Positive Salinity Gradients at the Ocean Surface:
Results From STRASSE

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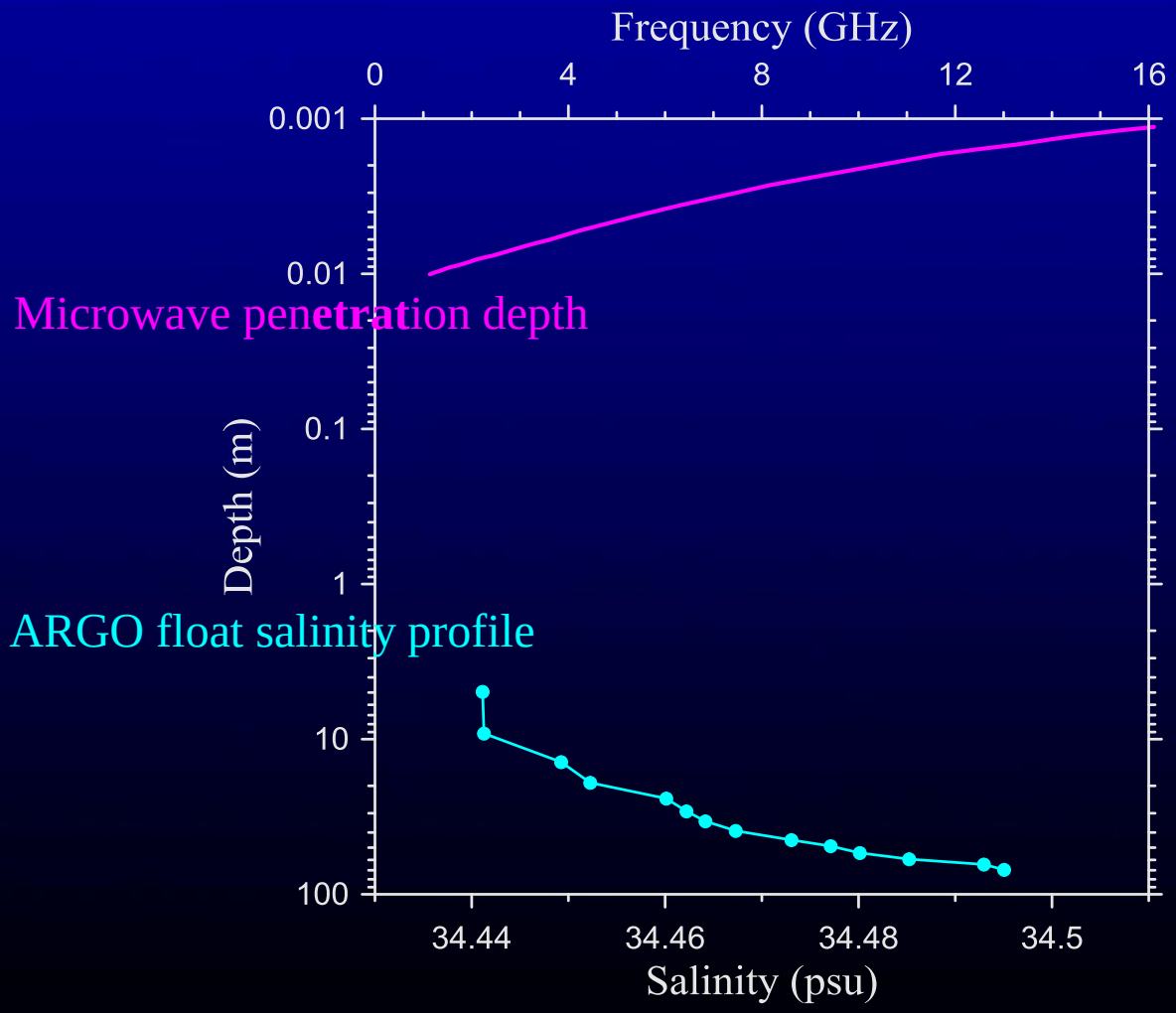
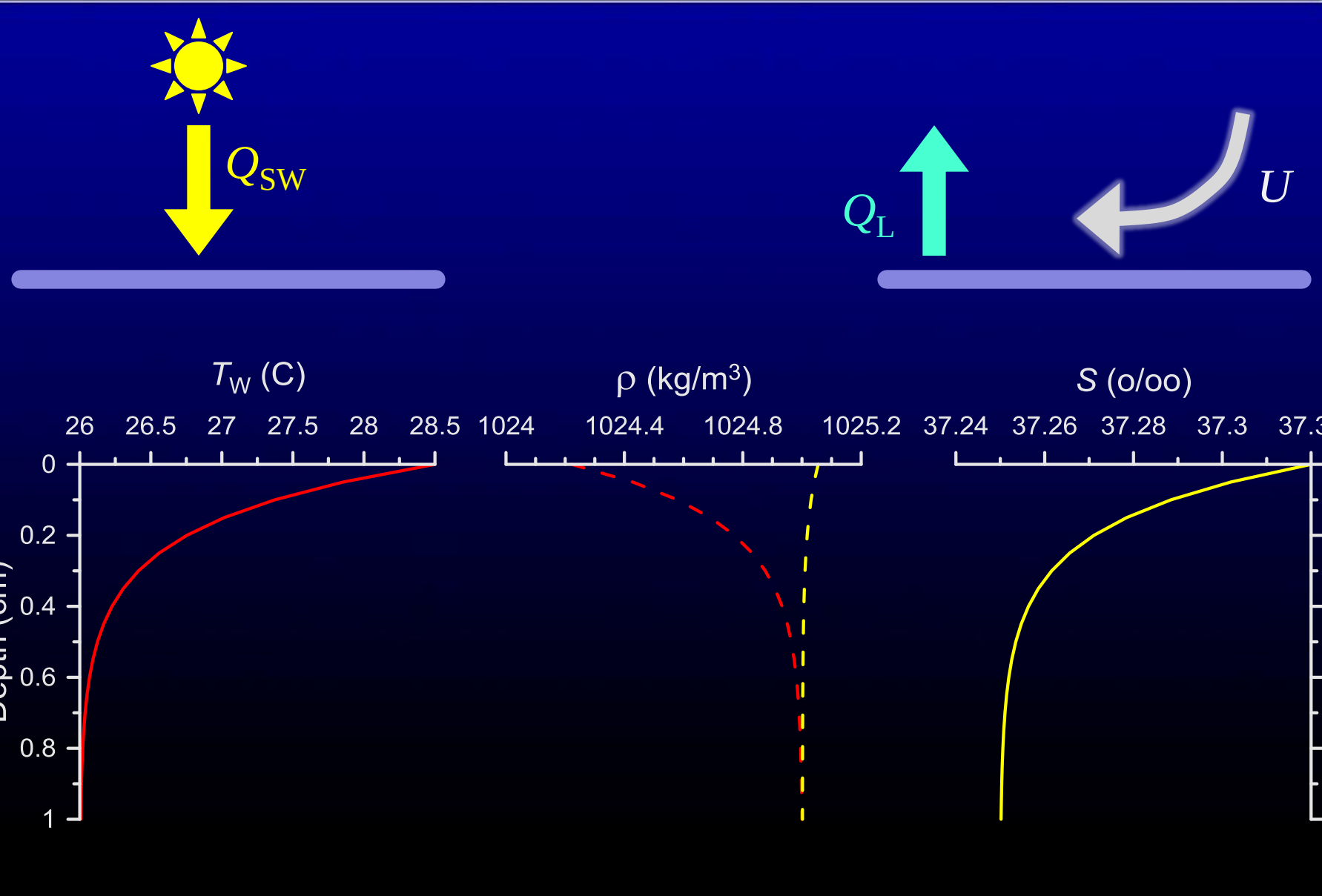
Why are surface salinity gradients important?

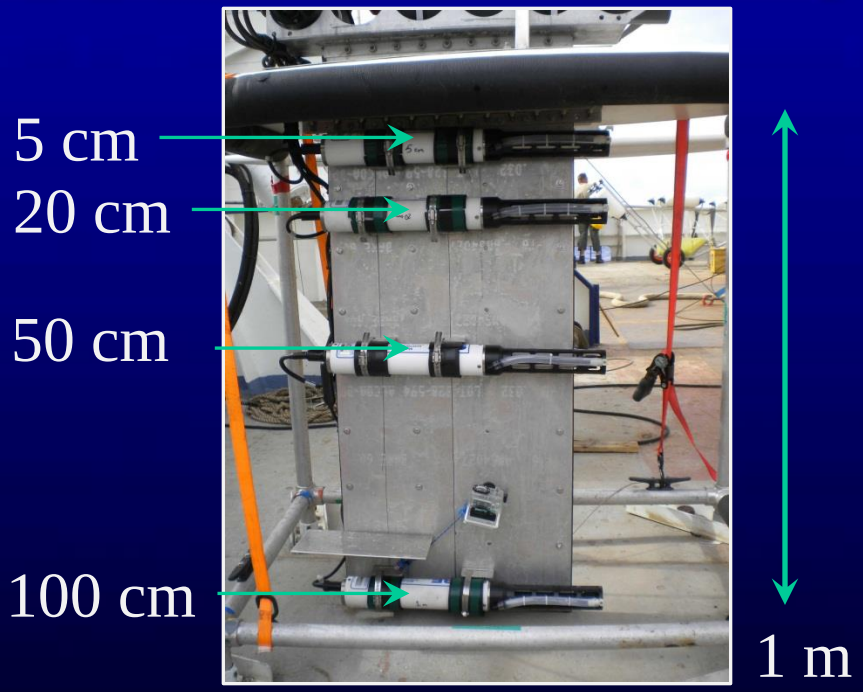


Mismatch between measurement depths for Aquarius and *in situ* observations

How positive salinity gradients form



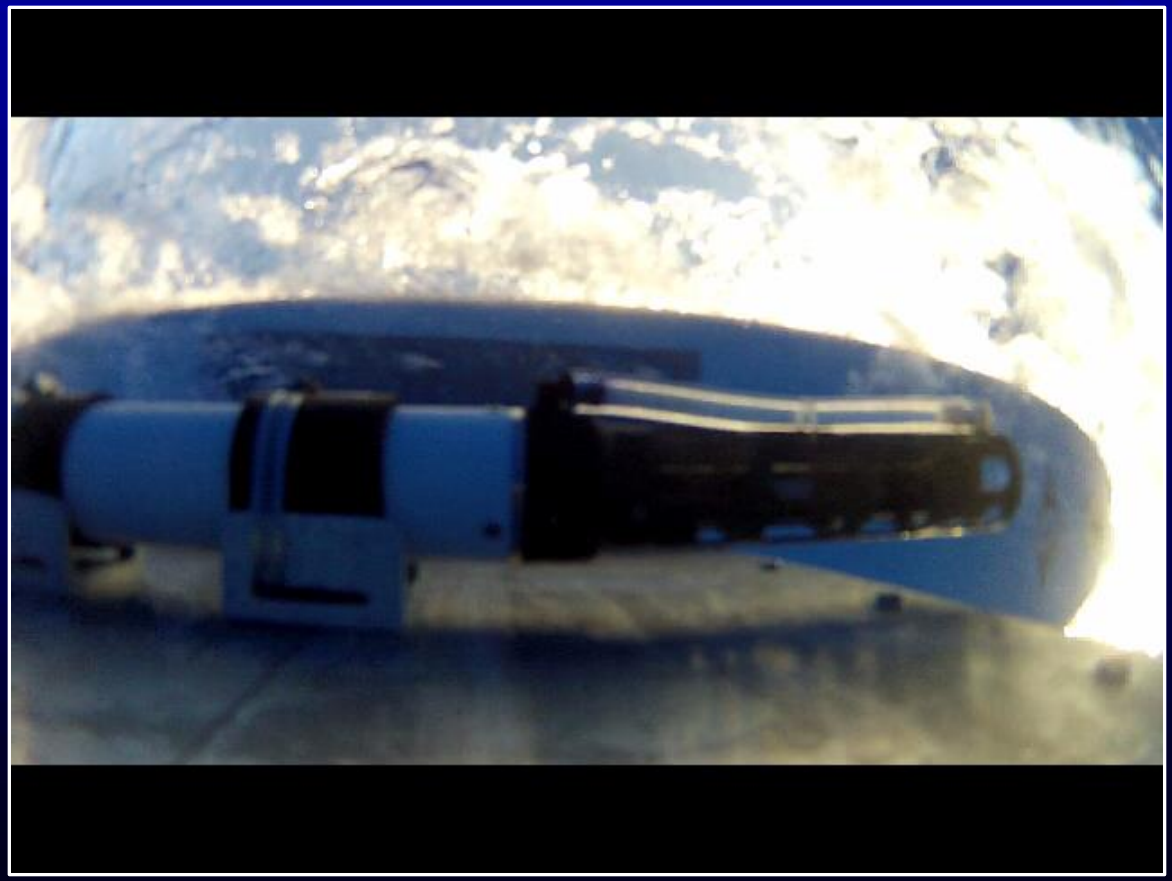
The Surface Salinity Profiler (SSP)



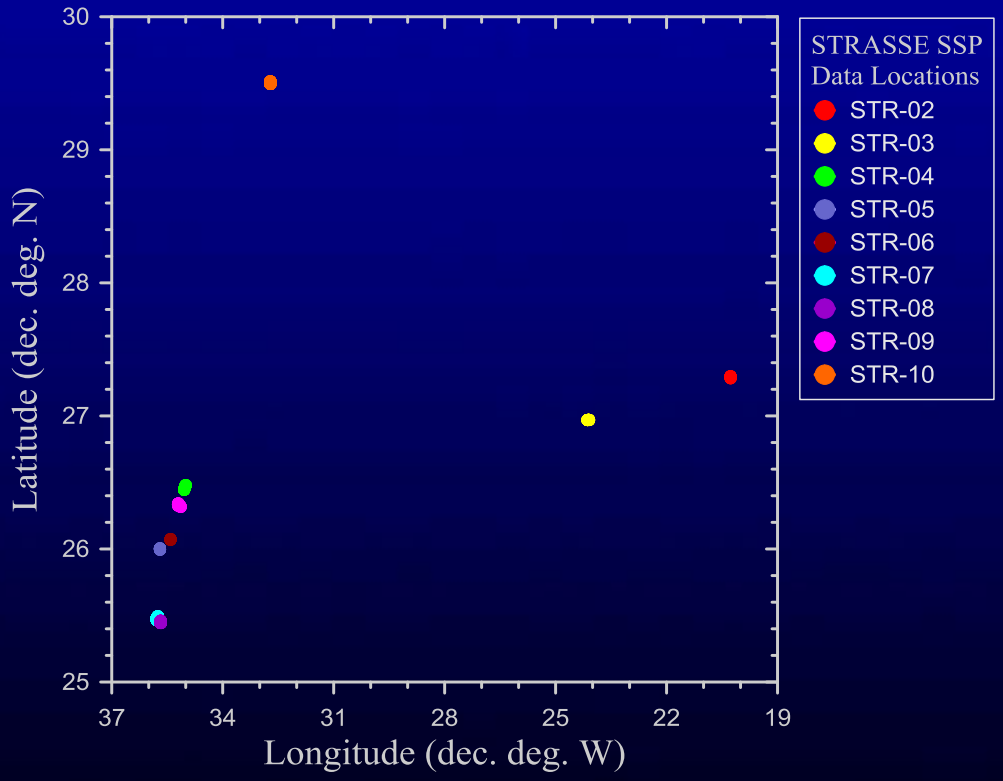
4 x SBE-49
CTDs

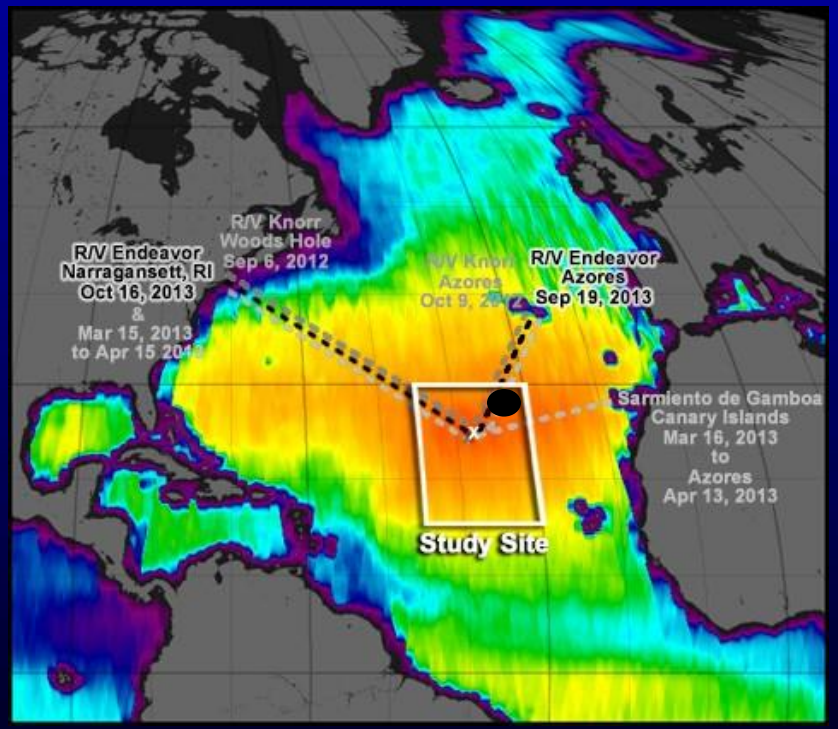
Surface-following behavior

Bubble entrainment

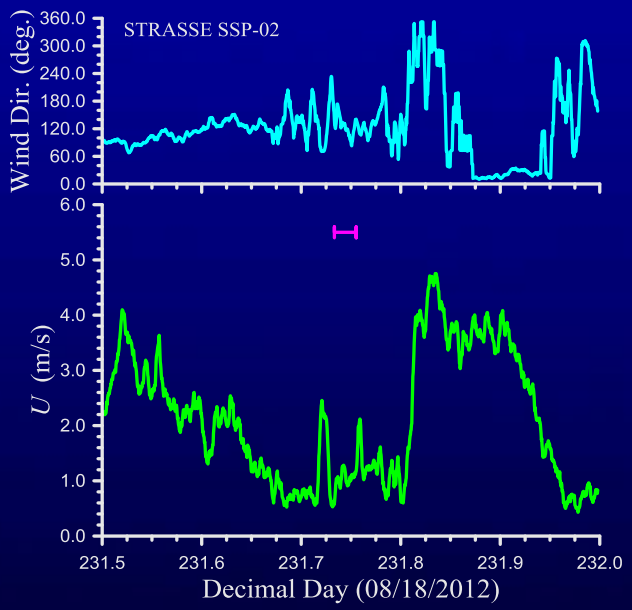


STRASSE: SSP measurements

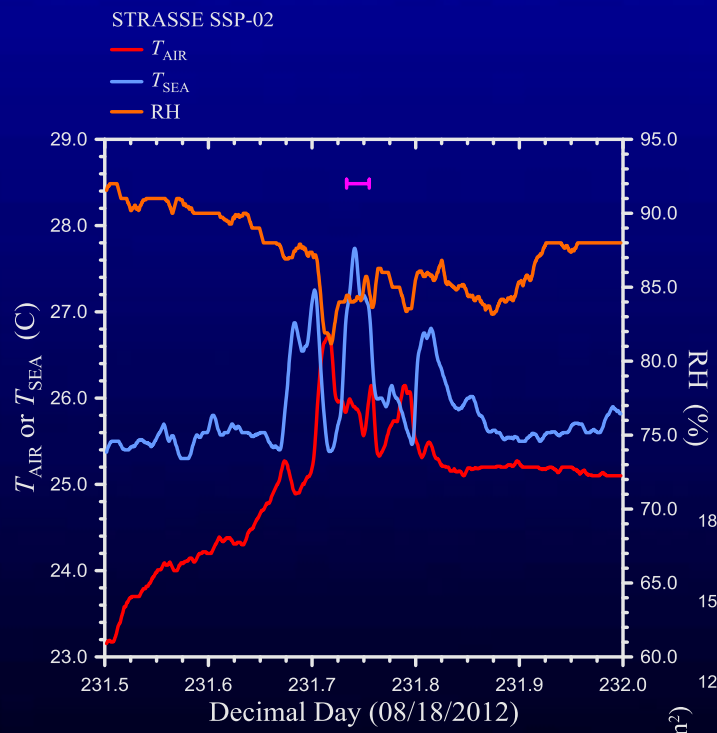




Diurnal warm layer: Part 1

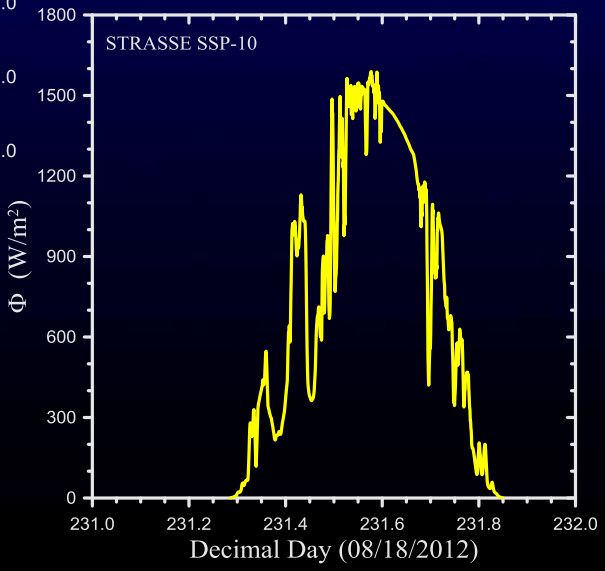


Low Wind

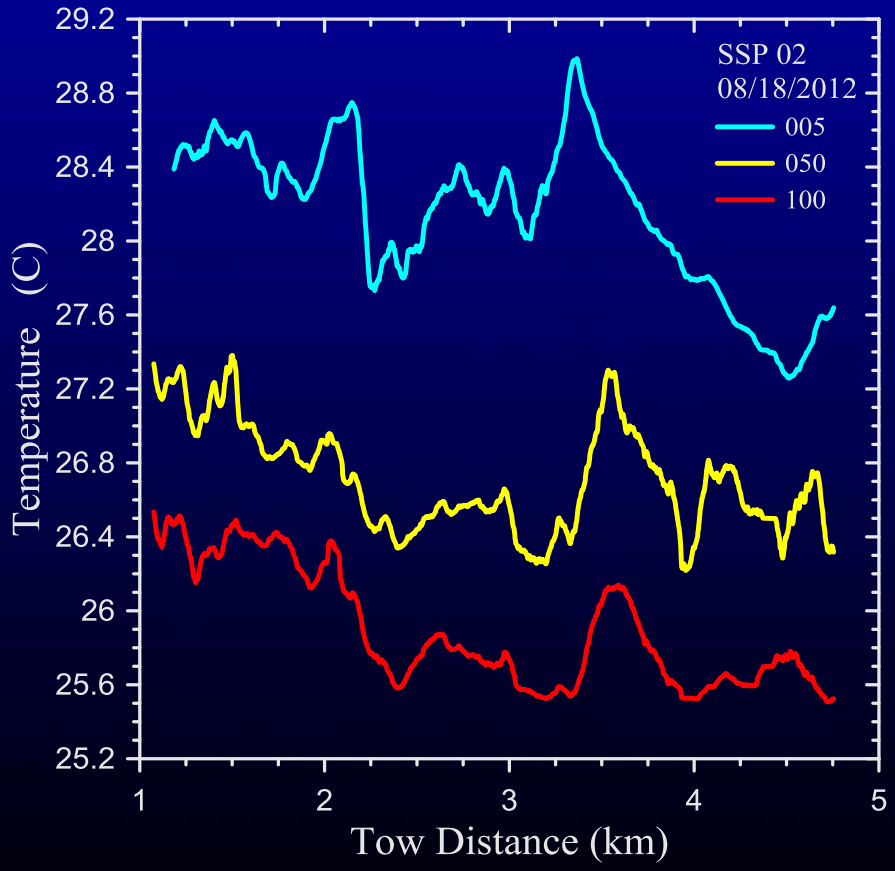


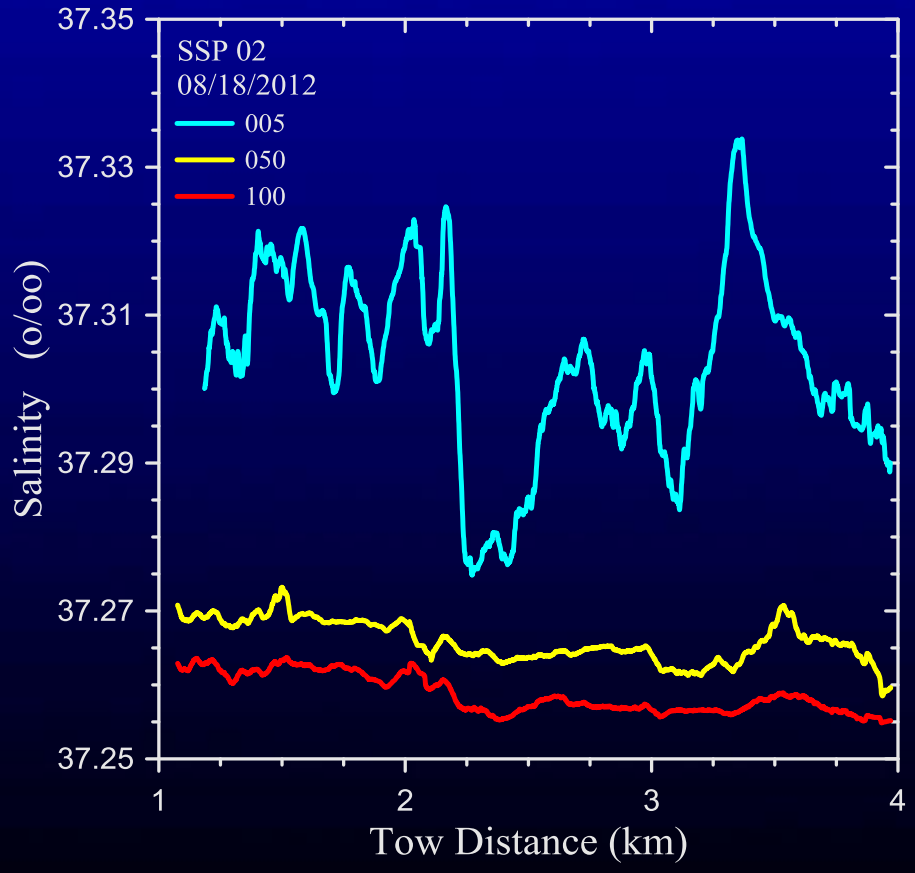
High $\Delta T_{air\text{-}sea}$
High Q_{Lat}

High Φ_{SW}

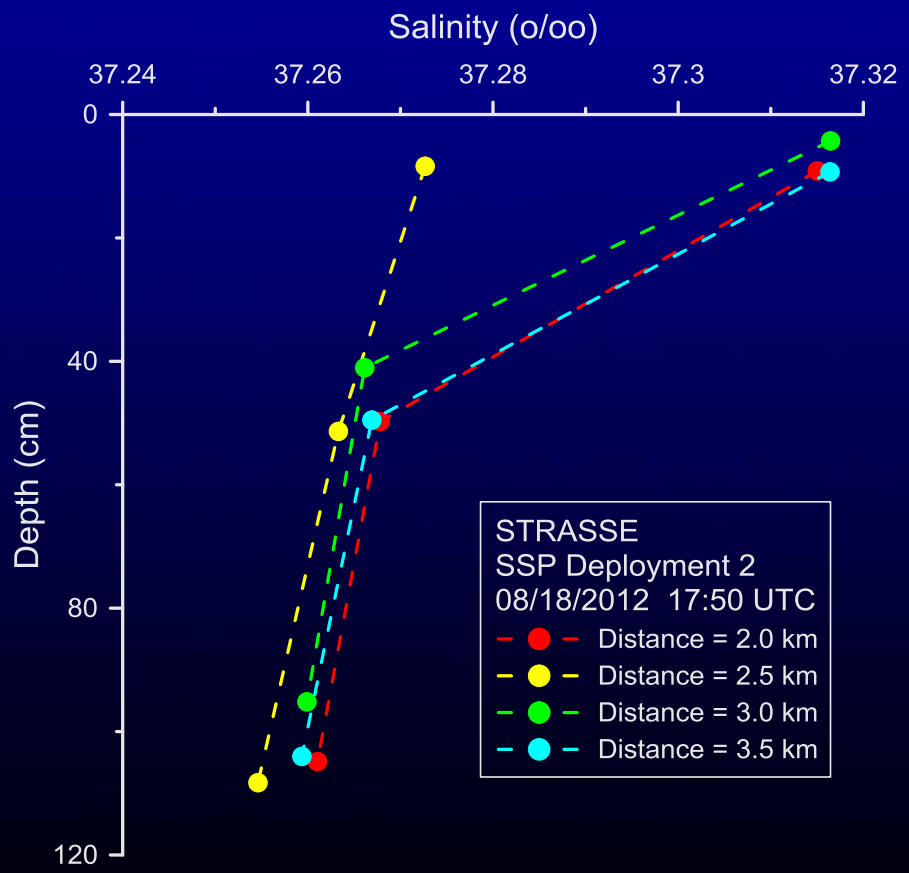


Salinity Stratification





Salinity Stratification : It is plausible?



From bulk formula:

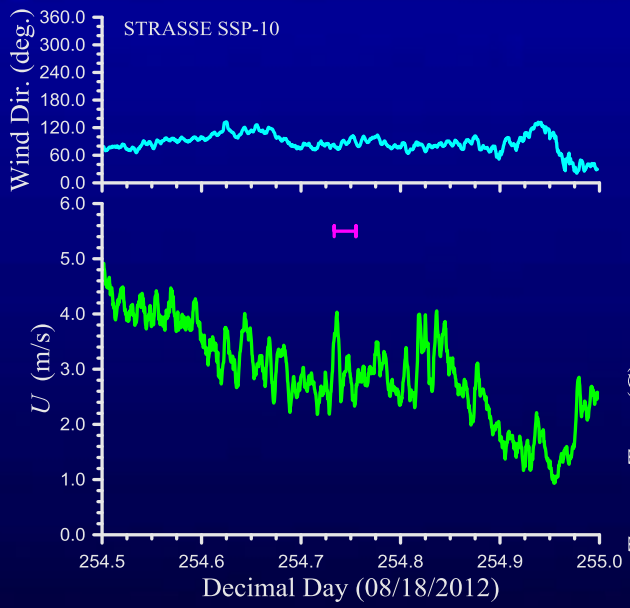
$$Q_{Lat} = \rho_A \Delta H_{vap} C_L U_{10} (q_W - q_A)$$

$$Q_{Lat} = 33.4 \text{ W/m}^2$$

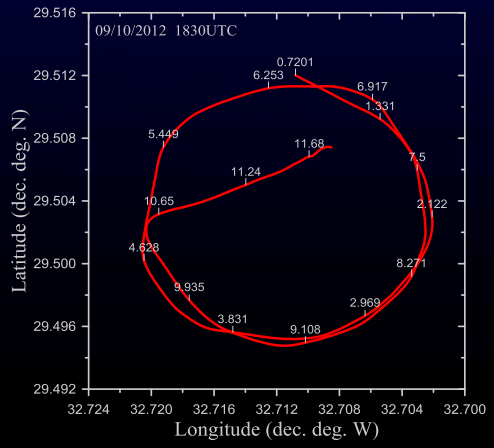
From estimating mass loss:

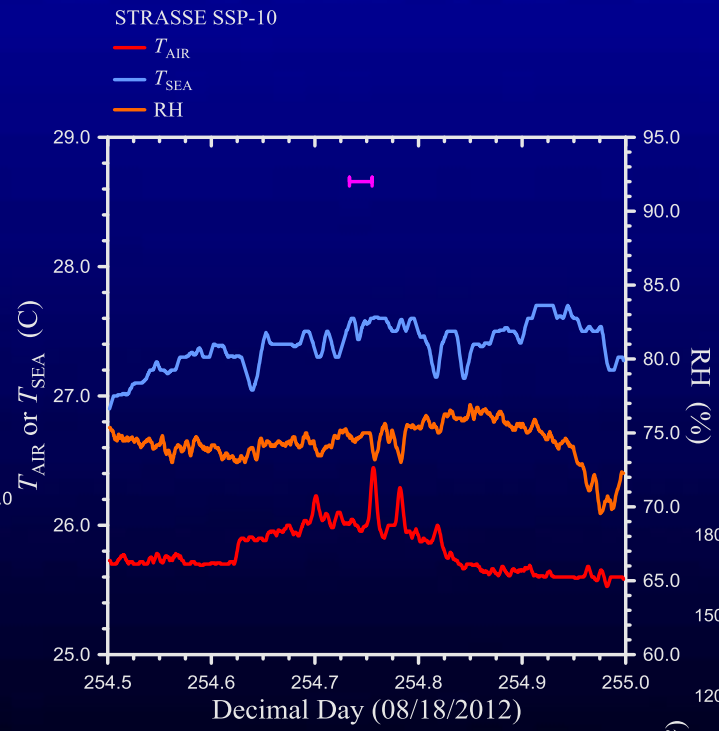
$$Q_{Lat} = 38.7 \text{ W/m}^2$$

Diurnal warm layer: Part 2



Low Wind





High $\Delta T_{\text{air-sea}}$
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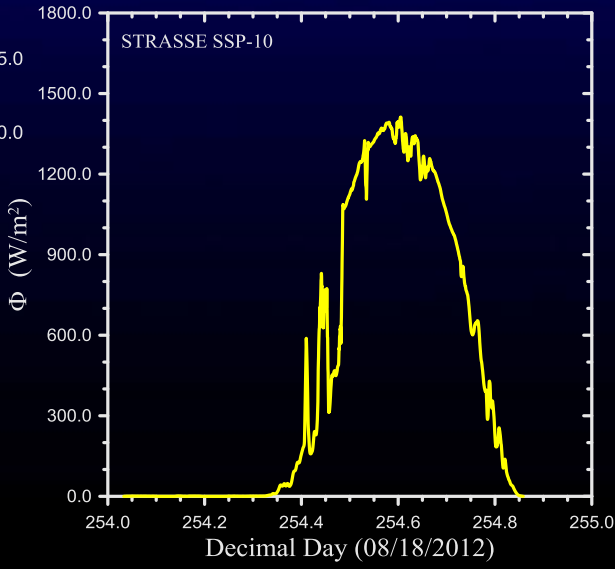
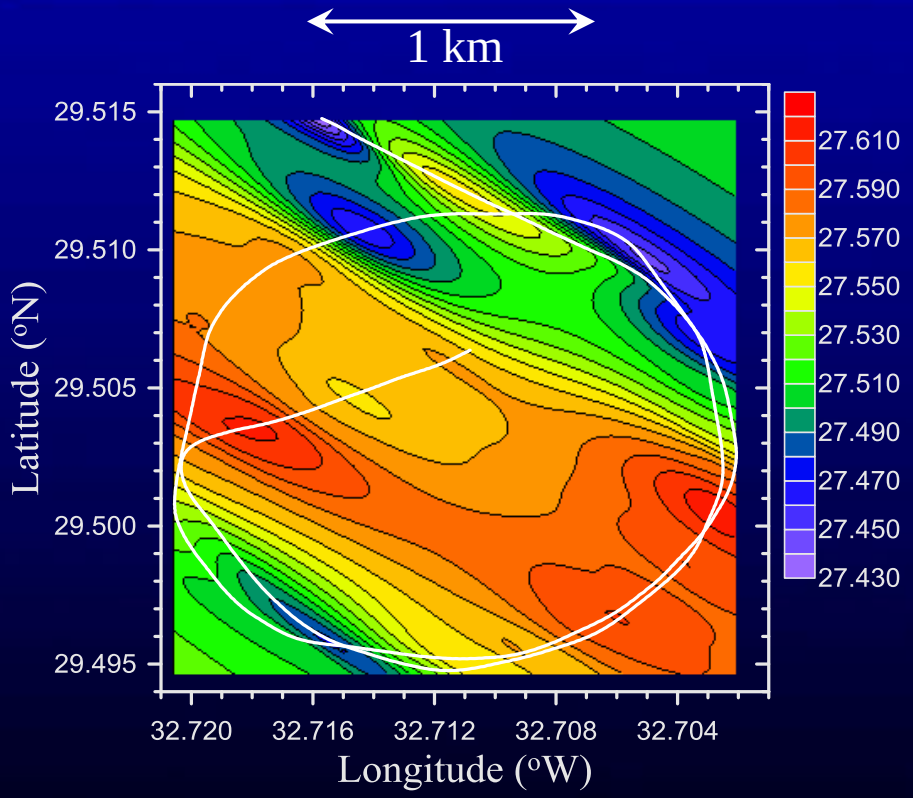
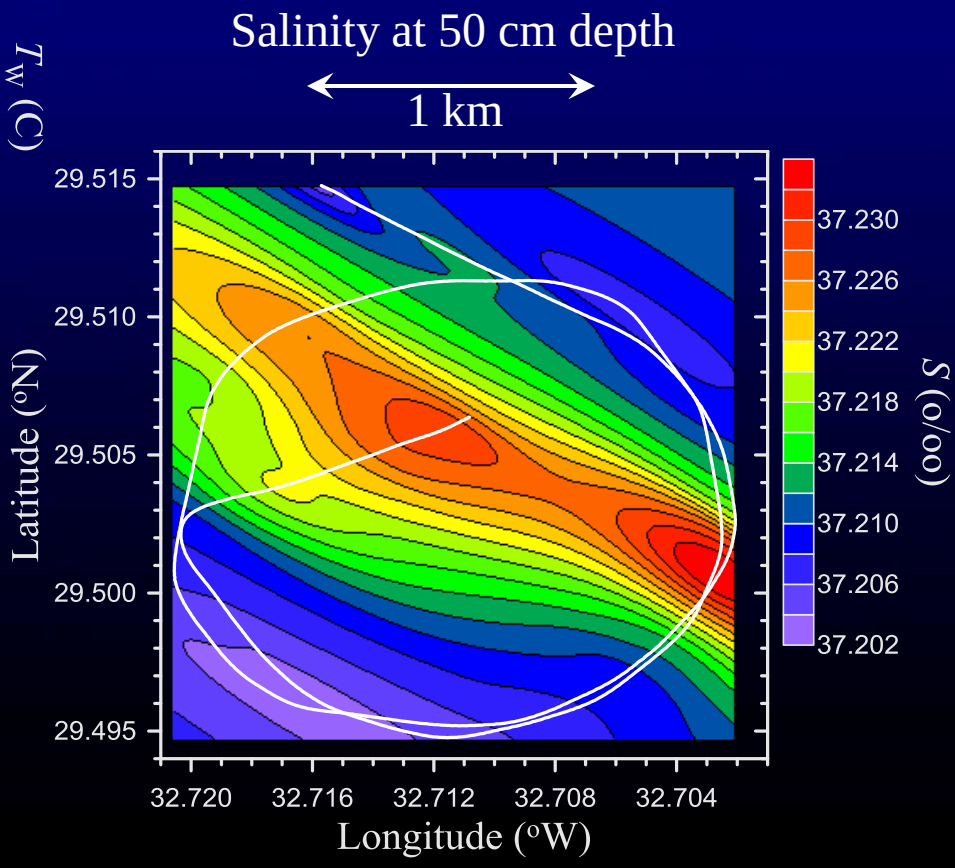


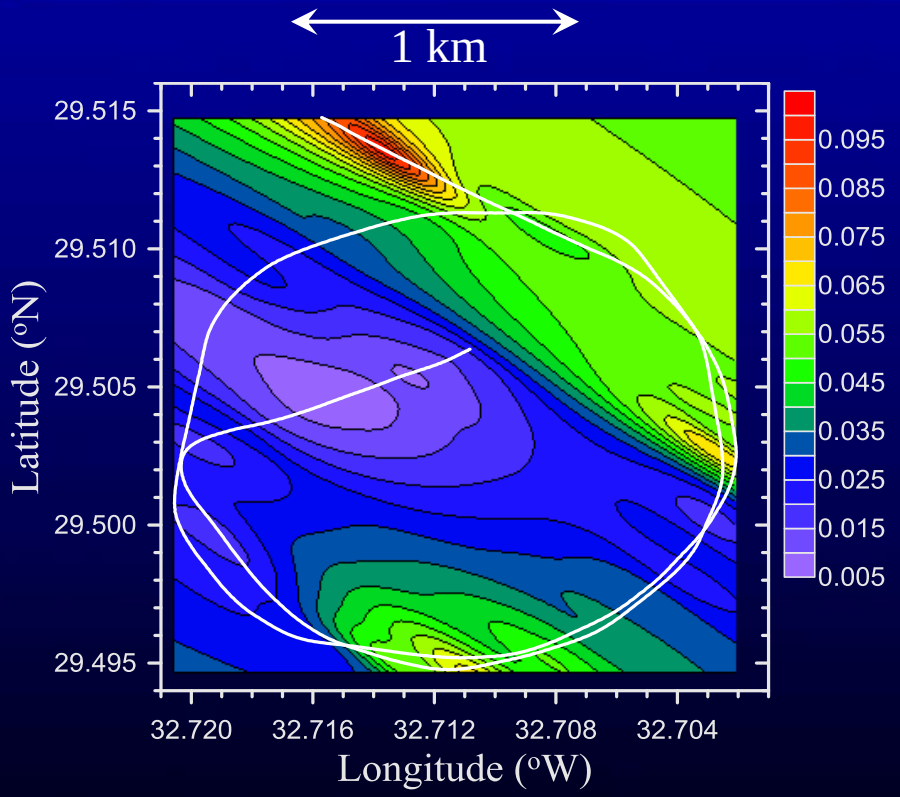
Spatial Variability of Temperature and Salinity



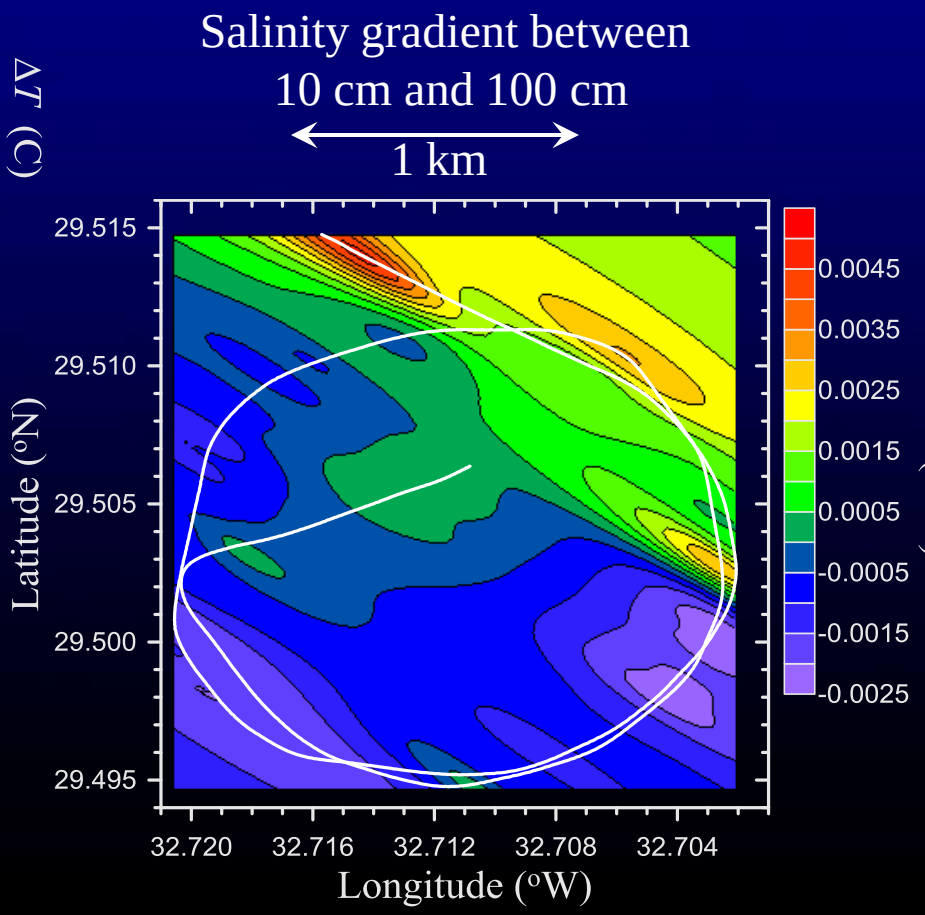
Water temperature at 50 cm depth



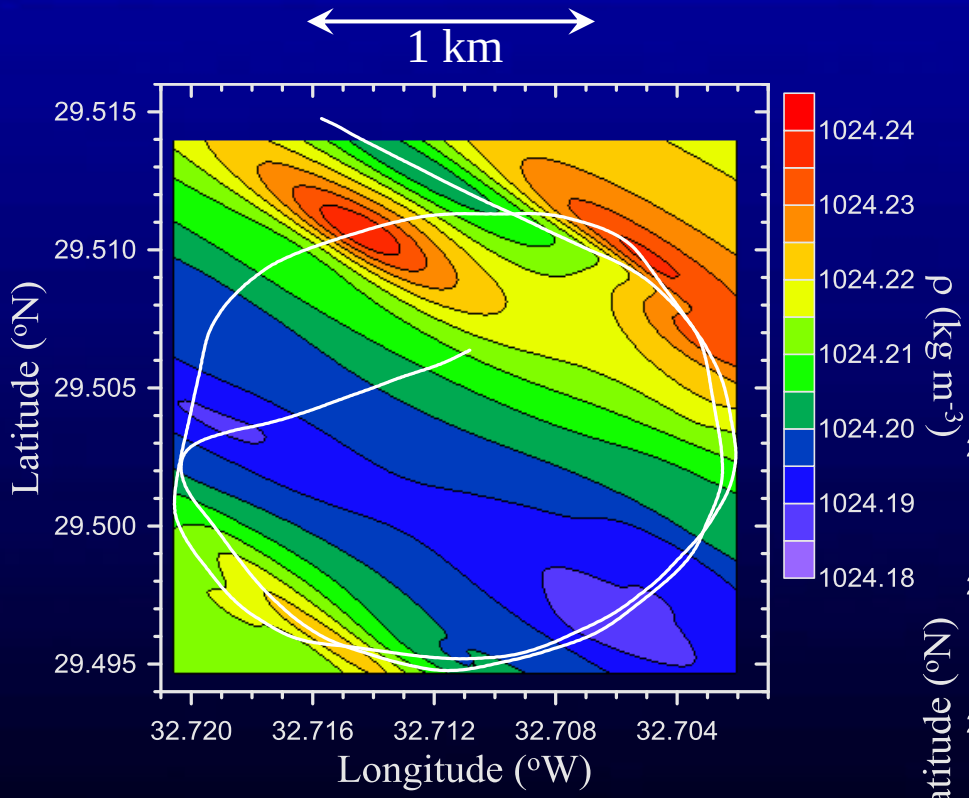
Spatial Variability of the Vertical Gradients



Temperature gradient between
10 cm and 100 cm

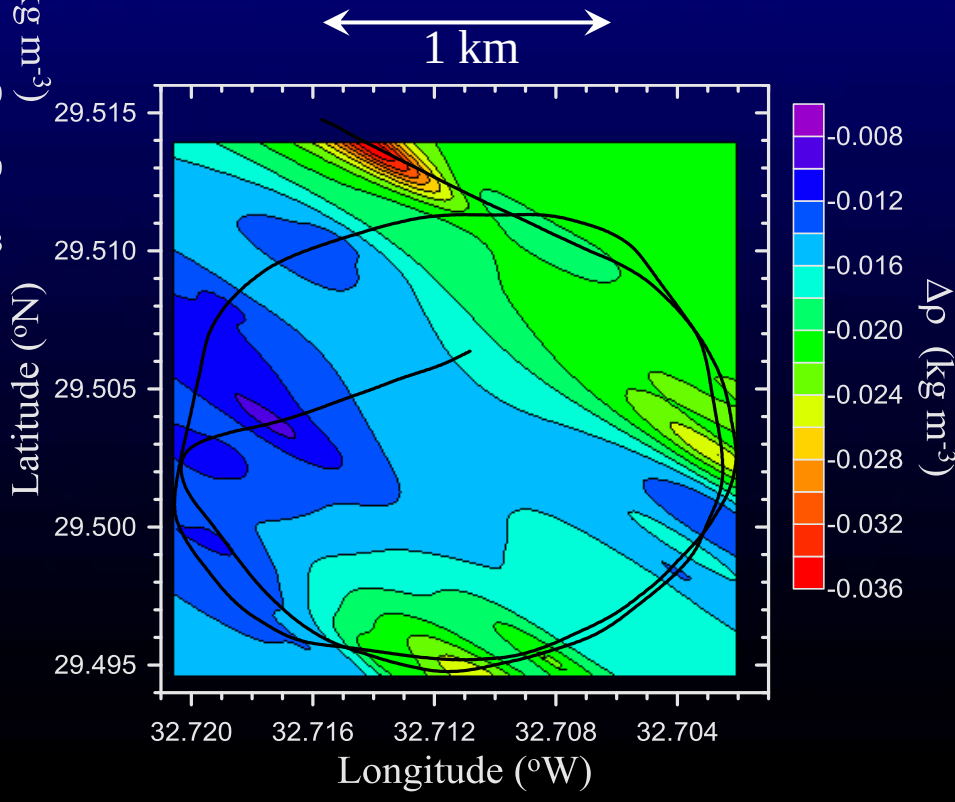


Spatial Variability of Density & Density Gradient

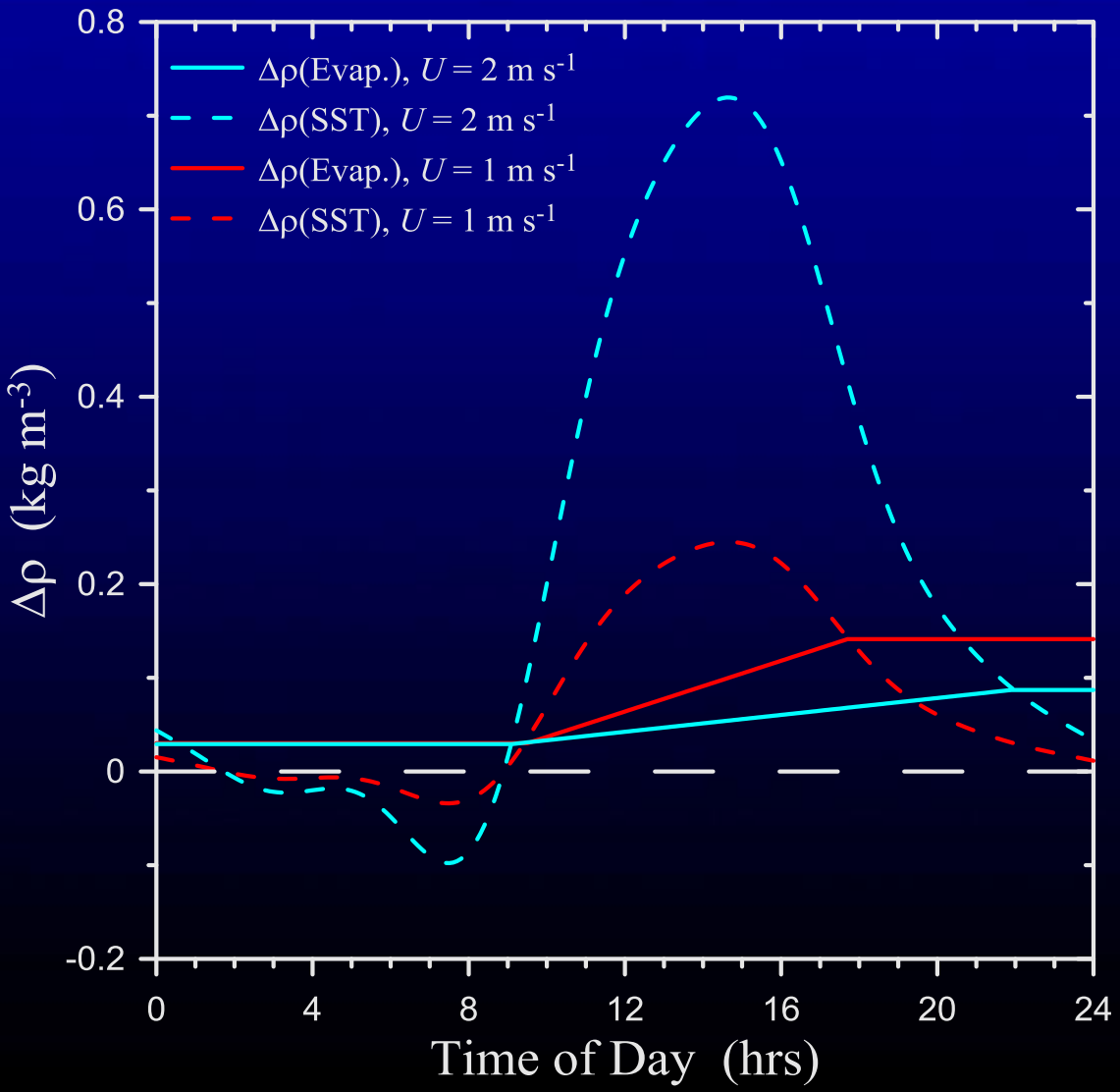


Water density at 50 cm depth

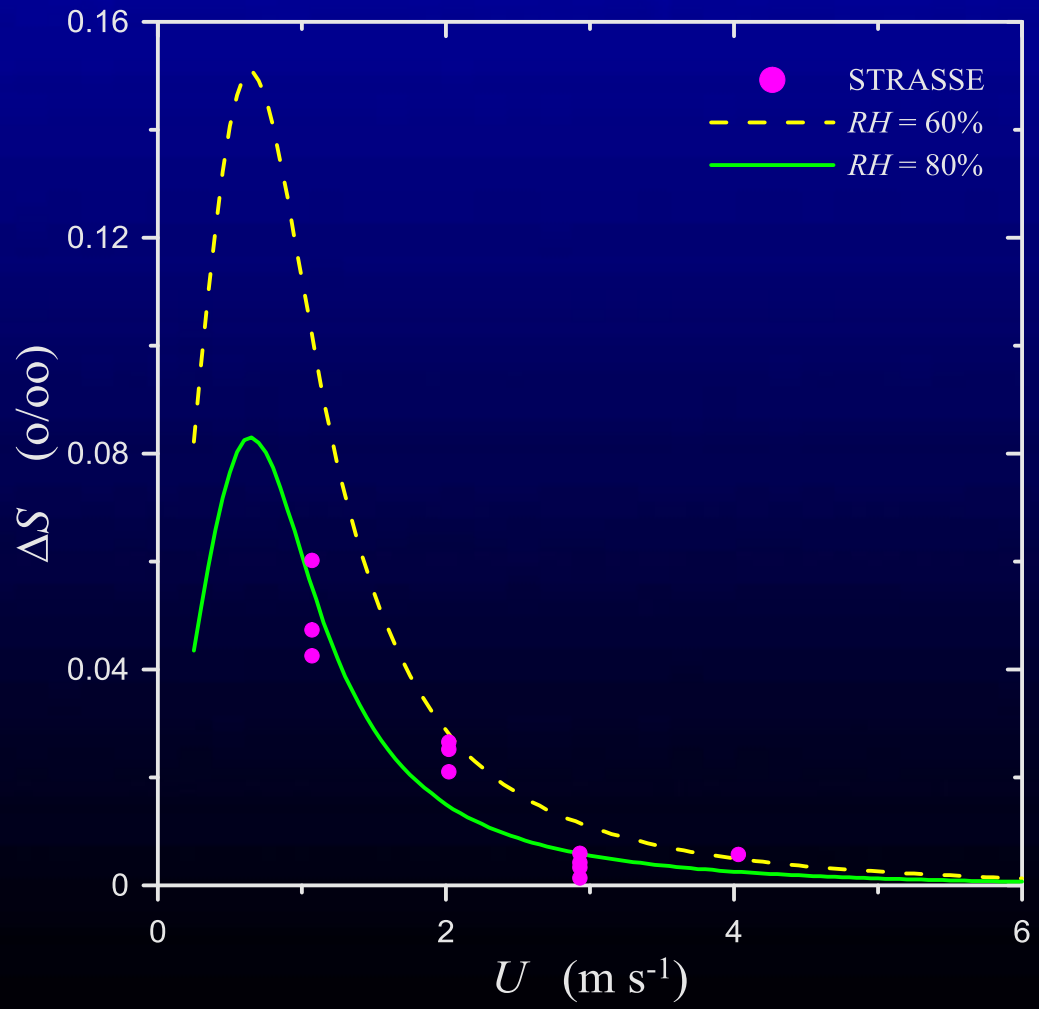
Density gradient between
10 cm and 100 cm



Time evolution and maximum value



Can you model their magnitude?



Conclusions

1. Evaporation in the presence of a diurnal warm layer can produce positive near-surface salinity gradients at low wind speed

2. Vertical gradients in *T* and *S* are spatially correlated

3. However, unless relative humidity is unrealistically low, positive salinity gradients probably do not represent a significant issue for Aquarius