

The Question: Should any special efforts be made with respect to underway measurements: adcp, T/S, met, nav, ctd...?

Yes! I have been studying R/V and VOS underway surface data and find it to be a vastly underutilized resource for study of ocean small and meso- scale eddy/frontal features.

UNOLS ships beside being a platform to lower or release instrument of varied types, has the capability to obtain, on a non-time interference basis, high horizontal resolution surface layer information that can knit together [meld] the data return from Lagrangian and Eulerian assets.

Underway: ADCP (upper 100s of meters); SST, SSS, ocean color, Meteorology {wind, Ta etc...}
 En route: xBT and xCTD probes.

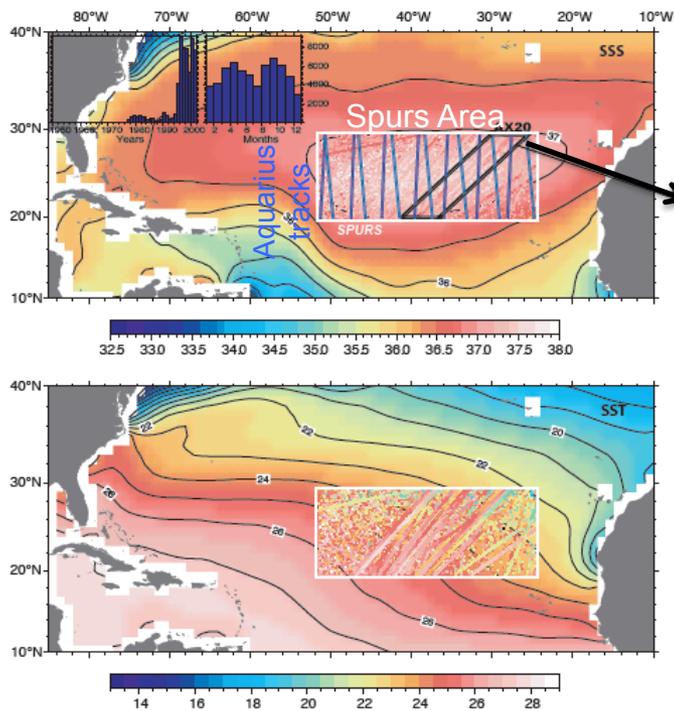


OPERATING INSTITUTION	SHIP
LARGE / GLOBAL	
Scripps Institution of Oceanography	MELVILLE
Woods Hole Oceanographic Institution	KNORR
University of Washington	THOMAS G. THOMPSON
Scripps Institution of Oceanography	ROGER REVELLE
Woods Hole Oceanographic Institution	ATLANTIS
Lamont-Doherty Earth Observatory	MARCUS LANGSETH
OCEAN	
University of Hawaii	KILO MOANA
INTERMEDIATE	
Oregon State University	WECOMA
University of Rhode Island	ENDEAVOR
Woods Hole Oceanographic Institution	OCEANUS
Scripps Institution of Oceanography	NEW HORIZON

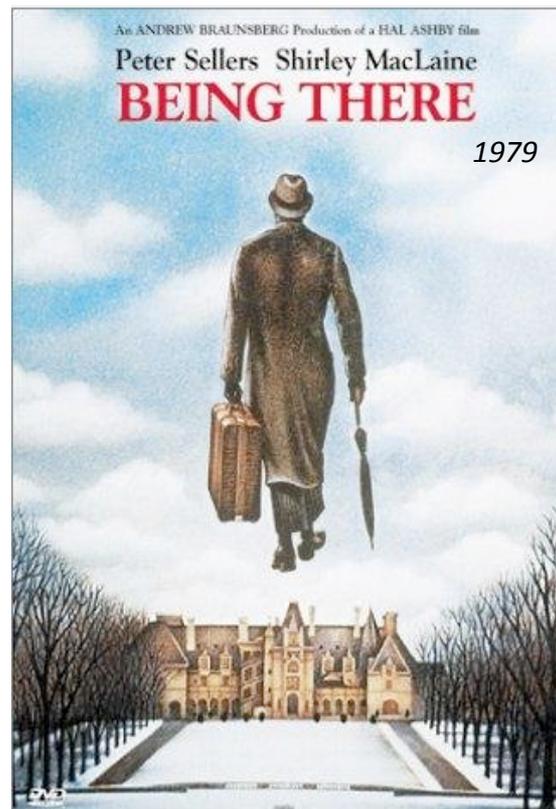
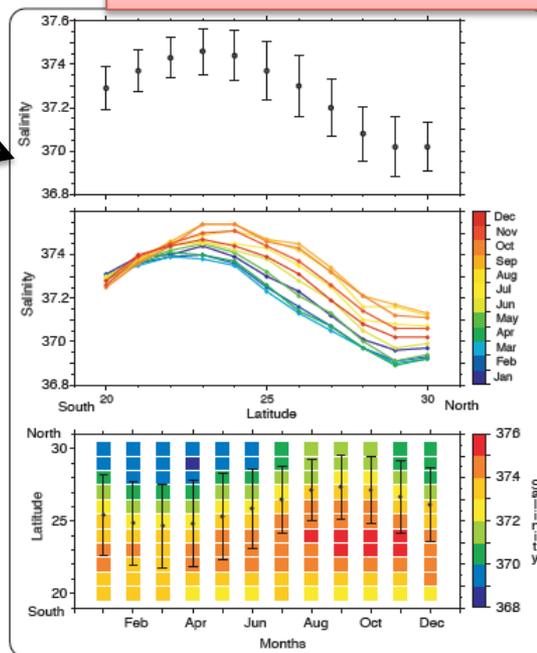
Model output; **satellite** derived sea surface height (SSH) and SST; **ship-based underway measurements** of SST, sea surface salinity (SSS) and hull mounted Acoustical Doppler Current Profilers (hADCP), reveal an abundance of mesoscale and sub-mesoscale structures in subtropical surface water. R/V UNOLS with underway data collection capability just **‘being there’** is a real asset.

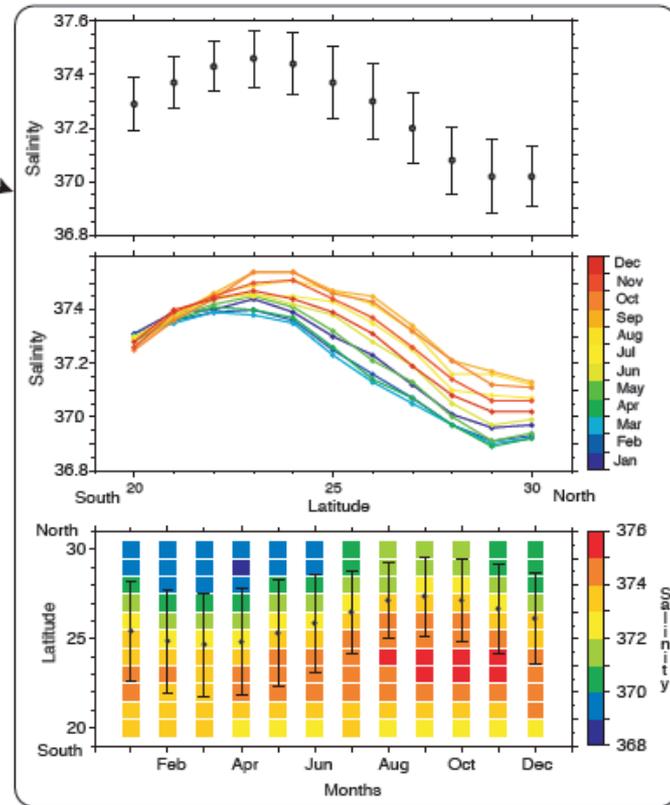
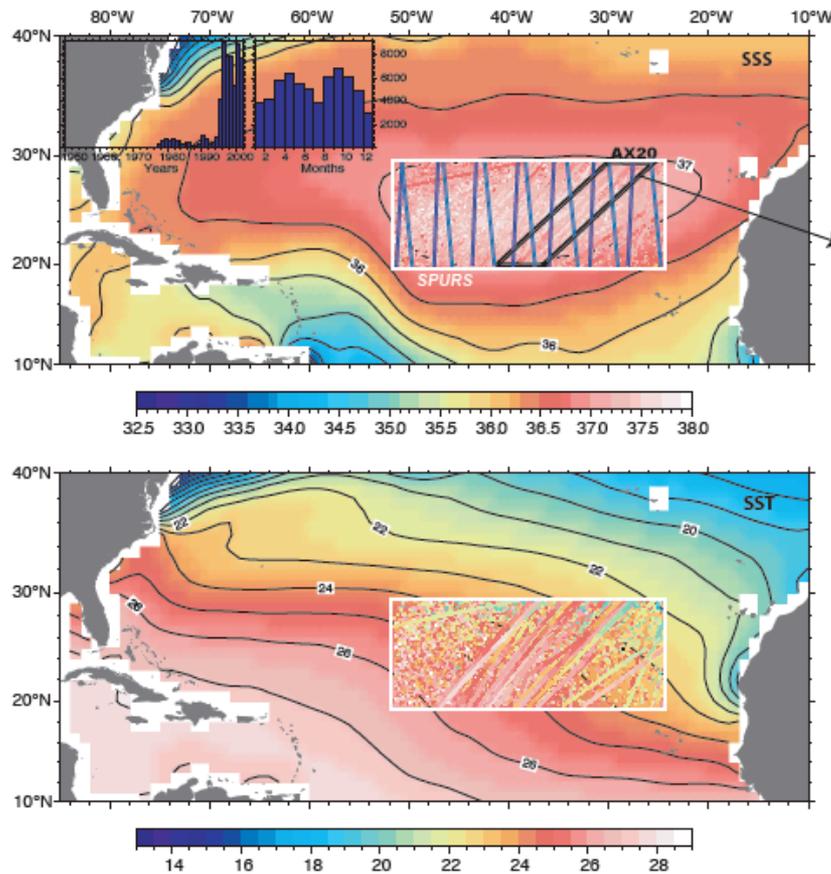
We should collect and QC underway data (also xCTD) along the ship track, perhaps in specific patterns at opportune times during SPURS. It is a cost-effective component to meld together data sets from SPURS moorings, gliders, drifters, argo profilers and Aquarius.

Within the SPURS area: SSS and SST data from VOS tracks (Delcroix et al., 2005). *The histograms indicate the number of observations per year and per month*



Trends within black trapezoid from VOS data

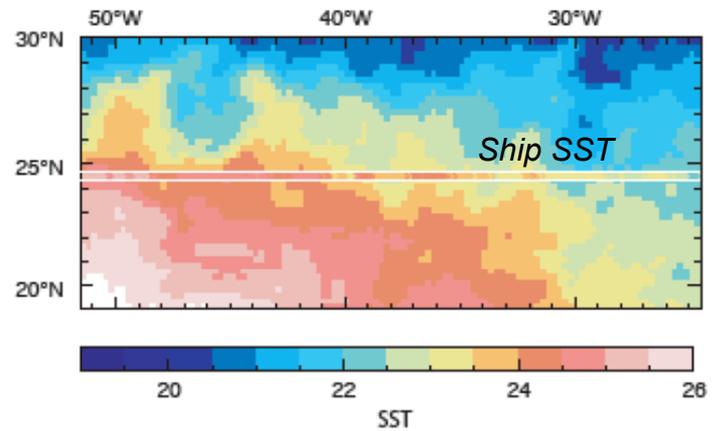
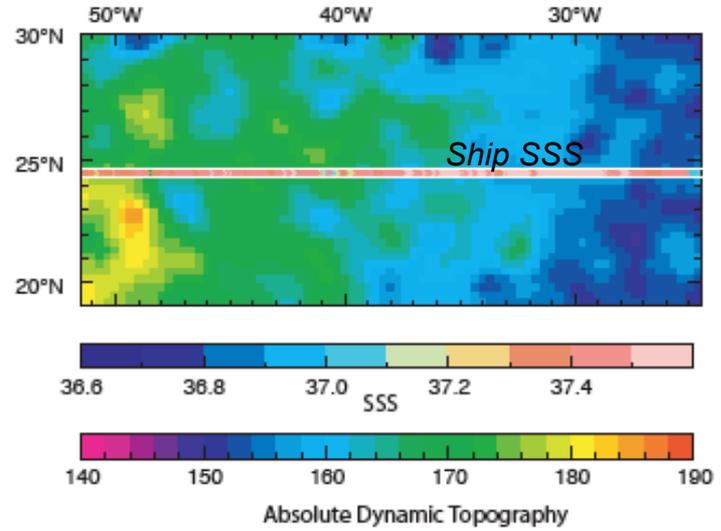
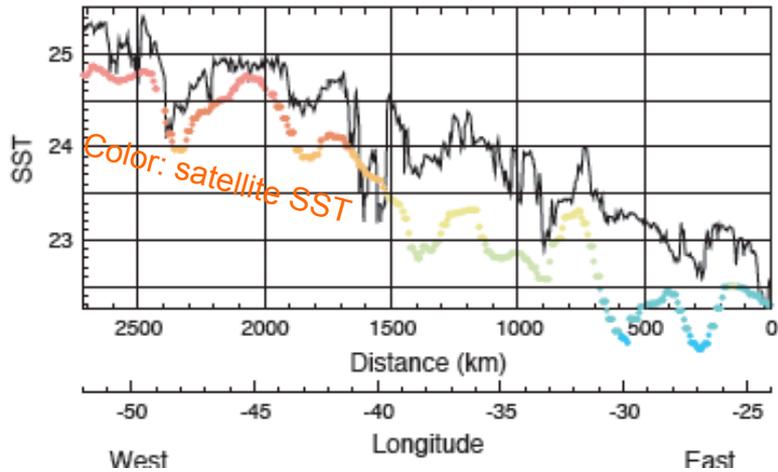
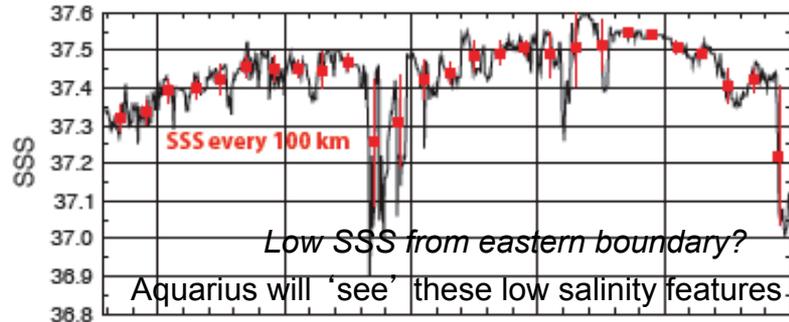
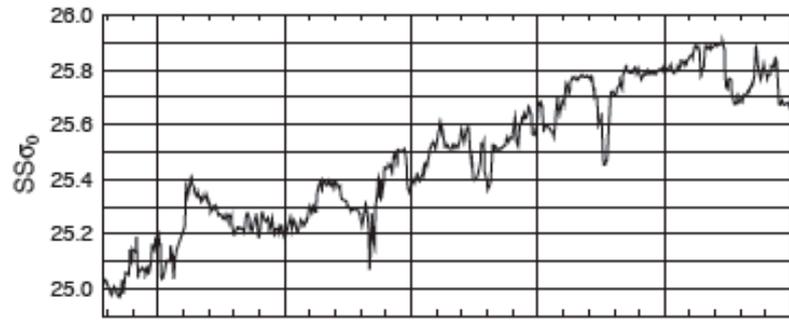




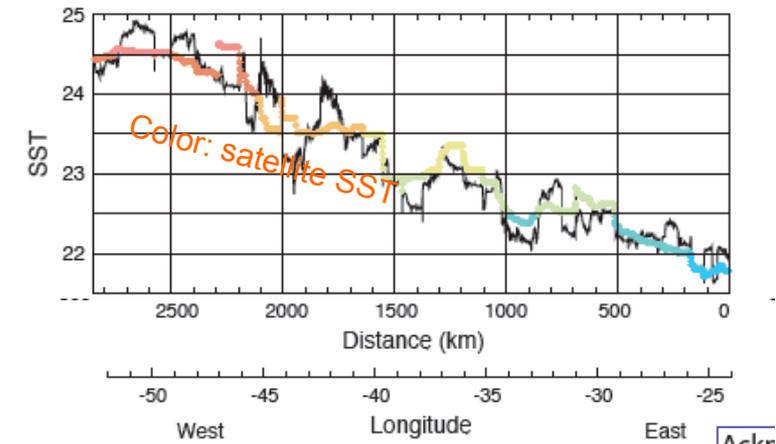
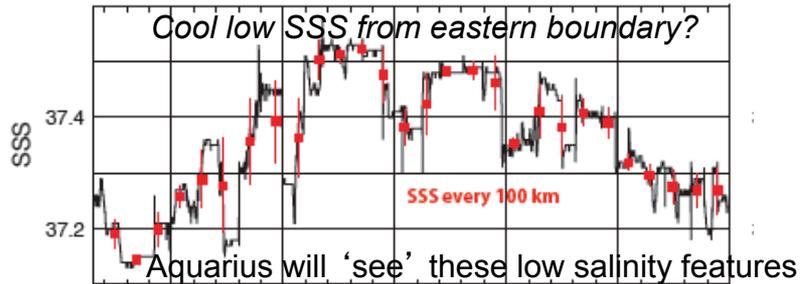
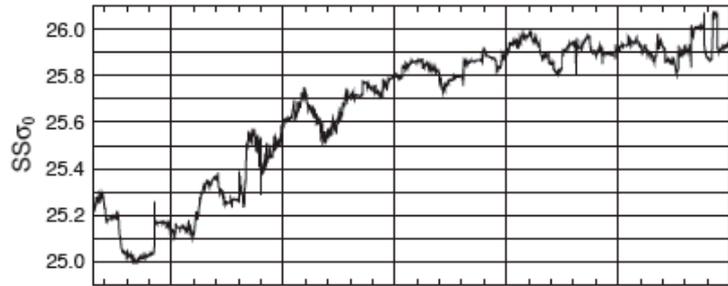
The climatic view of SSS is deceptively smooth as the meso-scales features are ‘averaged-out’. The white box indicates the SPURS site. Within the SPURS area, color-coded circles represent SSS and SST data from Voluntary Observing Ship (VOS) tracks (Delcroix et al., 2005; French Sea Surface Salinity Observation Service <http://www.legos.obsmp.fr/observations/sss/>). The histograms indicate the number of observations per year and per month.

Monthly SSS and standard deviation values computed for the polygon within the SPURS area. *Upper panel: annual mean and standard deviation as a function of latitude; middle panel: monthly SSS by latitude; lower panel, SSS color-coded by months (x-axis) to latitude (y-axis). Notice increased range of SSS in the more northern latitudes.*

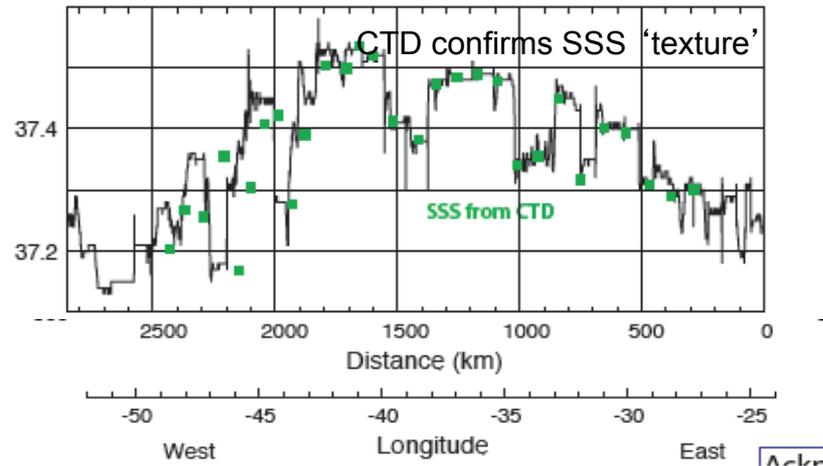
14-18 Jan 1998 R/V R.Brown



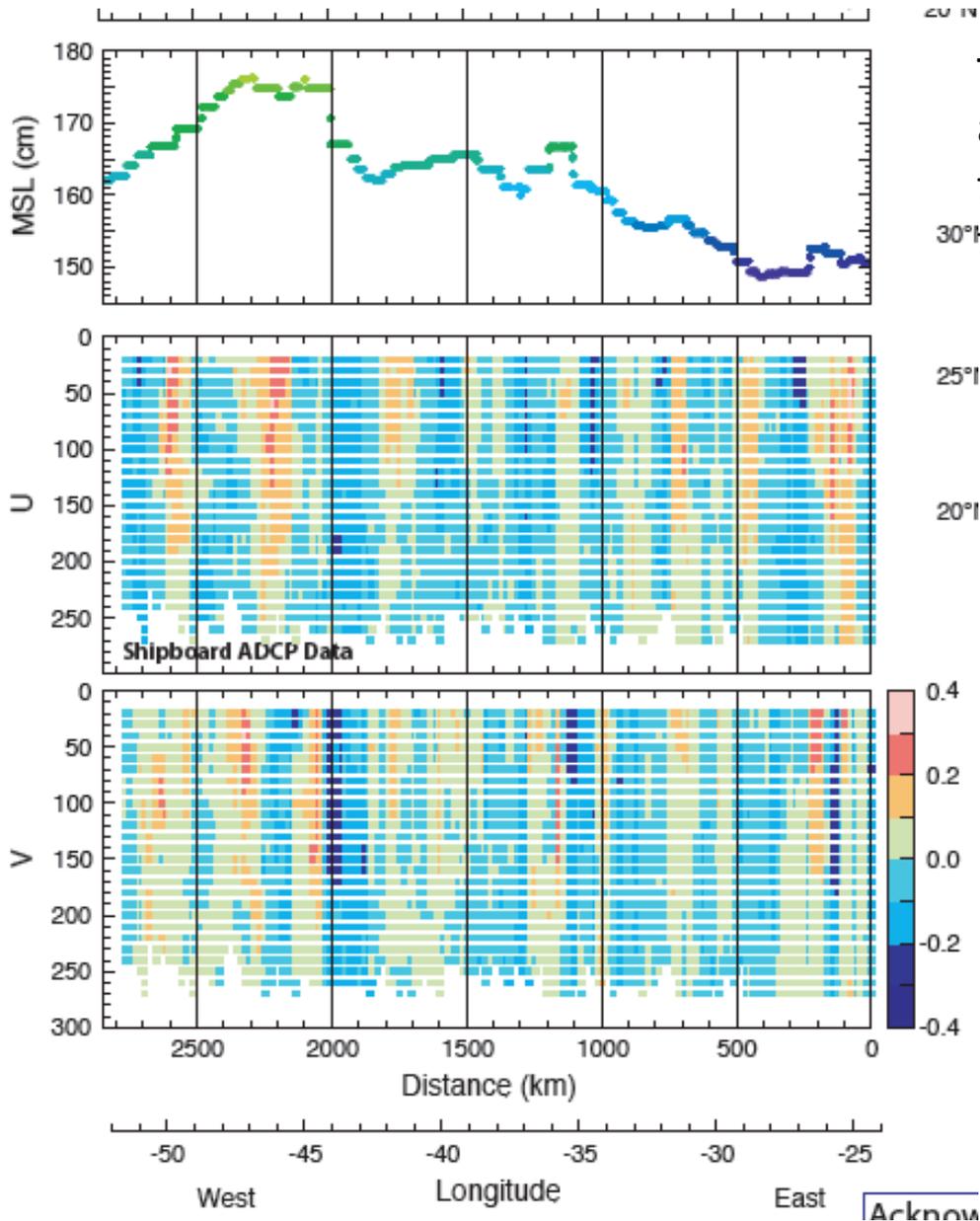
24 Apr-05 May 2004 RRS Discovery



Underway SSS and SST at a ~ 0.6 km spacing, from April-May 2004 (RAPIDMOC cruises). Data supplied to BODC by Dr. Stuart Cunningham; <http://www.bodc.ac.uk/projects/uk/rapid/>. Also shown the SSS (green symbols) computed as an average of the upper 20 m from the CTD data collected during the same cruise.



The SSS fluctuations observed in the subtropical regime at the 100 km scale are intense enough to be recorded by Aquarius. The high horizontal SSS gradients measured by the underway instruments is also observed from calibrated CTD data.



20 14

The mean sea level averaged spatially and temporally along the cruise track from Aviso

25°N

20°N

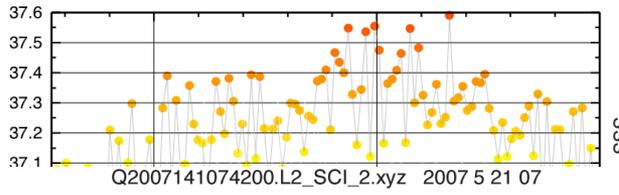
shipboard ADCP data sections collected during the cruise.

The Aviso MSL, and the ship based hull mounted ADCP data reveal a very active meso-scale, as does the ship based underway SST/SSS data. The velocity field and the SSH, SST and SSS signals are coherent with each other. The swirls of eddies and accompanying SST and SSS fluctuations are likely to be associated with mini-density fronts, and biological productivity, which may link the sea surface features to the subsurface stratum.

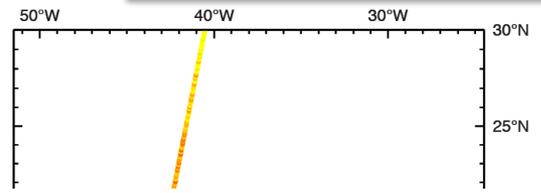
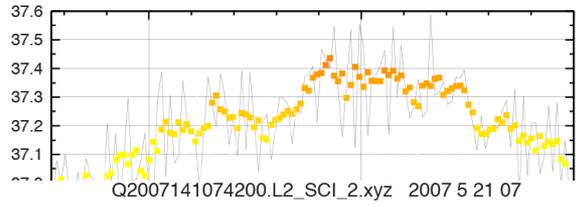
Acknow

AQUARIUS Level 2

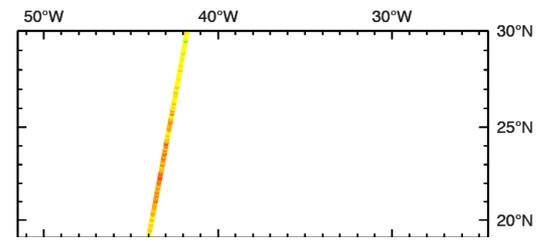
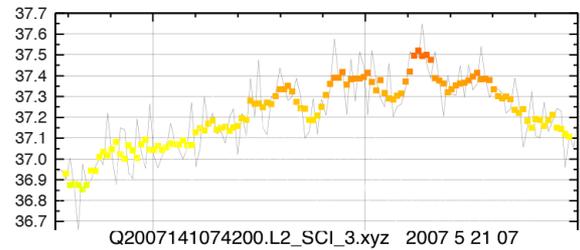
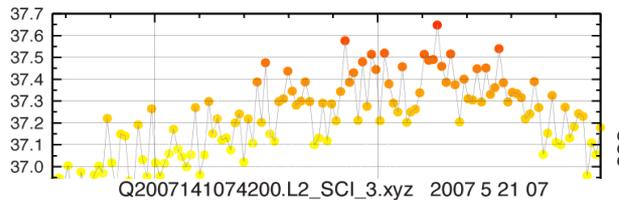
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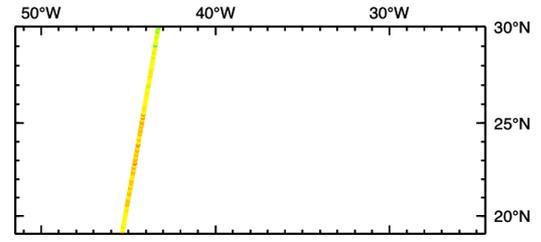
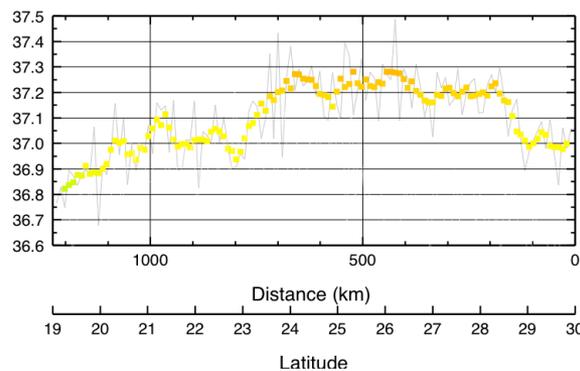
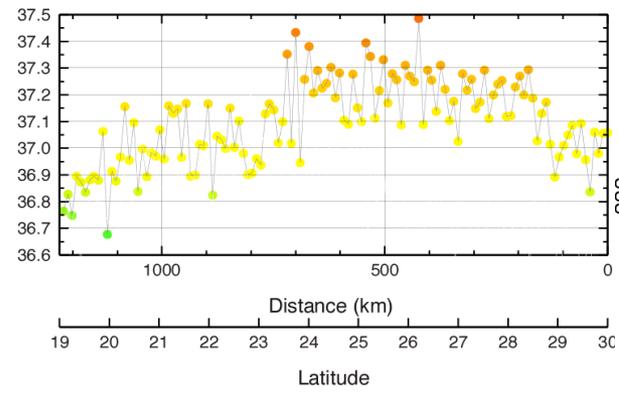
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Aquarius SSS L2 daily data (21 May 2007), same as previous slide, but color SSS had been smoothed by running mean of 5 values. Gray lines, are the original data at spacing of 10km.

Horizontal scales of surface layer characteristics [SST, SSS, velocity upper 400 m, other] of the subtropical sub-mesoscale/ mesoscale/fronts, plus XCTD, to meld together the varied data return from SPURS Lagrangian and Eulerian observational components and satellite data (*Aquarius*).

Just by having the UNOLS ship
‘Being There’

*Issue- how to best utilize this resource:
passive, active, combination?*

