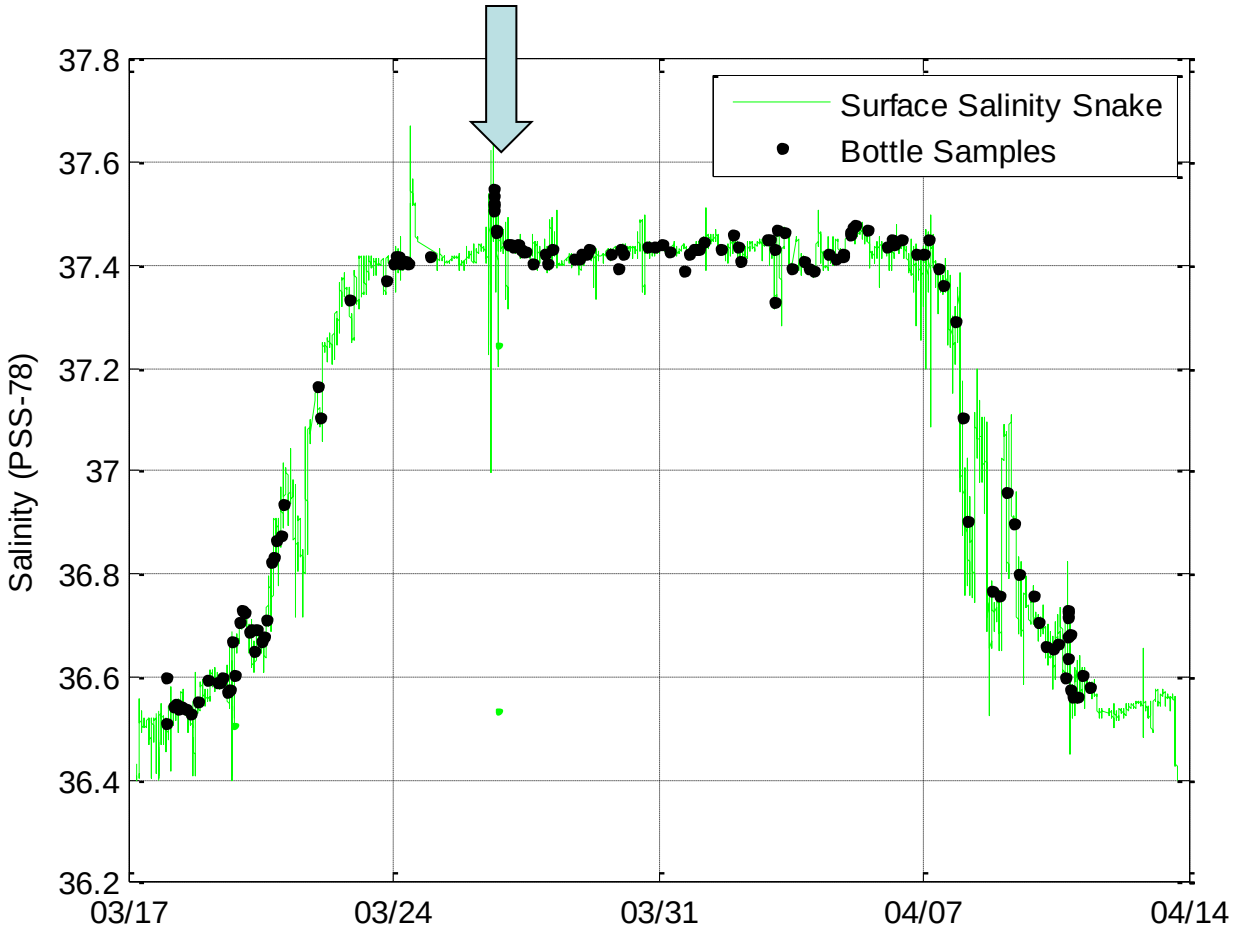


- Revised ship-side apparatus
- Changed routing of hoses for more effective de-bubbling

Background

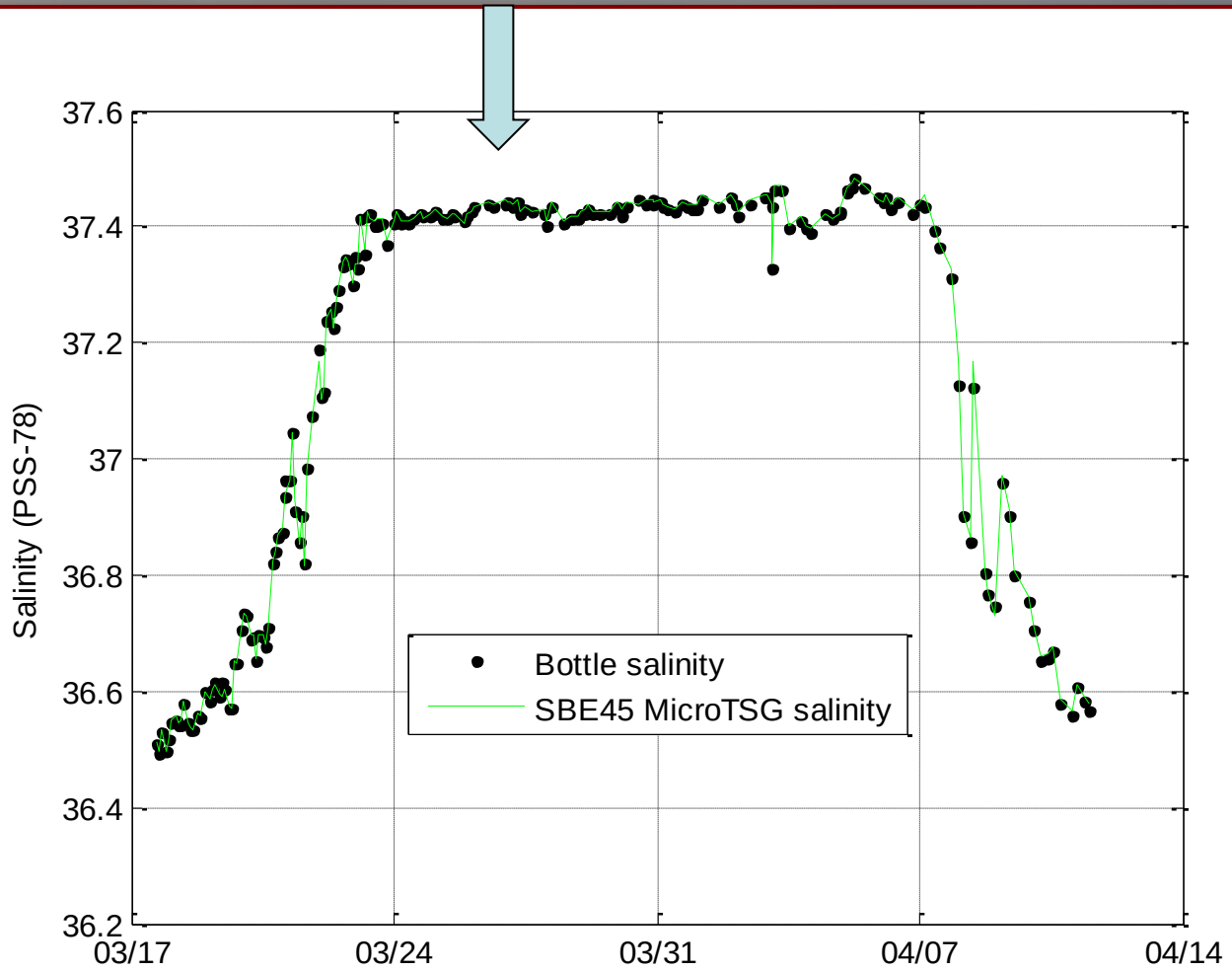
- Removal of bubbles is crucial for accuracy
- Bottle samples and MicroTSG show excellent agreement

II Results: SPURS 2 (October 2013)



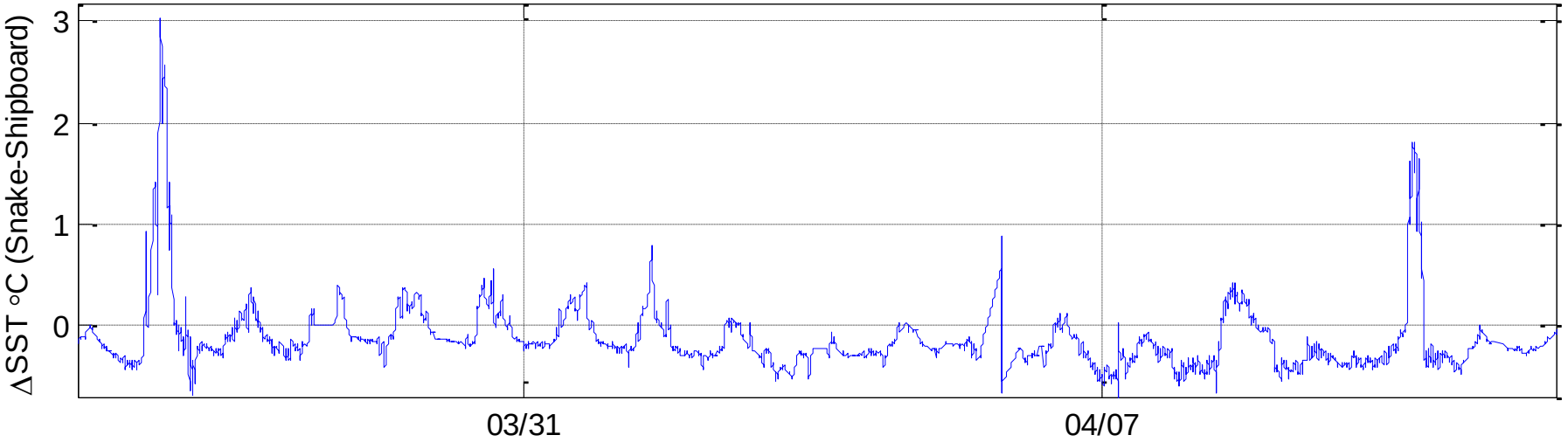
- Excellent agreement between bottle samples and MicroTSG measurements
- Found salinity enhancement of 0.15 relative to shipboard bottle

II Results: SPURS 2 (October 2013)



- Shipboard MicroTSG validated using salinometer
- Note lack of diurnal salinity enhancements

II Results: SPURS 2 (March 2013)

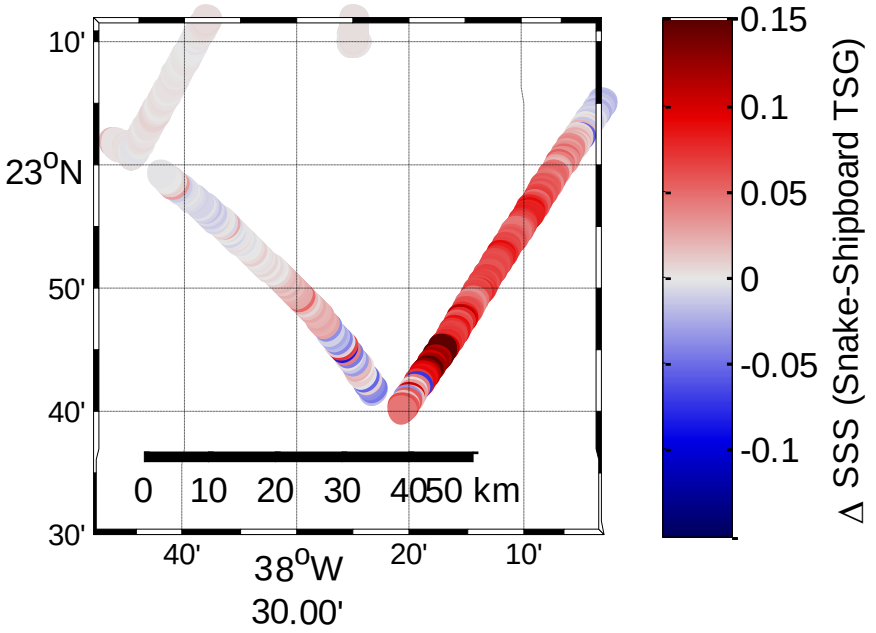


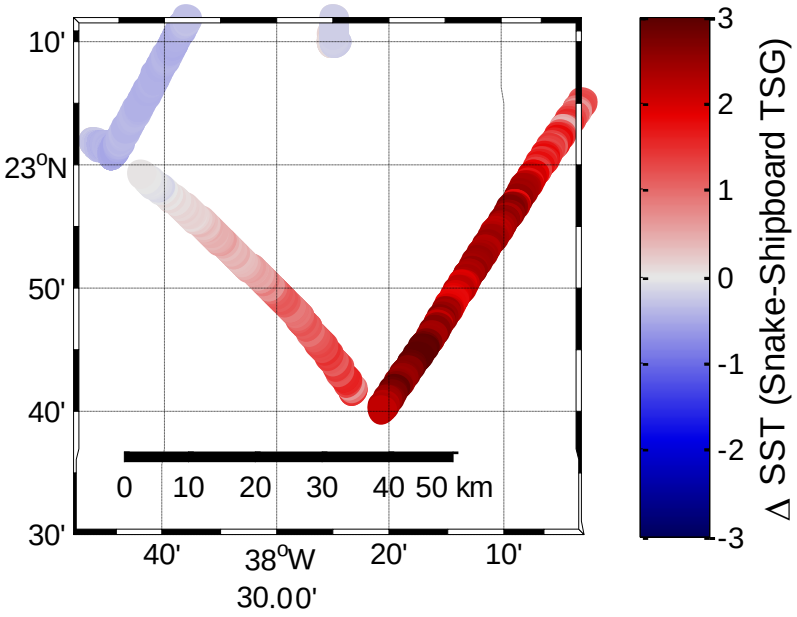
- 2 major events: 3/26 and 4/10.
- Strong salinity enhancement on 3/26/2013
- Diurnal signal still visible on most days

II Results: SPURS 2 (3/26/2013)

- Most interesting results during calm conditions (3/26 shown)
- Surface salinity increases of over 0.15 observed

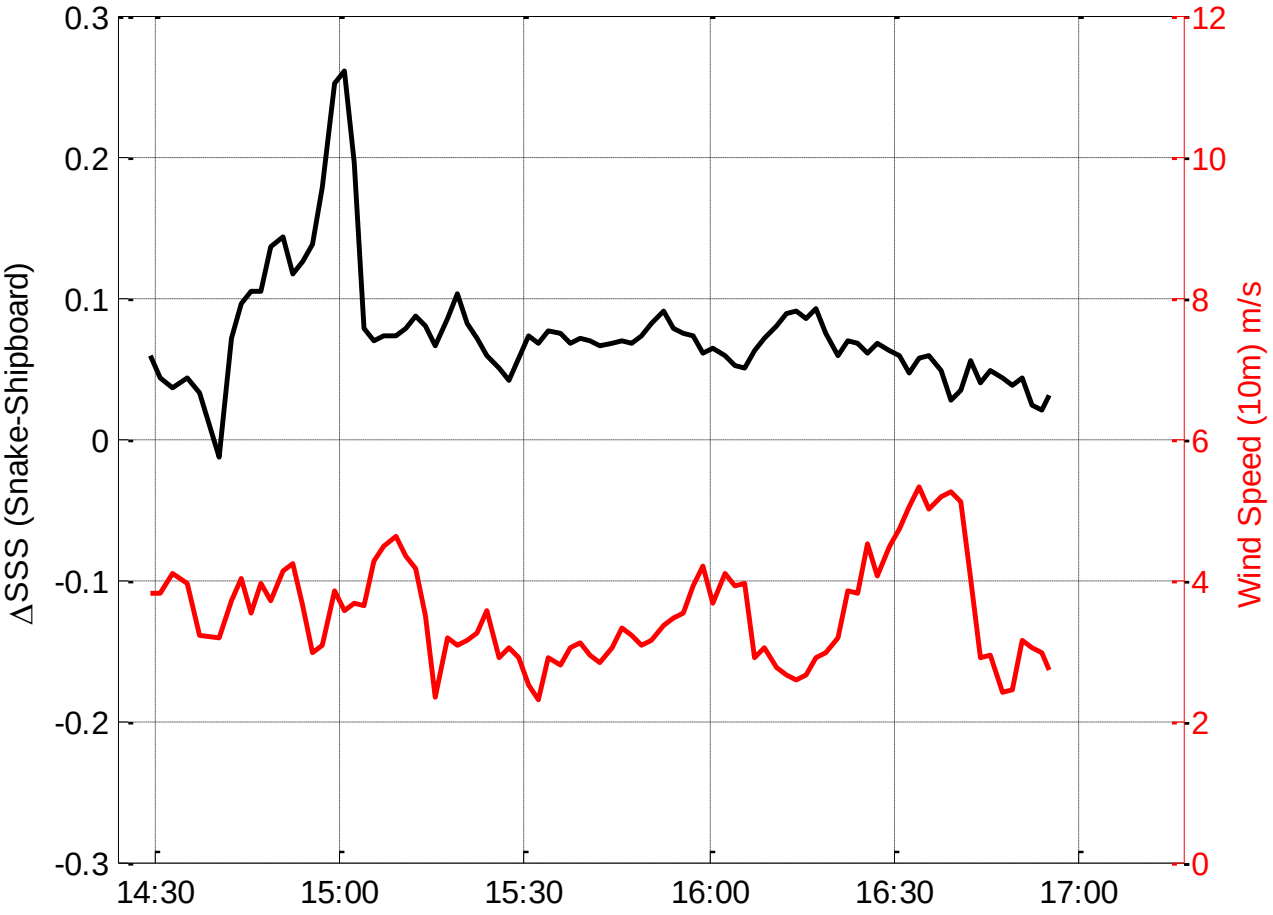
II Results: SPURS 2 (3/26/2013)





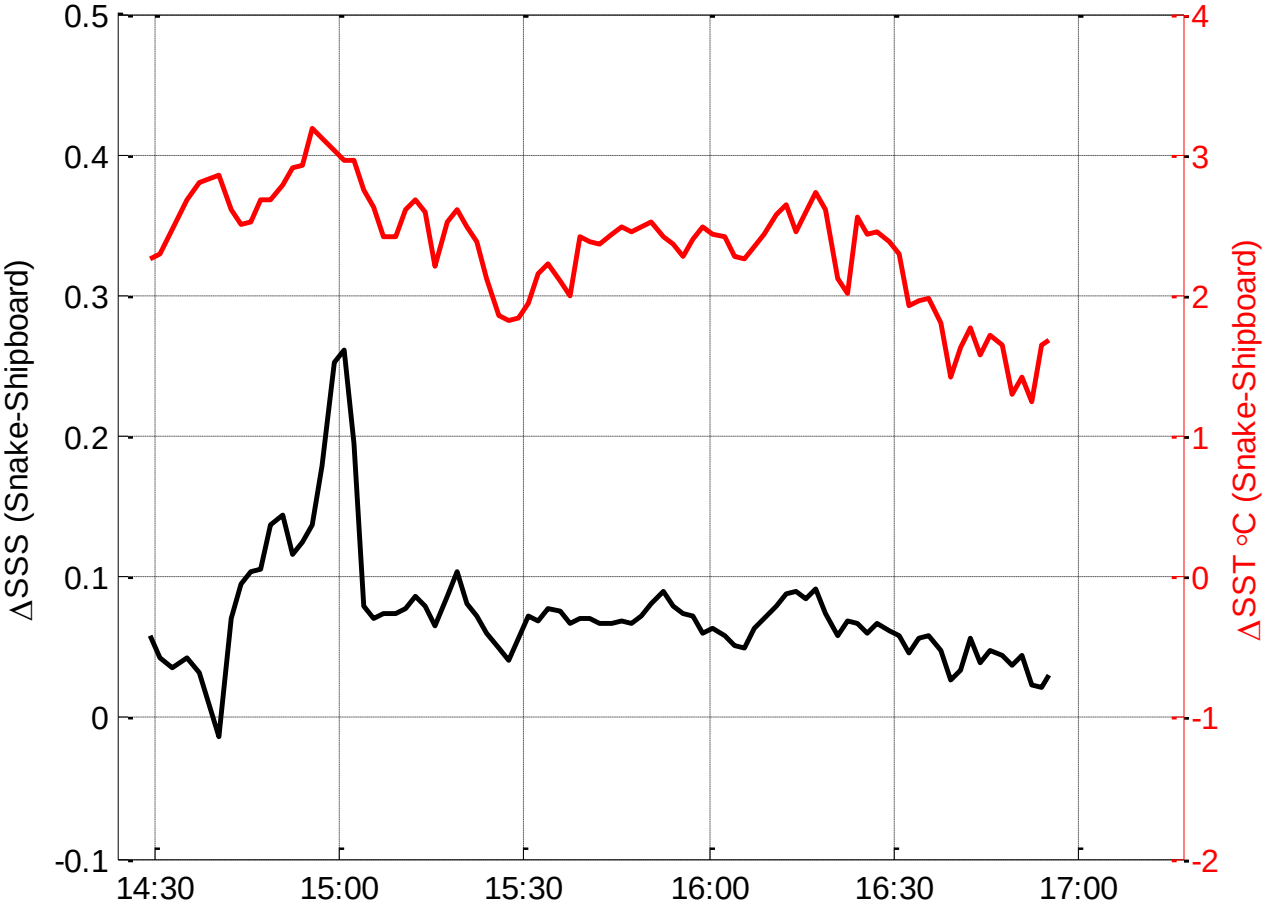
- Strongest surface salinity enhancement observed
- Enhancement exceeding 3°C and 0.15 psu (verified)

Results: SPURS 2 (3/26/2013)



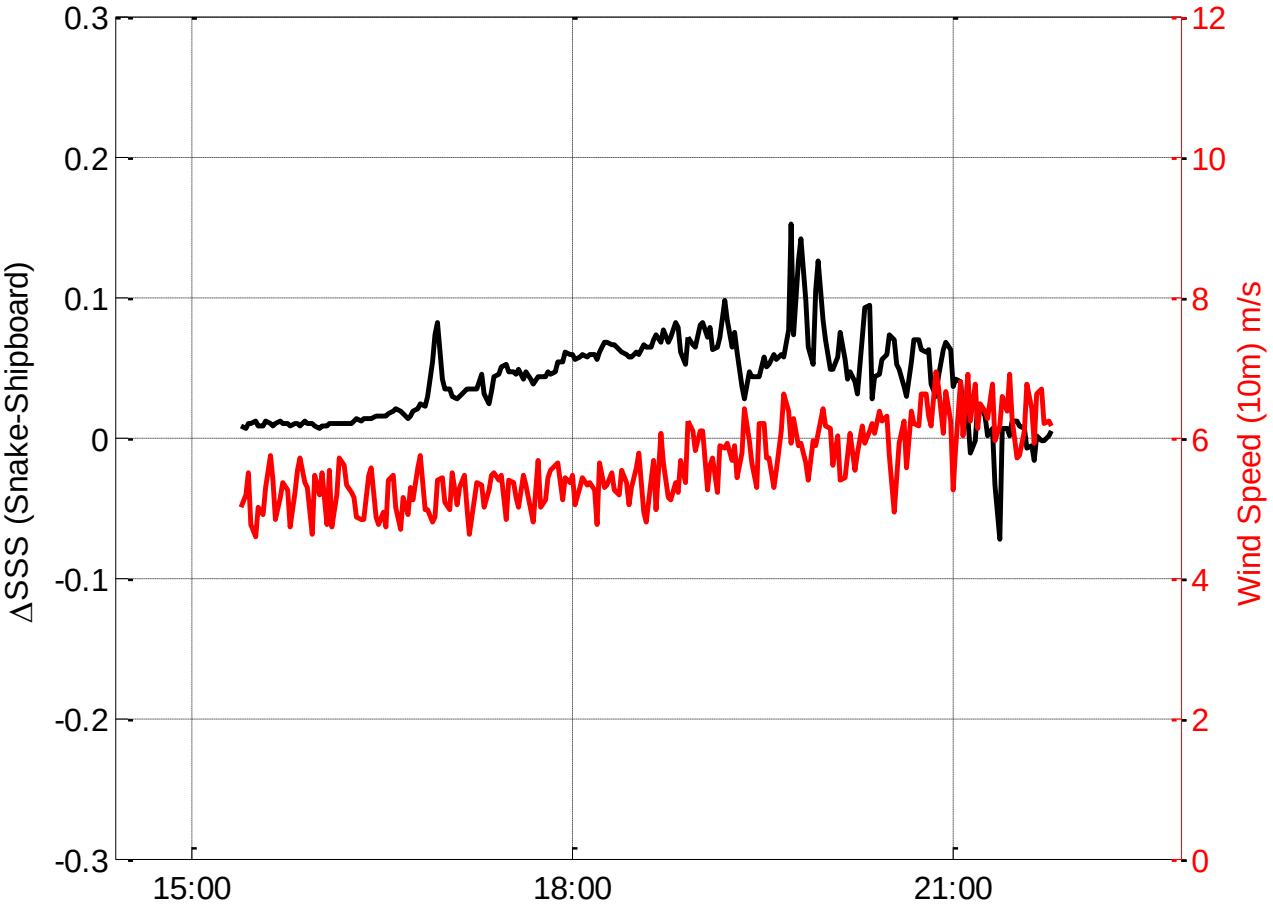
- Enhancement event shown
- Wind speed in m/s in red
- Time in UTC, offset to Greenwich ~2.5 hrs.
- Delay in peak SSS

Results: SPURS 2 (3/26/2013)



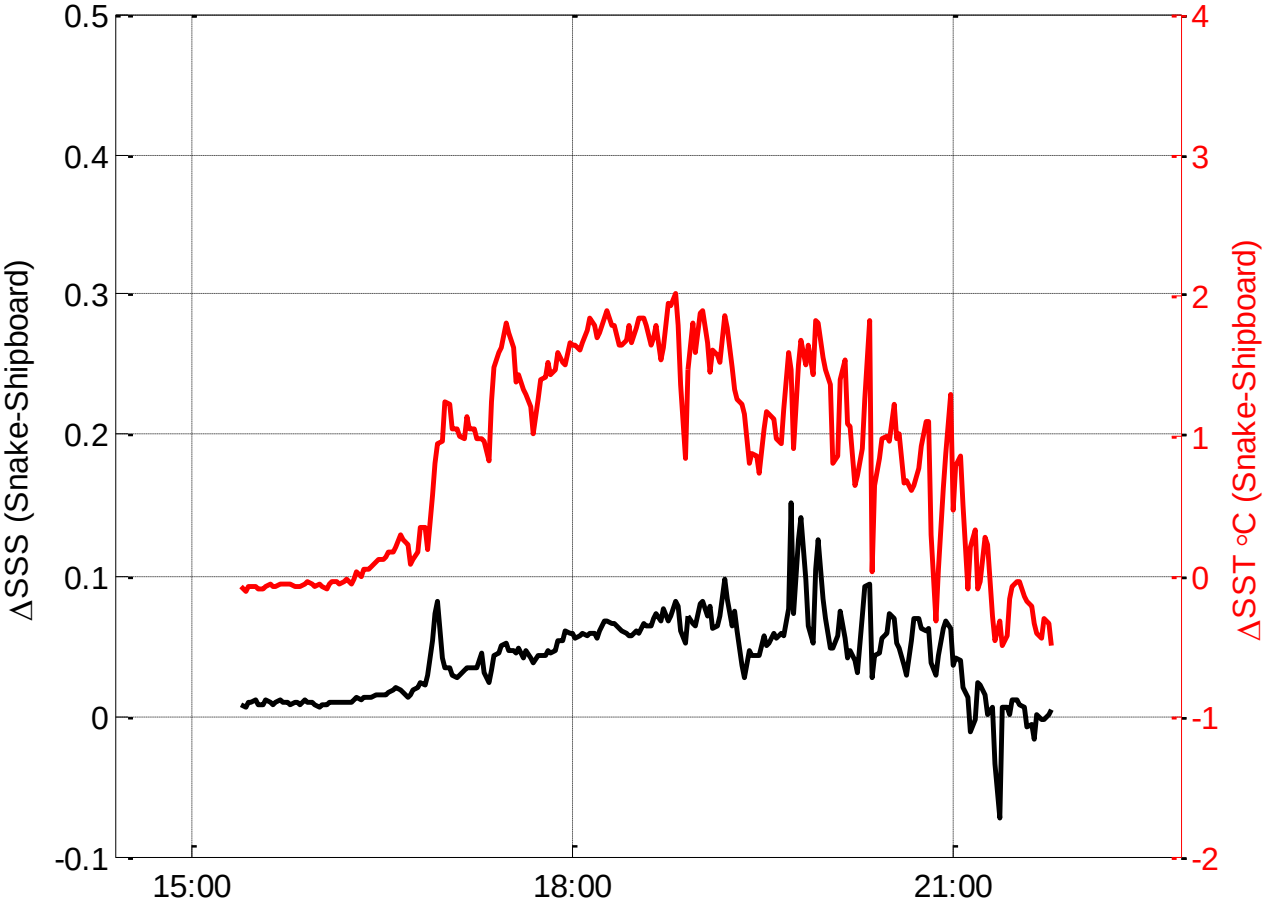
- Enhancement event shown
- Wind speed in m/s in red
- Time in UTC, offset to Greenwich ~2.5 hrs.
- Delay in peak SSS

Results: SPURS 2 (4/10/2013)



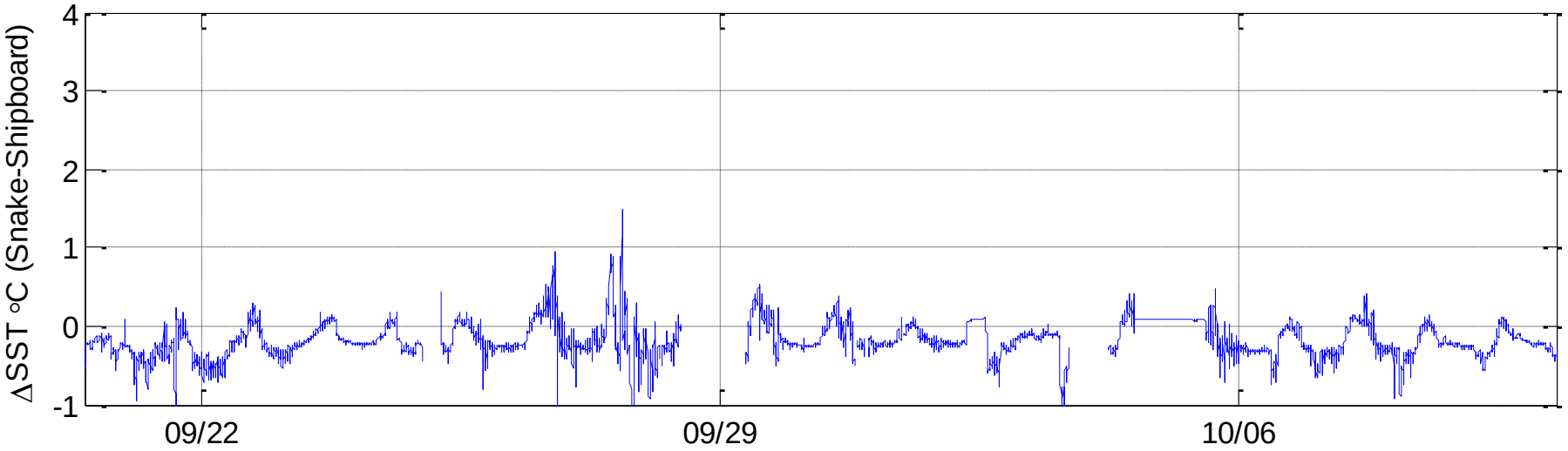
- Weaker enhancement event shown
- Wind speed in m/s in red
- Time in UTC, offset to Greenwich ~4 hrs.

Results: SPURS 2 (4/10/2013)



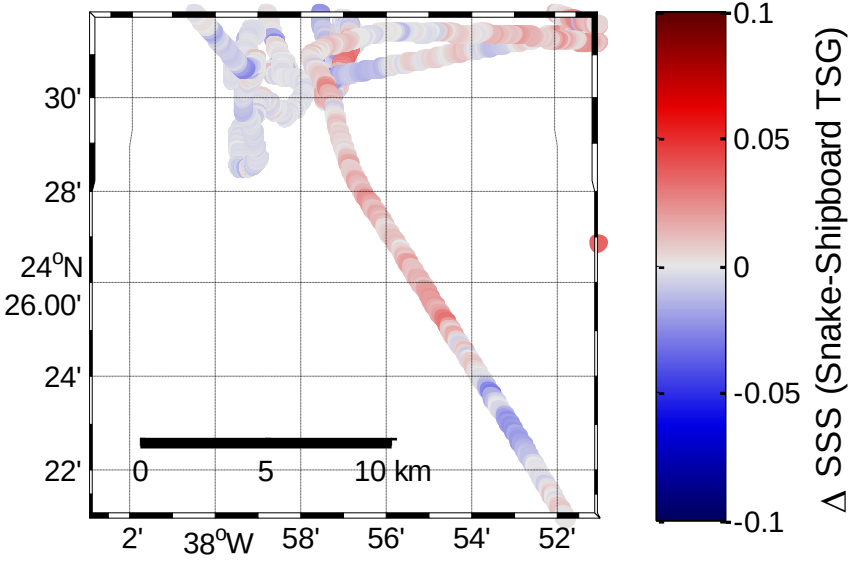
- Second enhancement event shown
- SST difference in red
- Time in UTC, offset ~4 hrs.

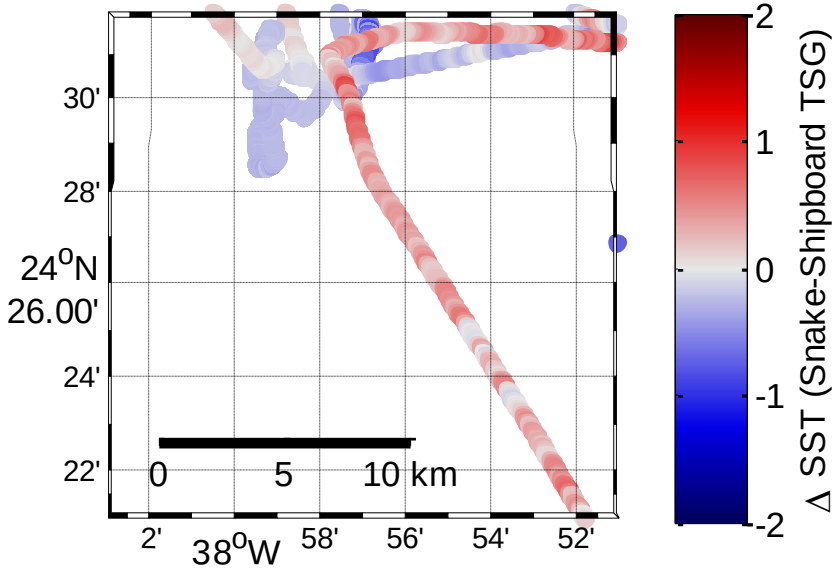
Results: SPURS 3 (Sep/Oct 2013)



- No major enhancements throughout the cruise
- Only one event with an enhancement around 1°C
- Diurnal signal still visible on most days

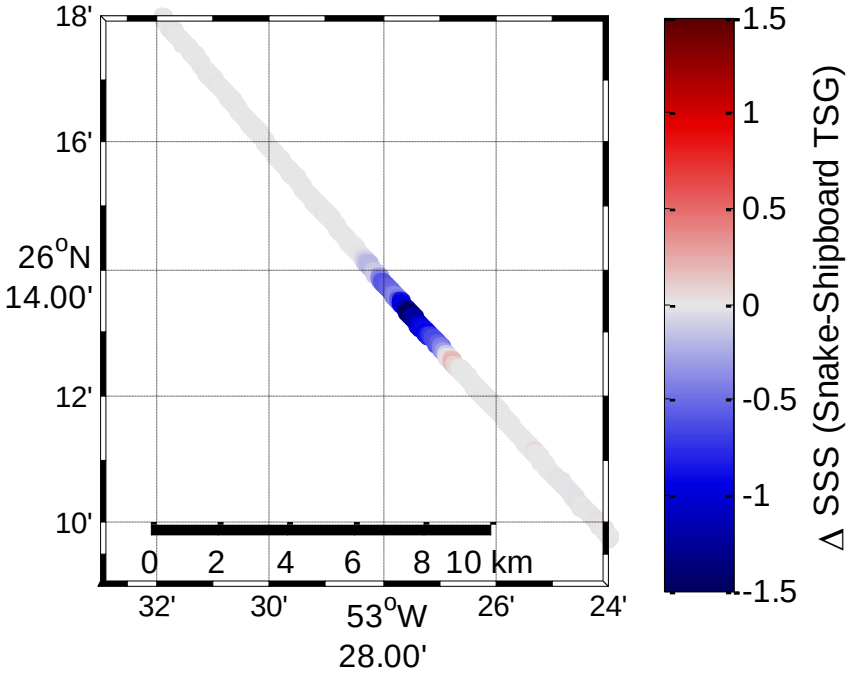
III Results: SPURS 3 (September 2013)

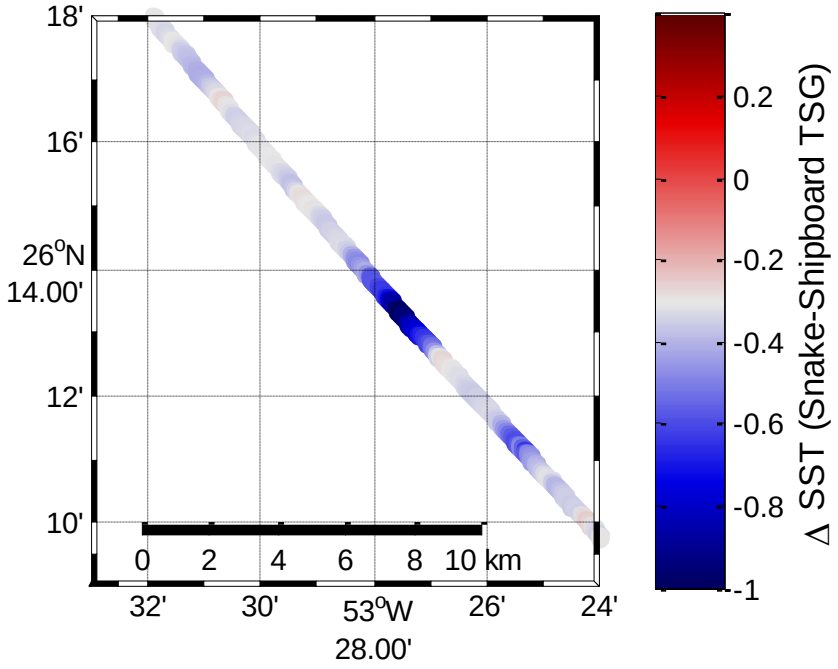




- Possible surface enhancement observed during SPURS 3
- Small in comparison with SPURS 2 enhancement

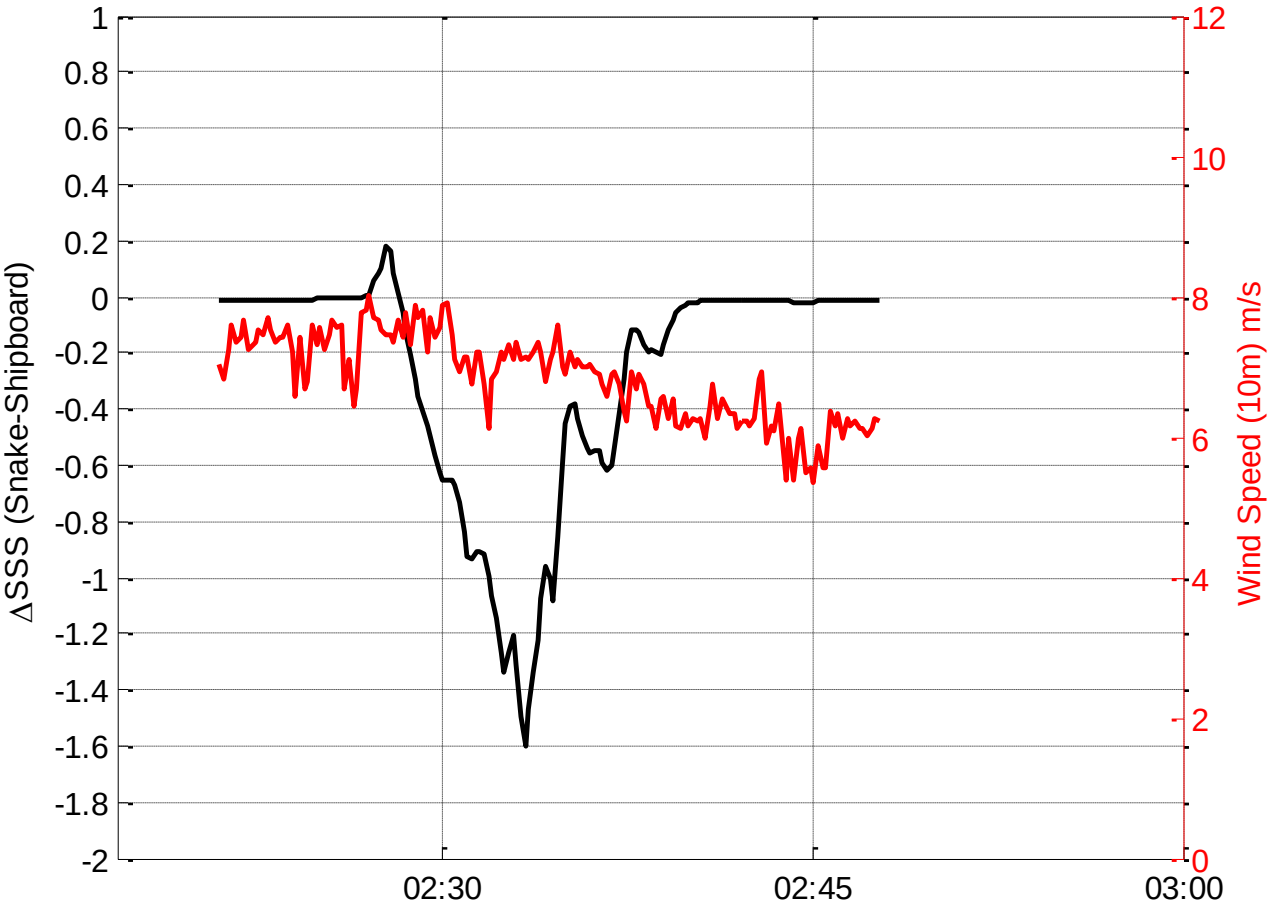
Results: SPURS 3 (October 2013)





- A puddle around 53.5°W 26°N
- Negative signature both in SSS and SST

II Results: SPURS 3 (October 2013)



- A puddle around 53.5°W 26°N
- Negative signature both in SSS and SST
- Offset to UTC 4 hours, ~10:30pm local
- Relevance to Aquarius

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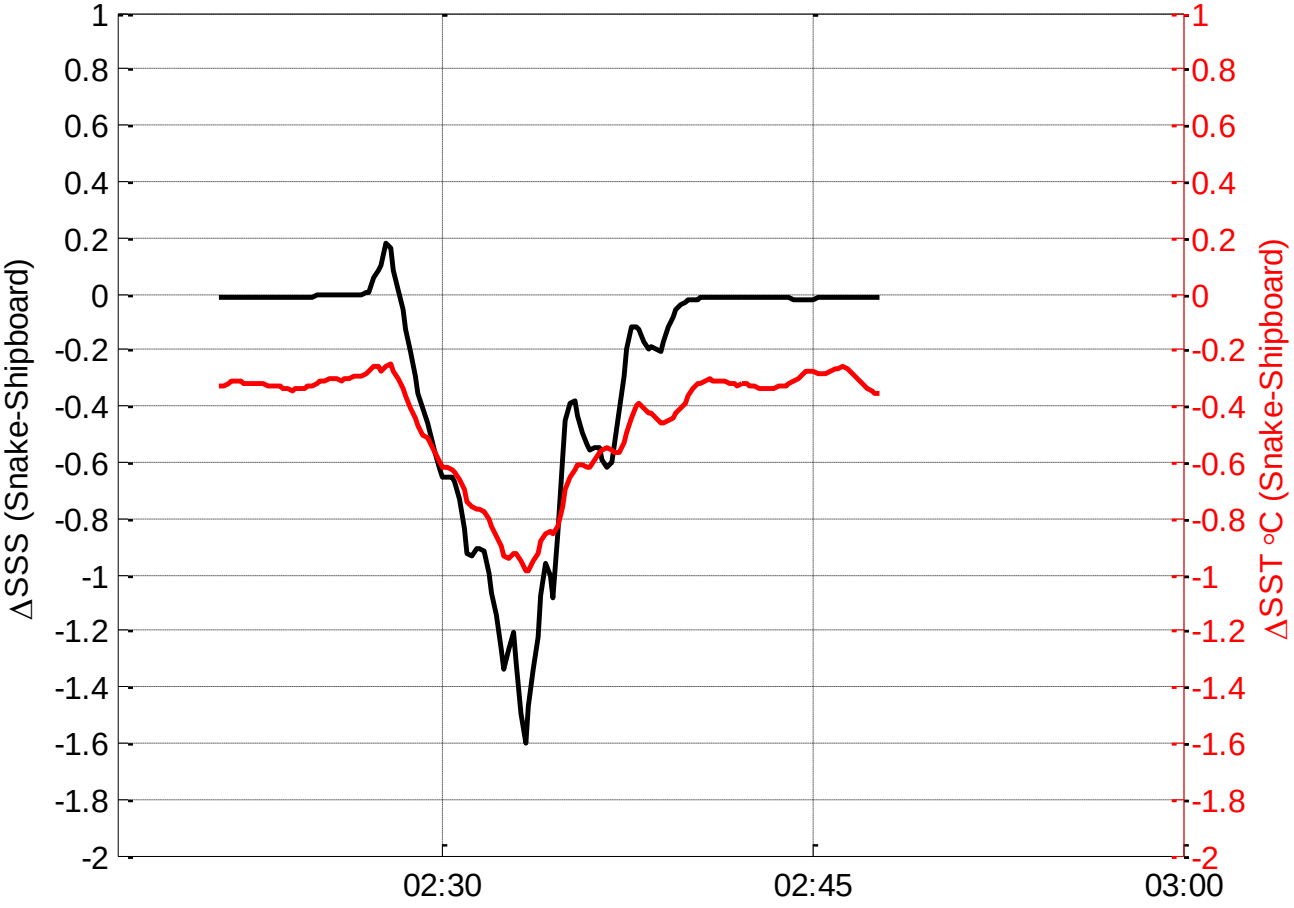

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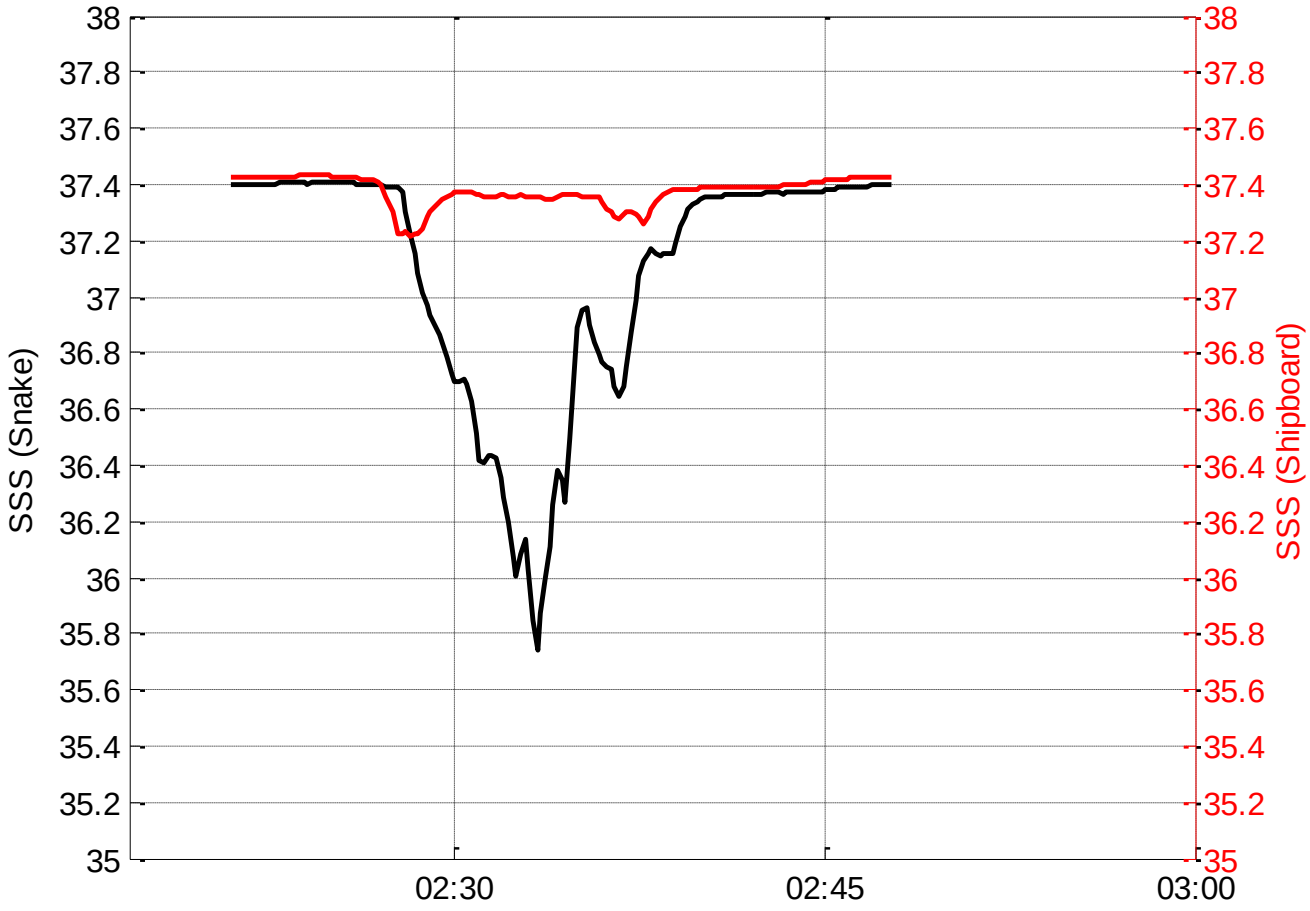

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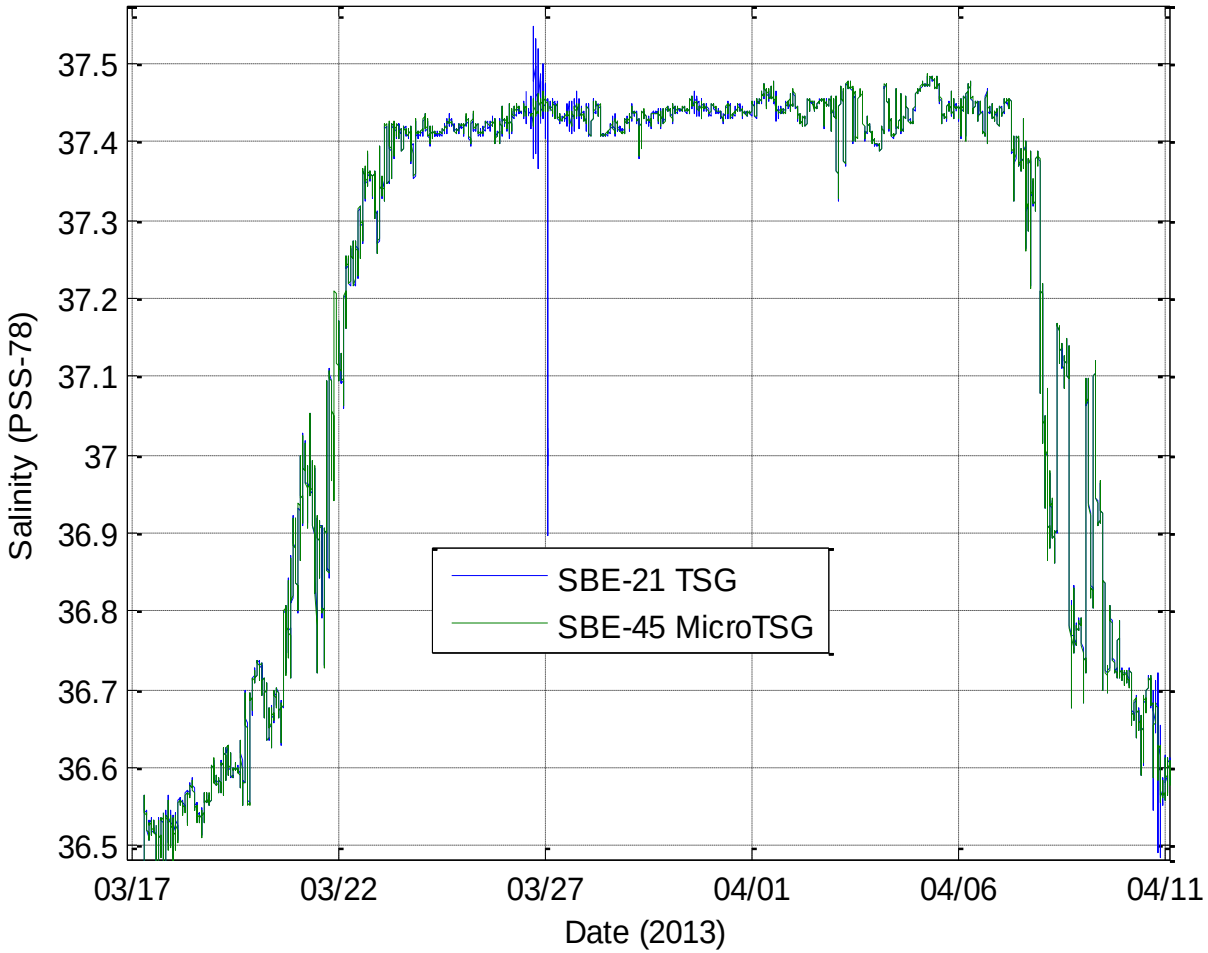
IV

Food for Thought



- Note SBE21 goes “noisy” on such days.
- This is due to the intake of the vessel

III

Conclusions

- Surface salinity enhancements: interesting, but probably not relevant to Aquarius retrievals
- Puddles can occur at any time of day, likely of some relevance to Aquarius retrievals.
- Next steps:
  - Model the development and breakdown of surface T/S changes (PWP model)
  - Gather more data in puddles (Fresh SPURS?)
  - Estimate impacts on Aquarius Cal/Val