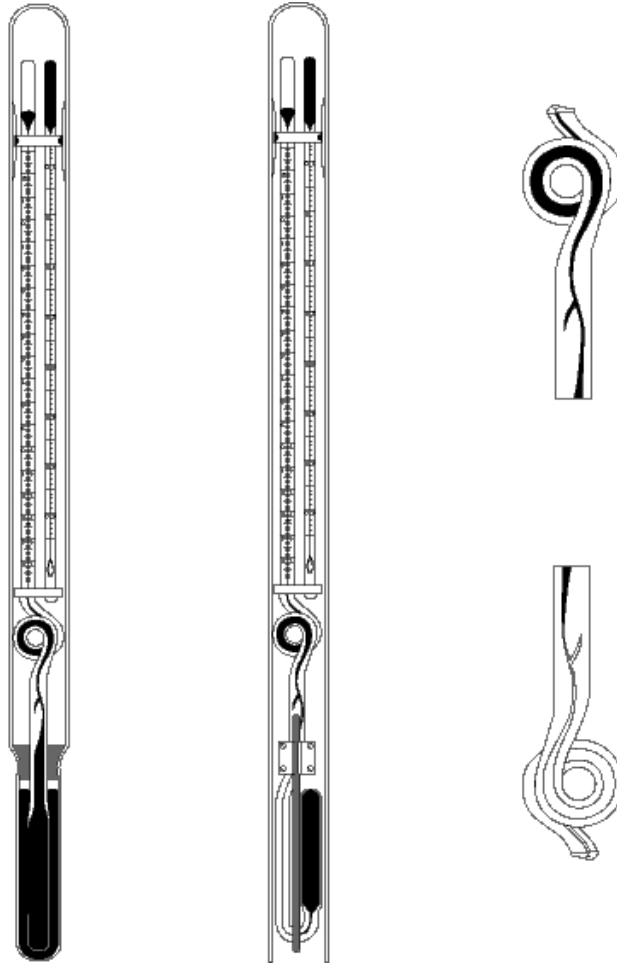


Oceanographic Instruments

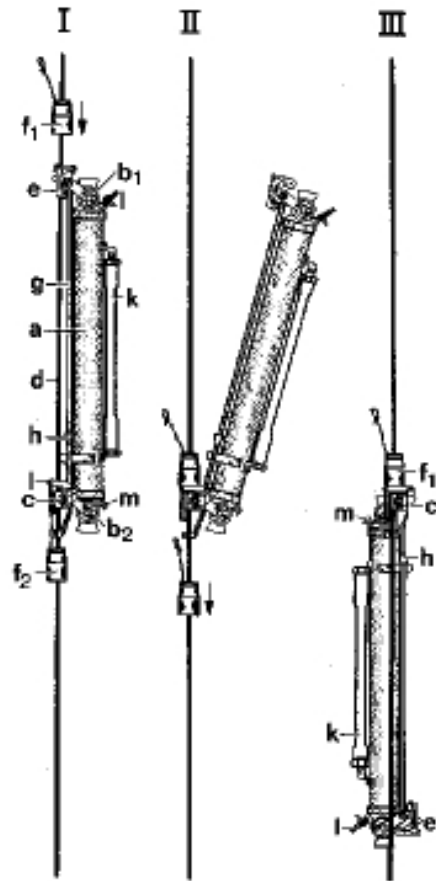
SIO 221B

Sarah Gille

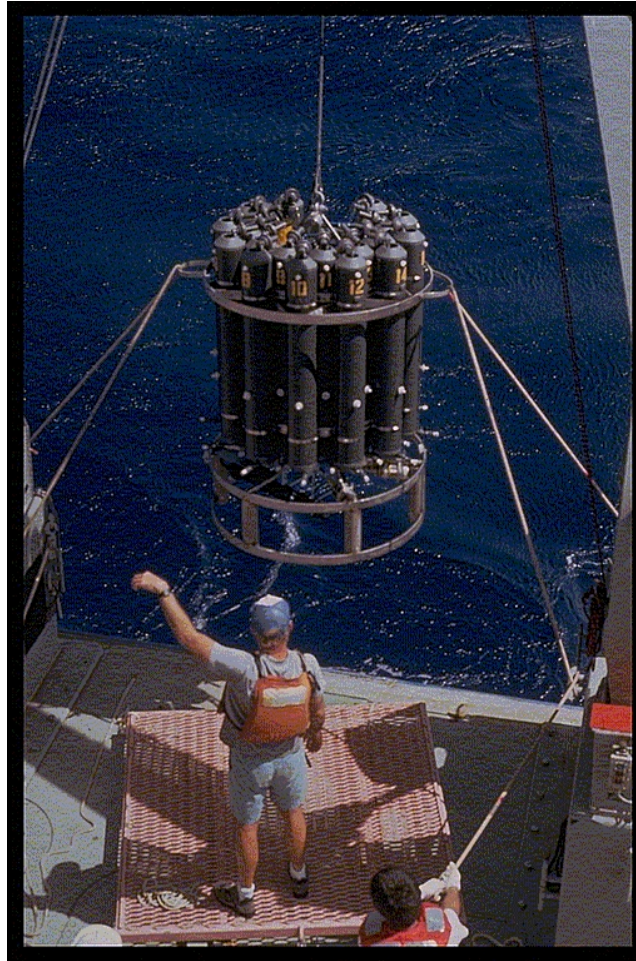
Reversing Thermometers



Water Samples: Nansen Bottles

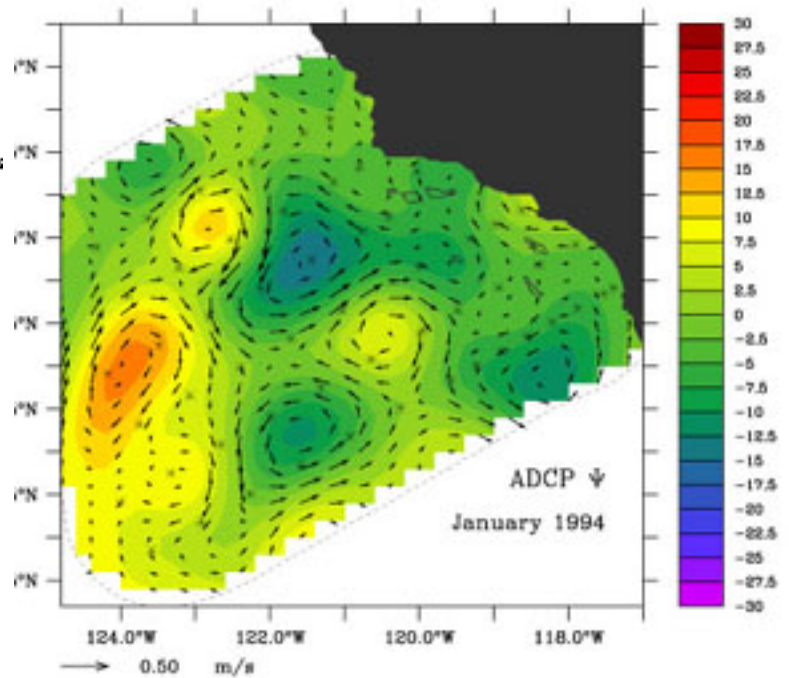
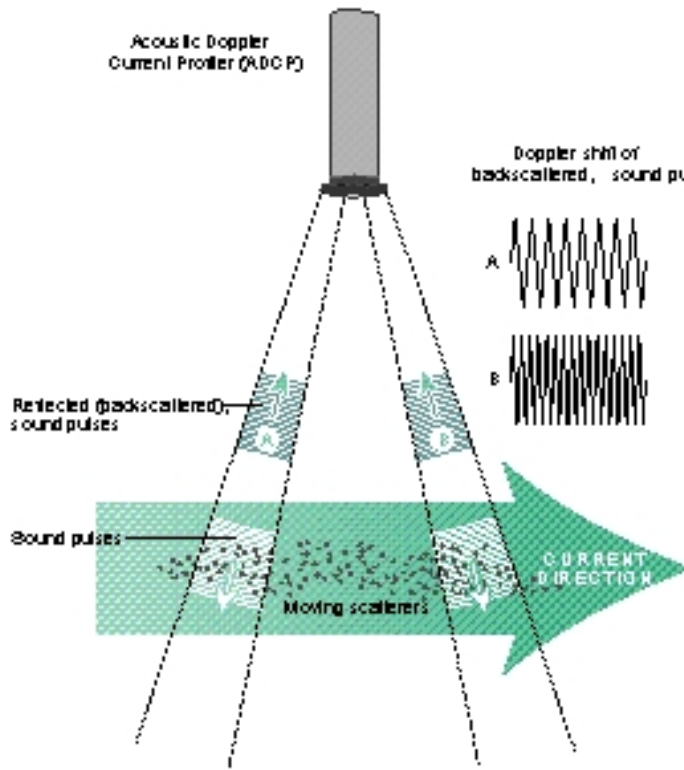


CTD and rosette



<http://www.pmel.noaa.gov/vents/PlumeStudies/WhatIsACTD/CTDMethods.html>.

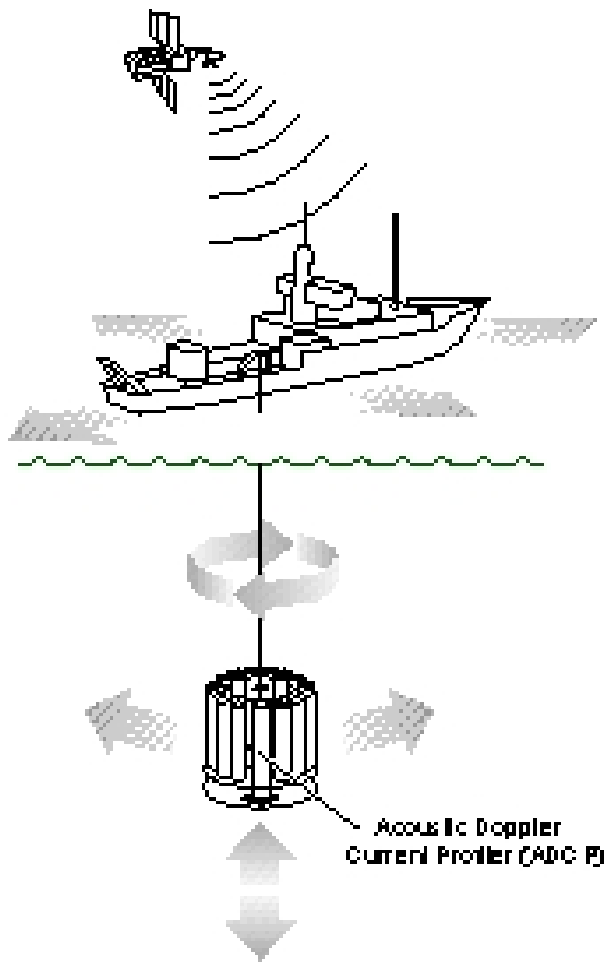
Shipboard ADCP



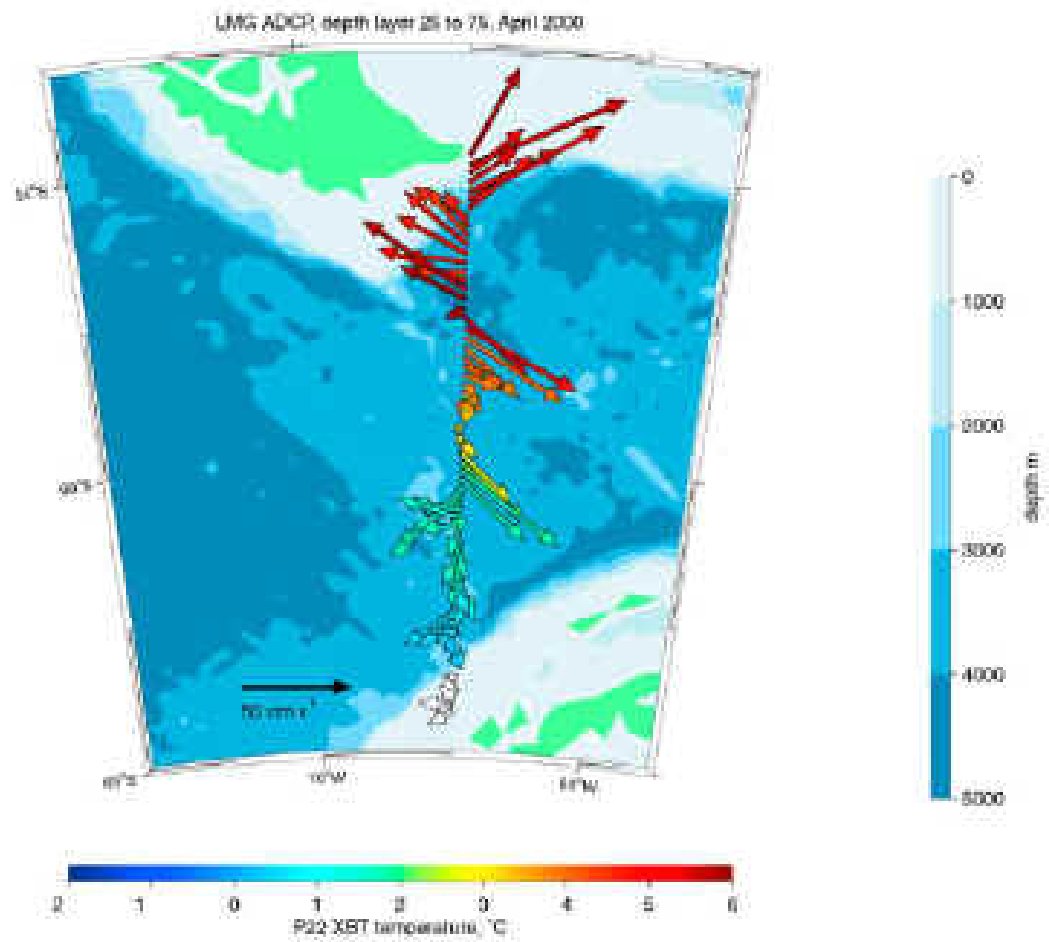
ADCP velocity on streamfunction, (75–125 m average)

<http://ccs.ucsd.edu/~teri>

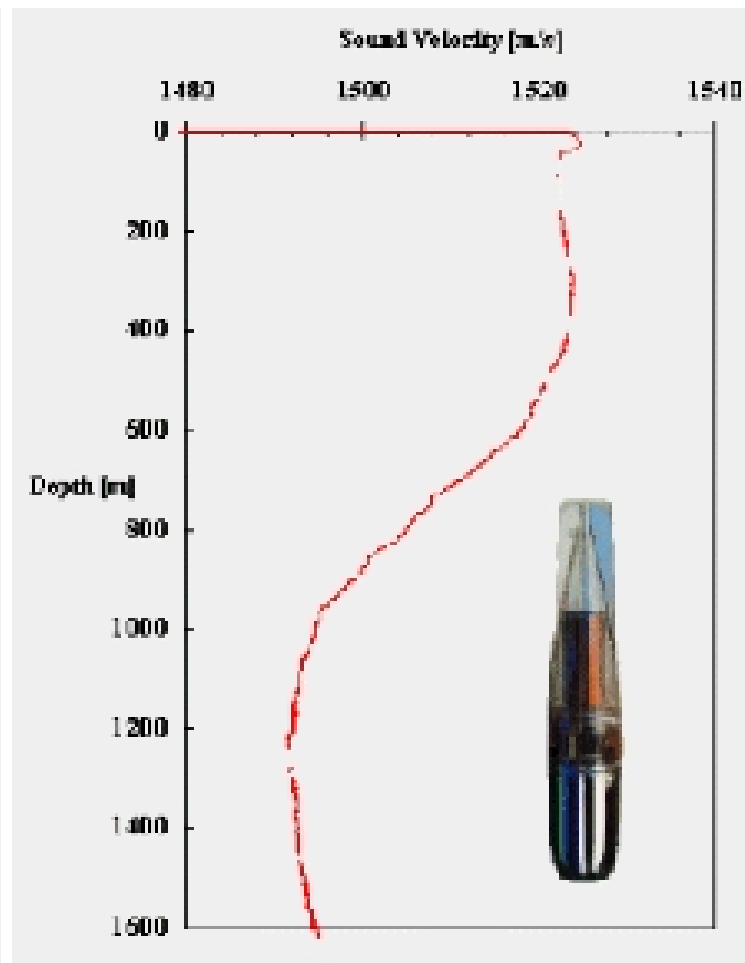
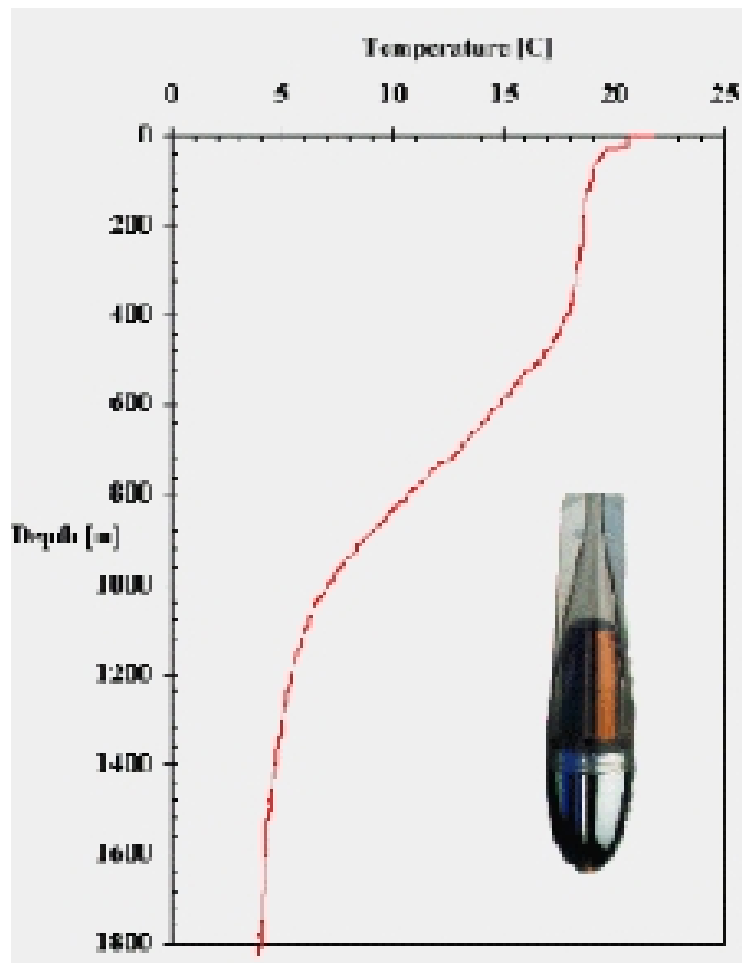
Lowered ADCP



Drake Passage ADCP

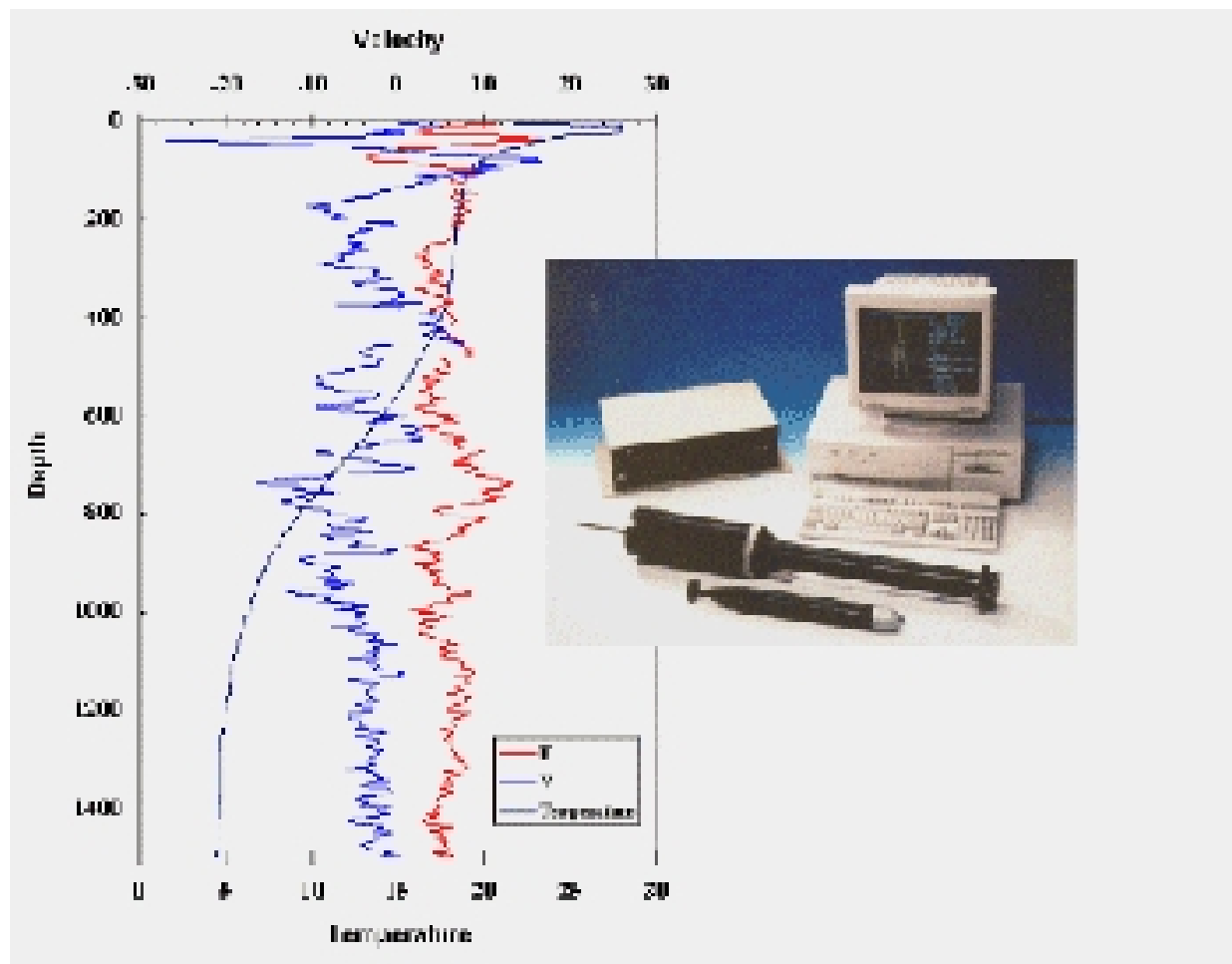


XBT, XSV, XCP



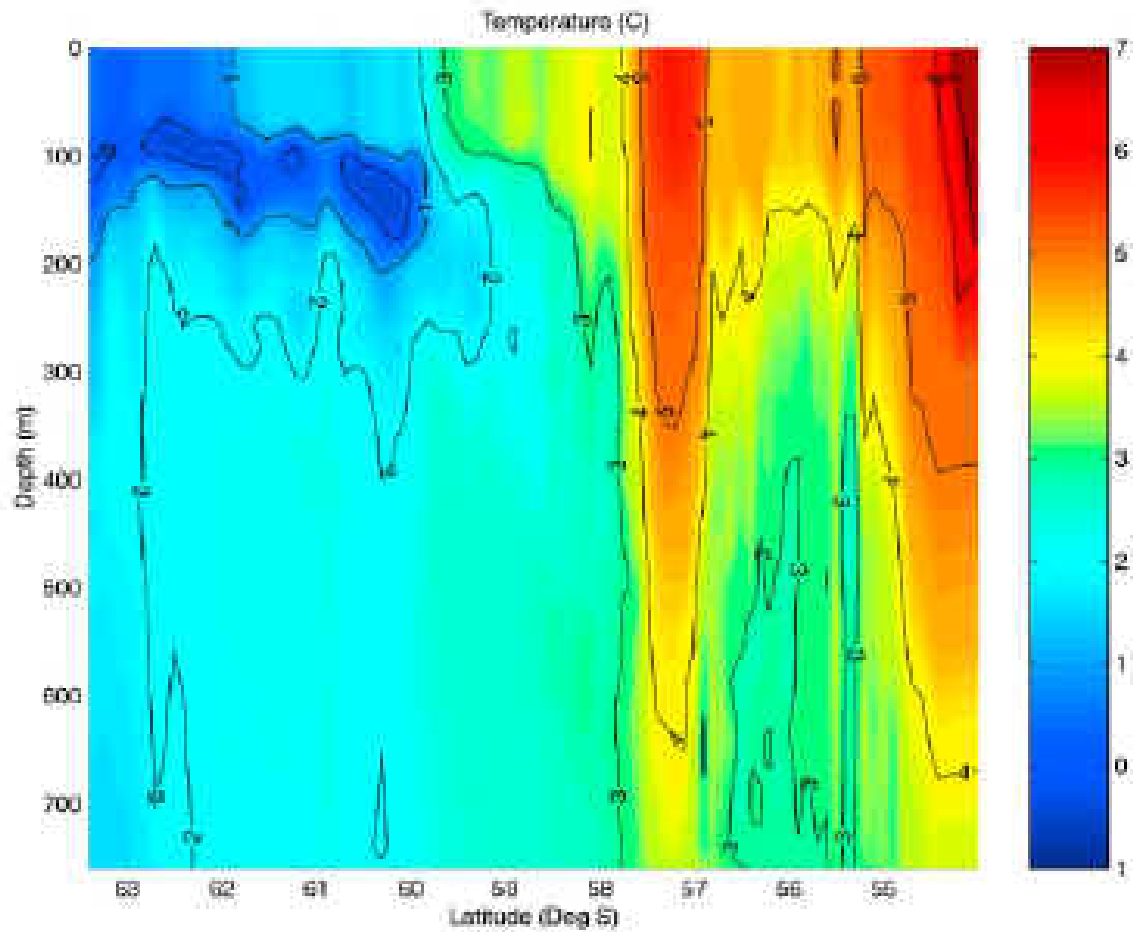
http://www.sippican.com/expendable_probes.html .

XCP



http://www.sippican.com/expendable_probes.html .

Drake Passage XBT

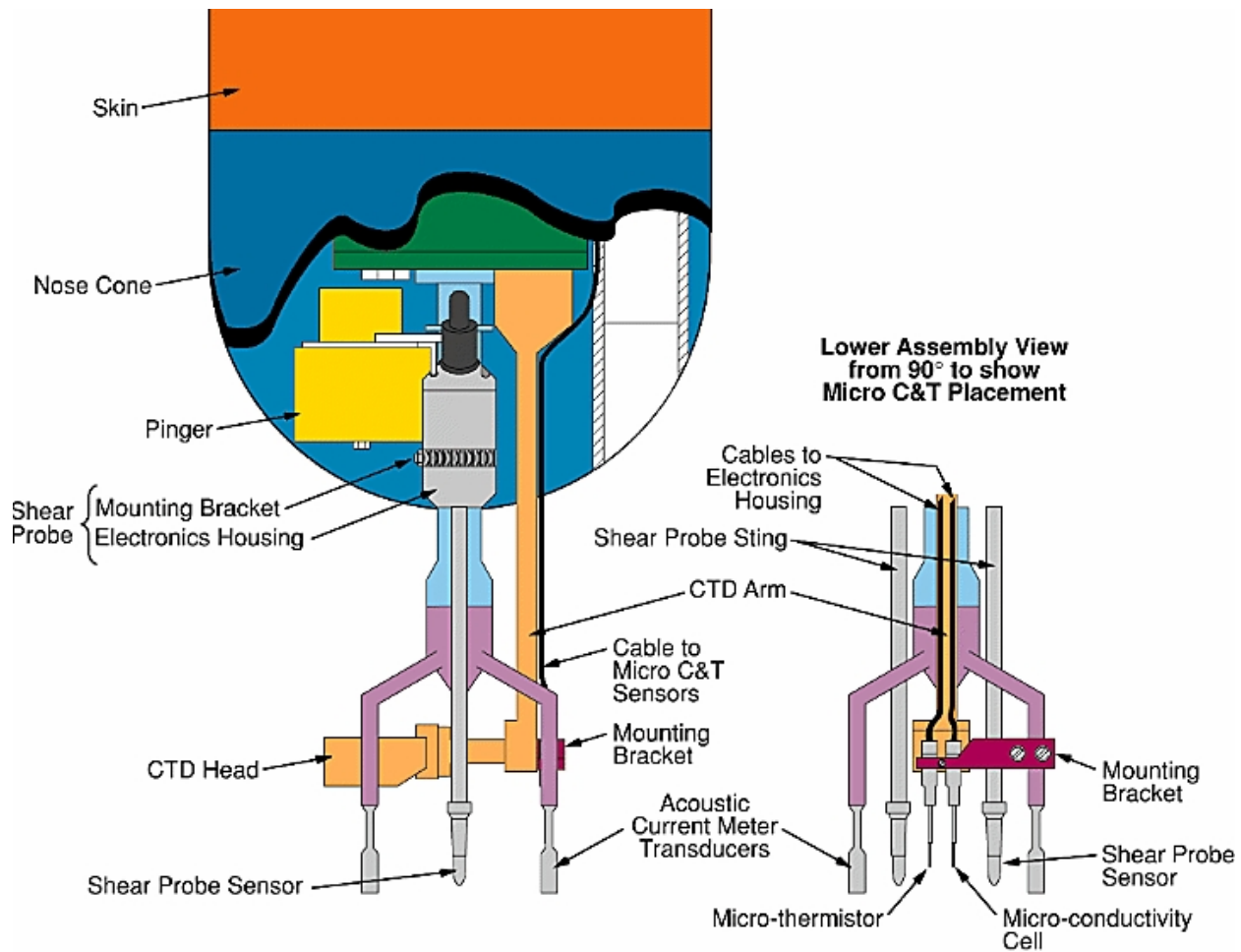


Microstructure

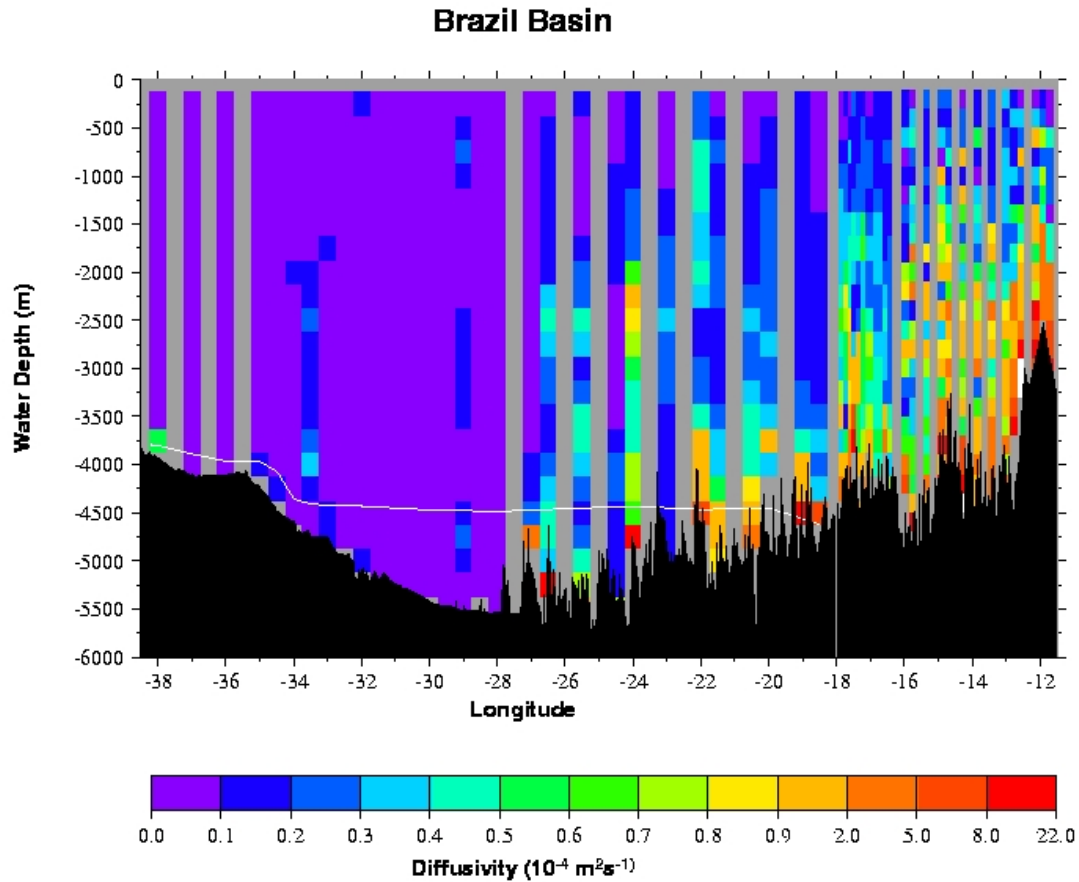


<http://hrp.whoi.edu/hrpgrp/hrp.html> .

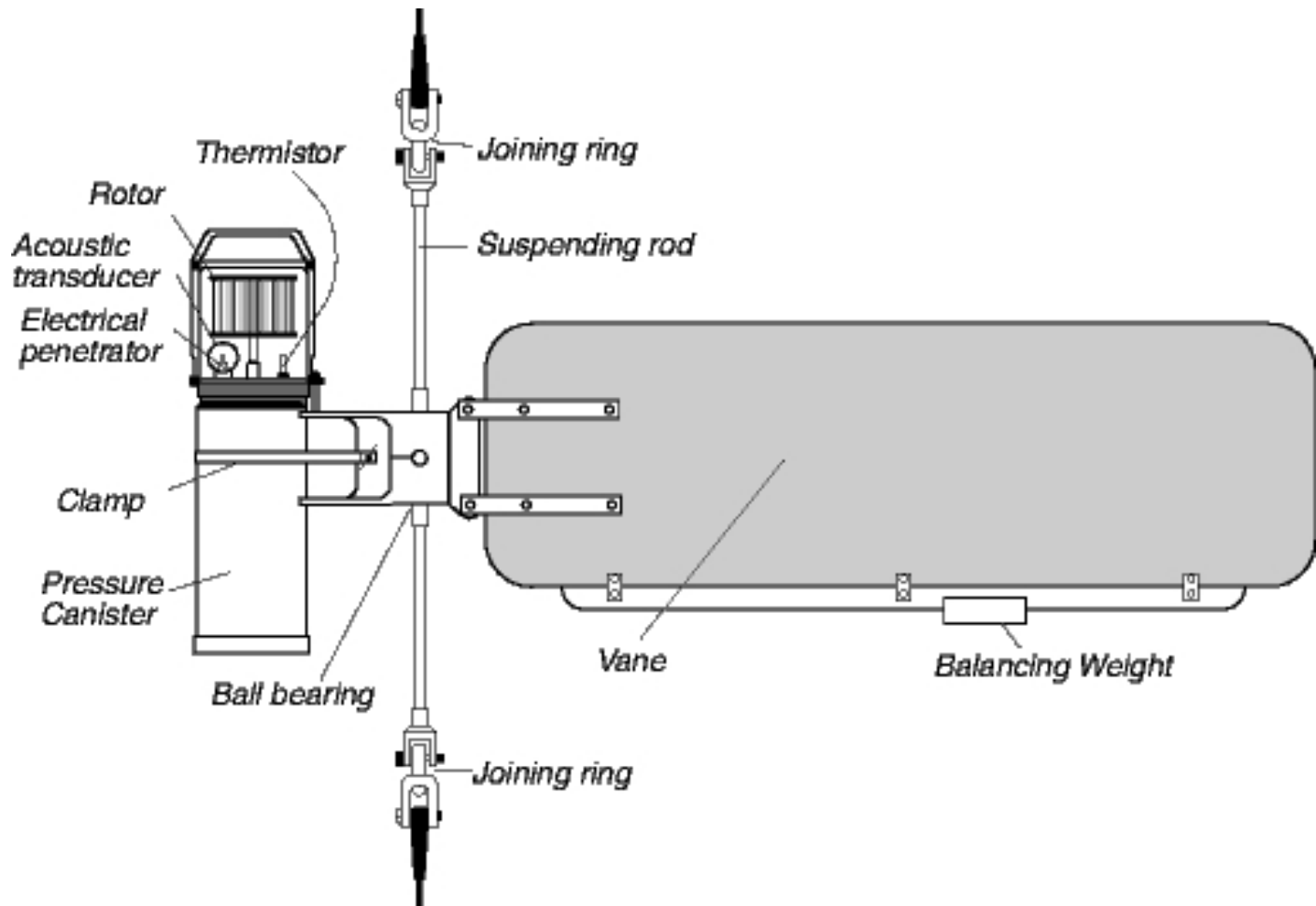
Microstructure sensors



Brazil Basin Diffusivities



Vector Averaging Current Meter



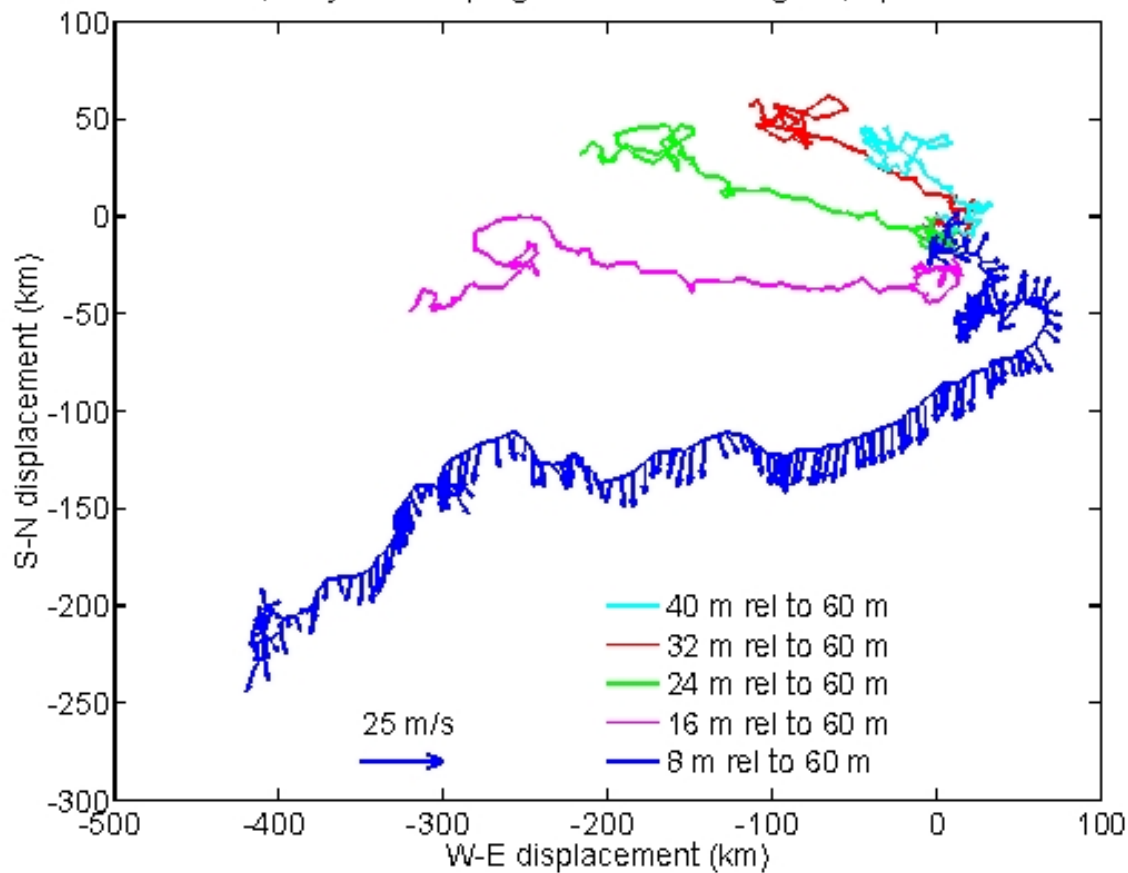
Vector Measuring Current Meter



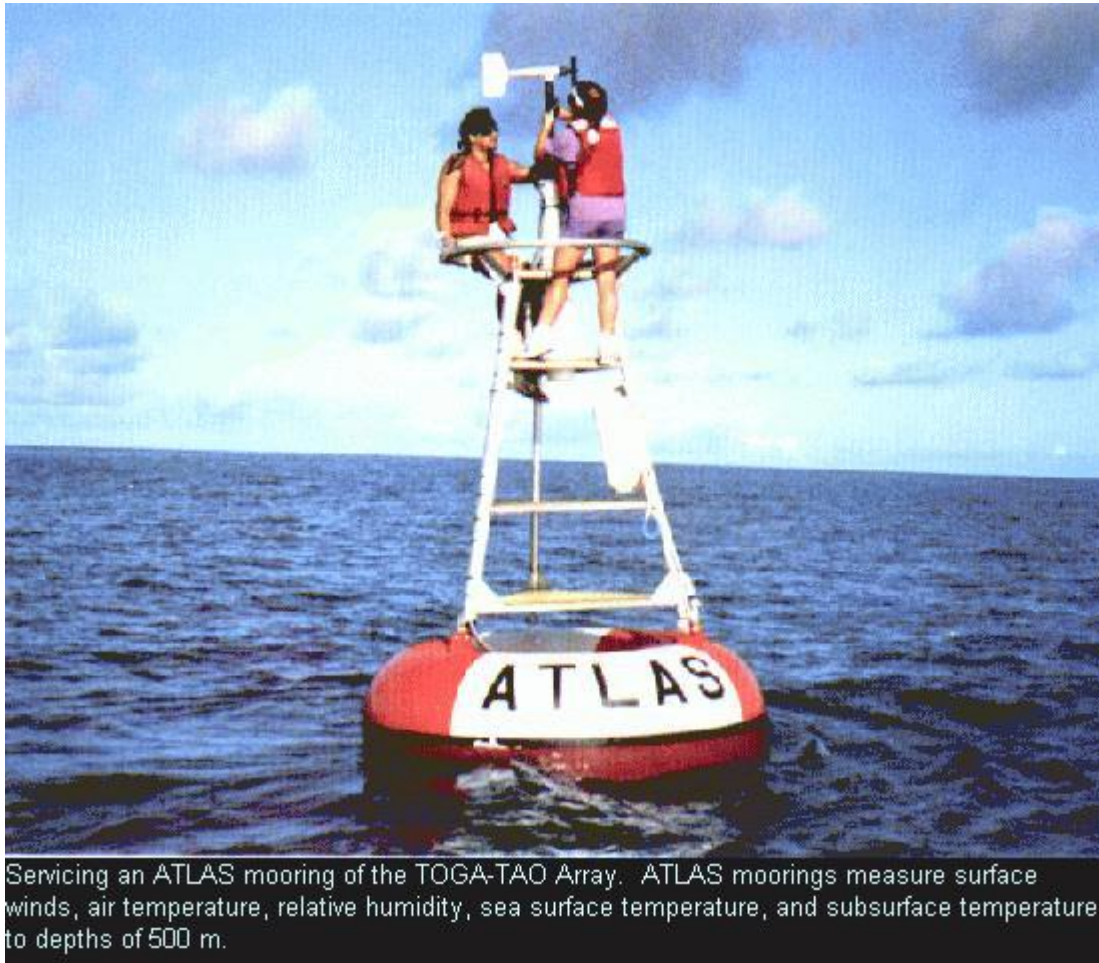
<http://woodshole.er.usgs.gov/staffpages/mmartini/instrument/vmboston.htm> .

Ekman Spiral: Moored ADCP

ebc, daily wind on progressive vector diagram, Apr-Oct 93



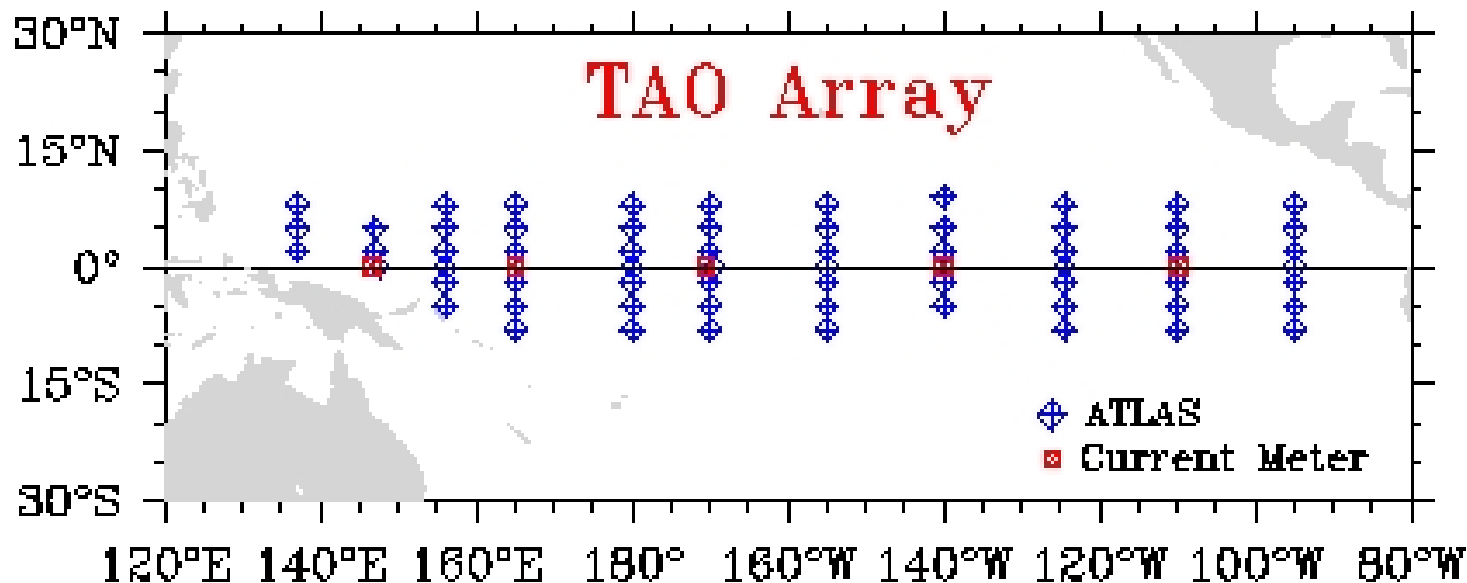
TOGA-TAO moorings



Servicing an ATLAS mooring of the TOGA-TAO Array. ATLAS moorings measure surface winds, air temperature, relative humidity, sea surface temperature, and subsurface temperature to depths of 500 m.

See <http://hrp.whoi.edu/hrpgrp/hrp.html>.

TOGA-TAO moorings

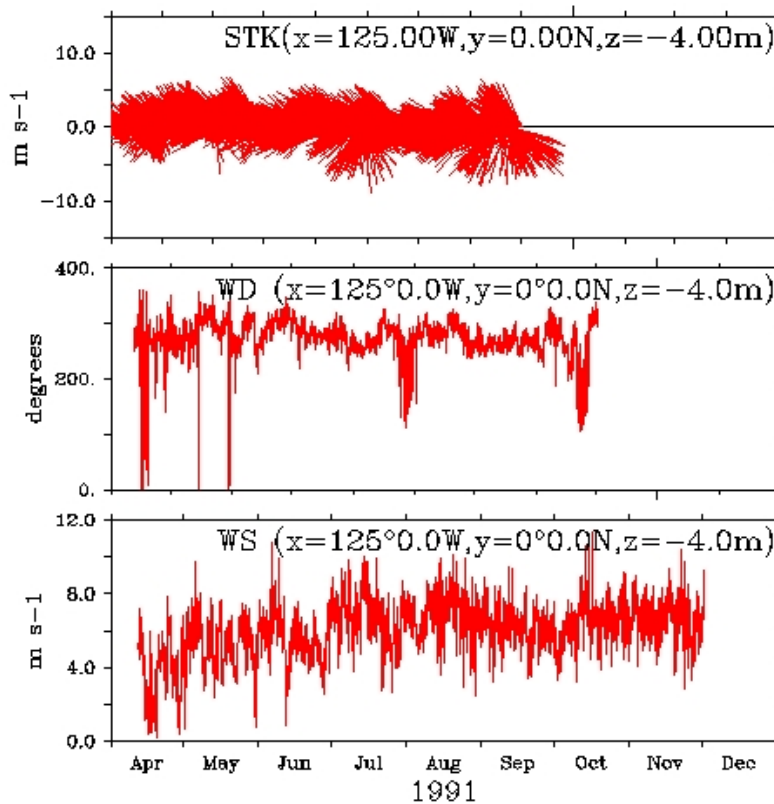


TAO Project Office/NOAA/PMEL

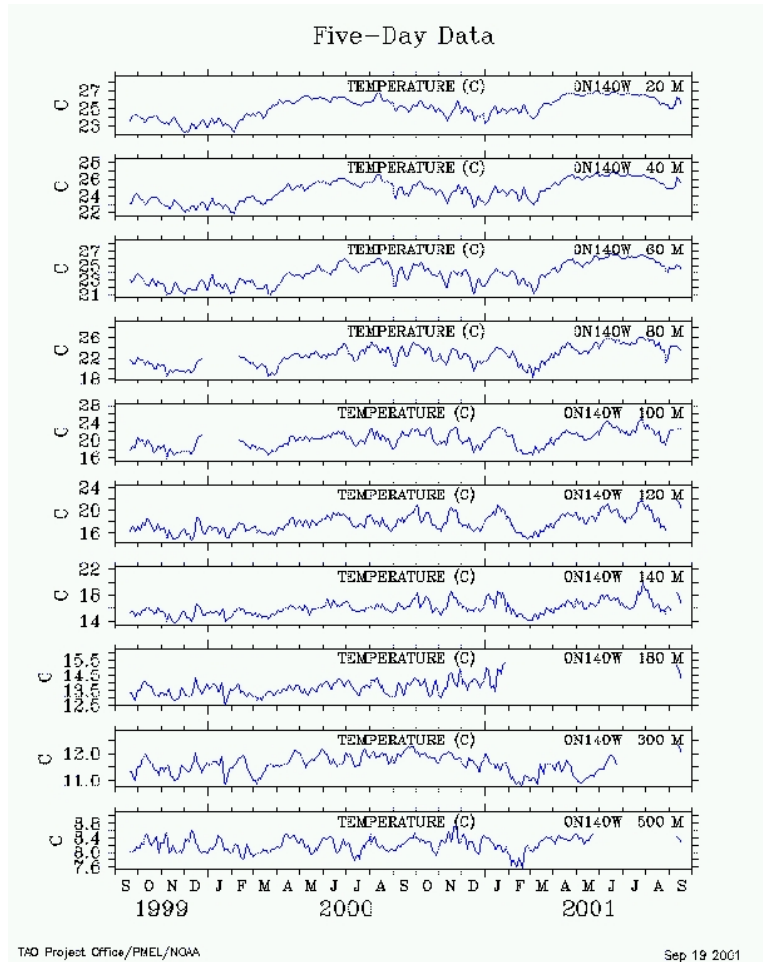
wind at 125 W

15:20:37 Sep 19 2001

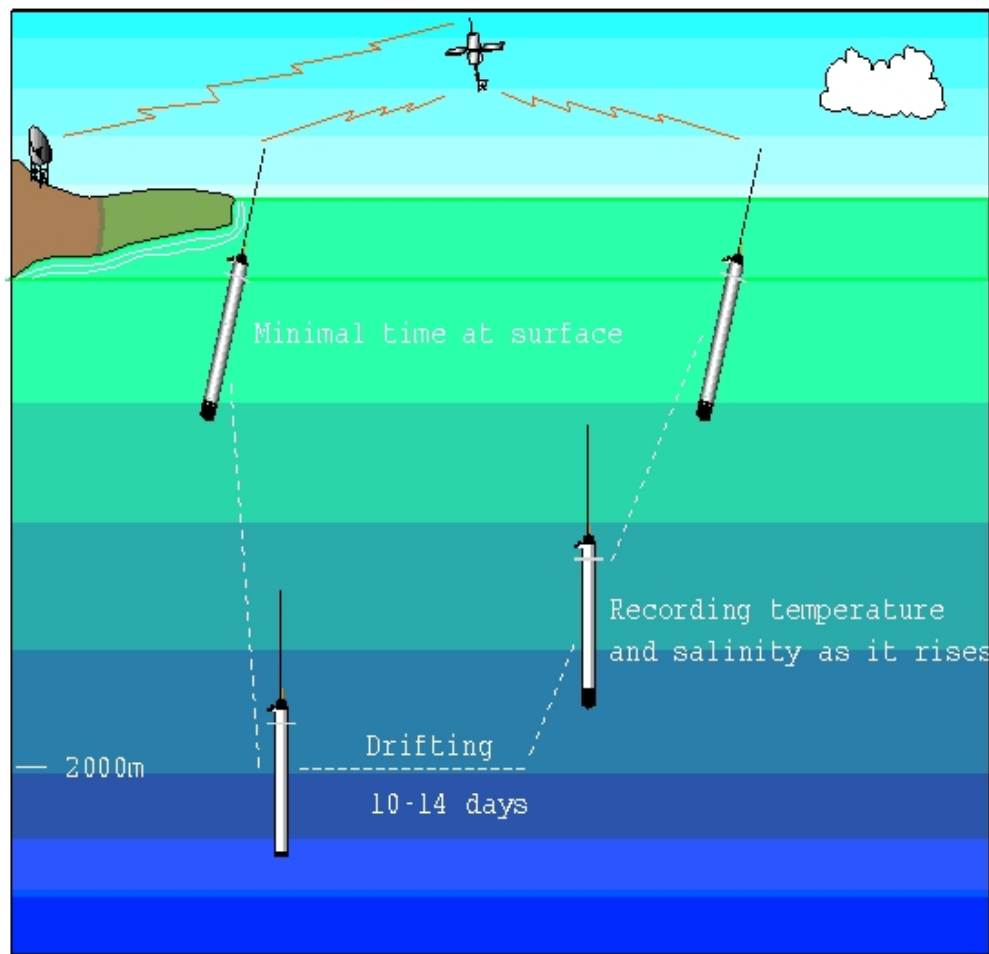
EPIC: ptr.dat PAGE: 1



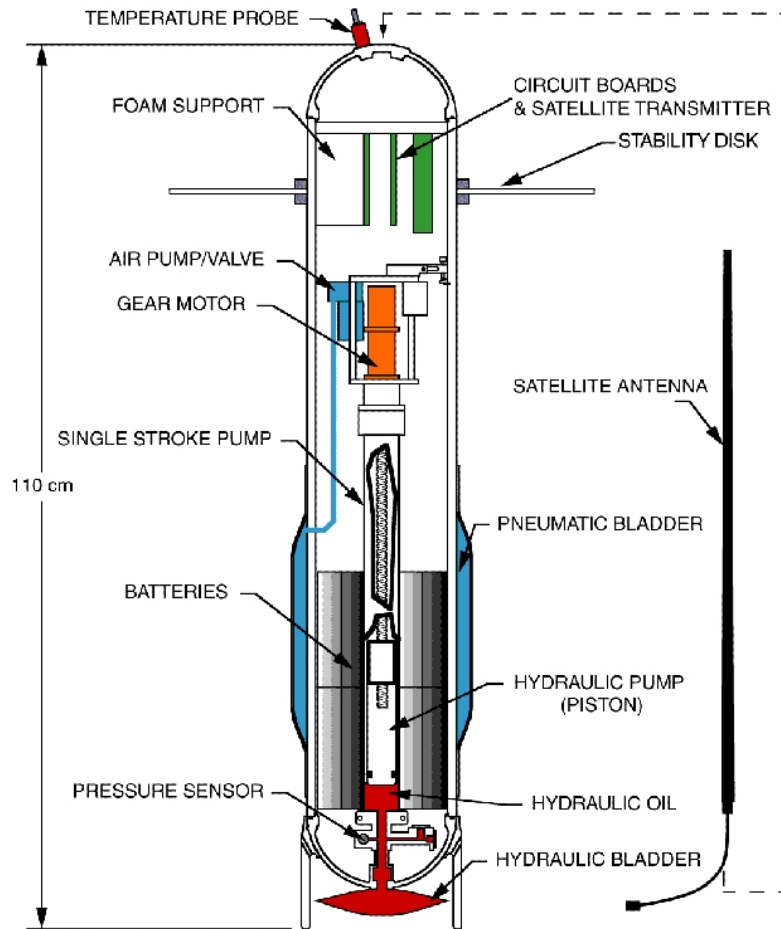
temperature at 140 W



ALACE/PALACE/ARGO/SOLO

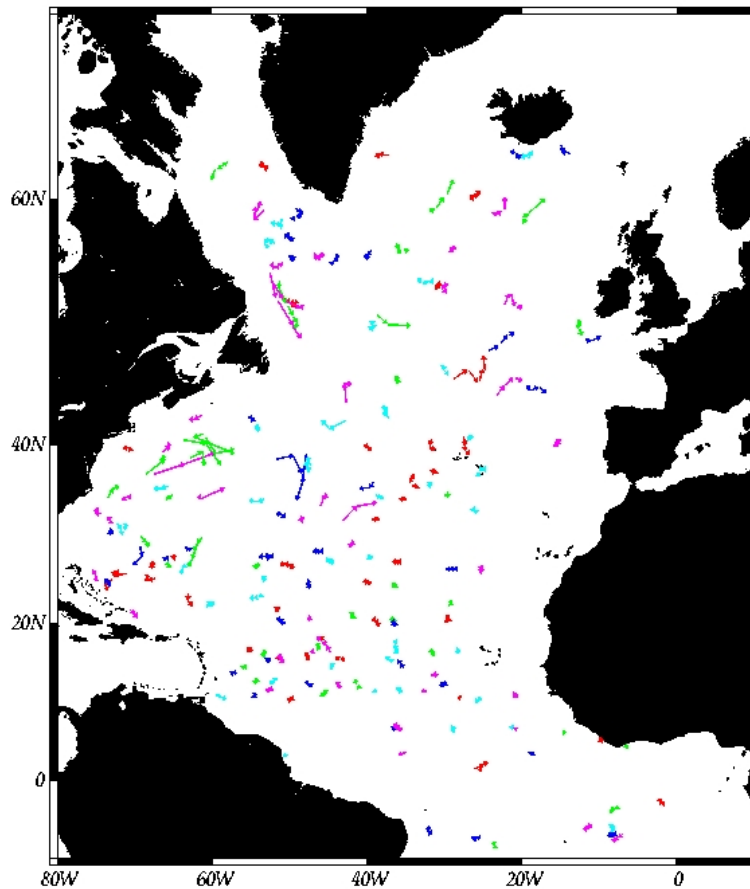


SOLO float design



ALACE in the Atlantic

Fig 4 ACCE PALACE Floats for Dec, 1998



Surface Drifters

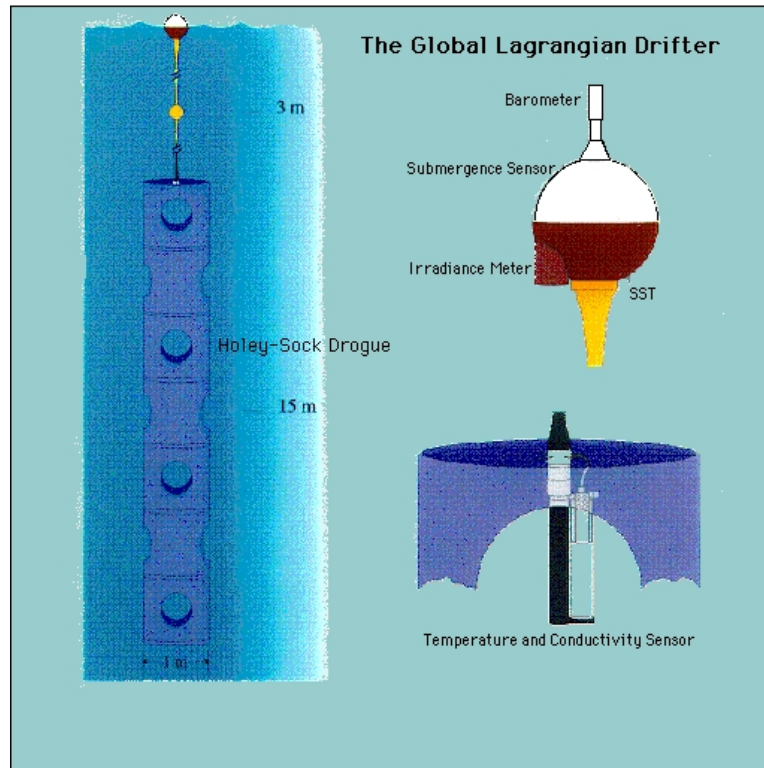
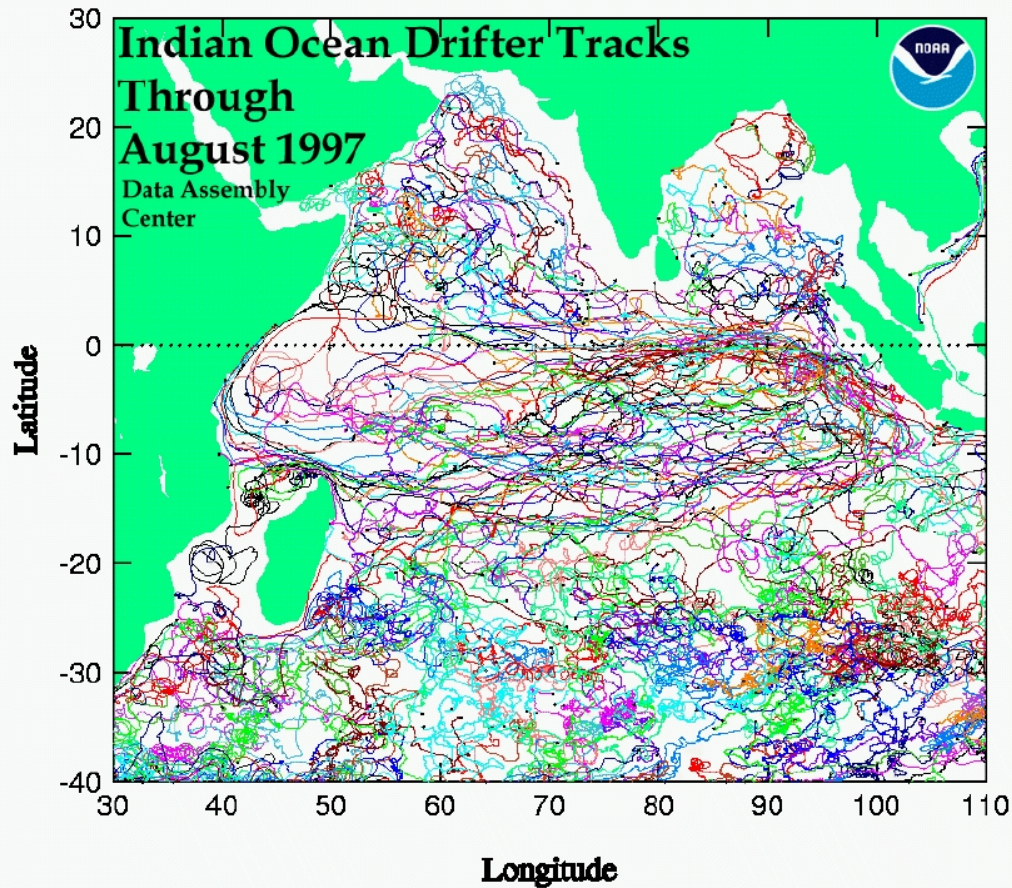


Diagram displaying the low-cost Global Lagrangian Drifter on the left hand side, and schematics of the sensor attachments (barometer, submergence, SST, irradiance and SEACAT), on the right hand side. Most drifters are also equipped with drogue sensors that indicate drogue loss. Buoys without drogues do not depict ocean currents accurately, because the drifter becomes susceptible to wave and wind action. Drifters transmit sensor data to satellites that determine the buoy's position and relay the data to Argos ground stations. Service Argos provides raw drifter data to the DAC where the data is processed and distributed.

<http://www.aoml.noaa.gov/phod/graphics/drifterfig.gif>

Indian Ocean Trajectories



Paleoclimate



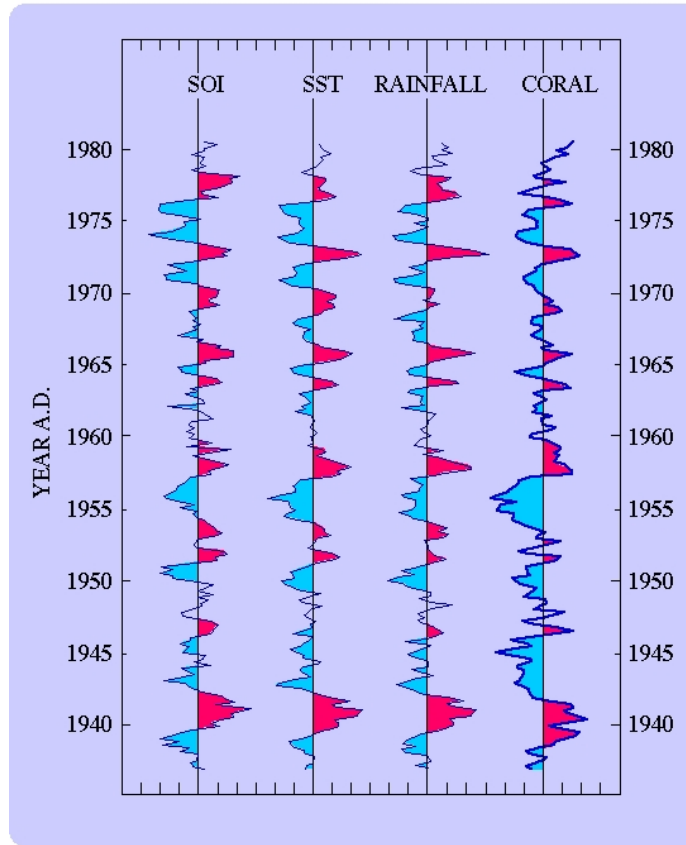
<http://www.ngdc.noaa.gov/paleo/outreach/coral/>

Coral Core Growth Rings (X-ray)

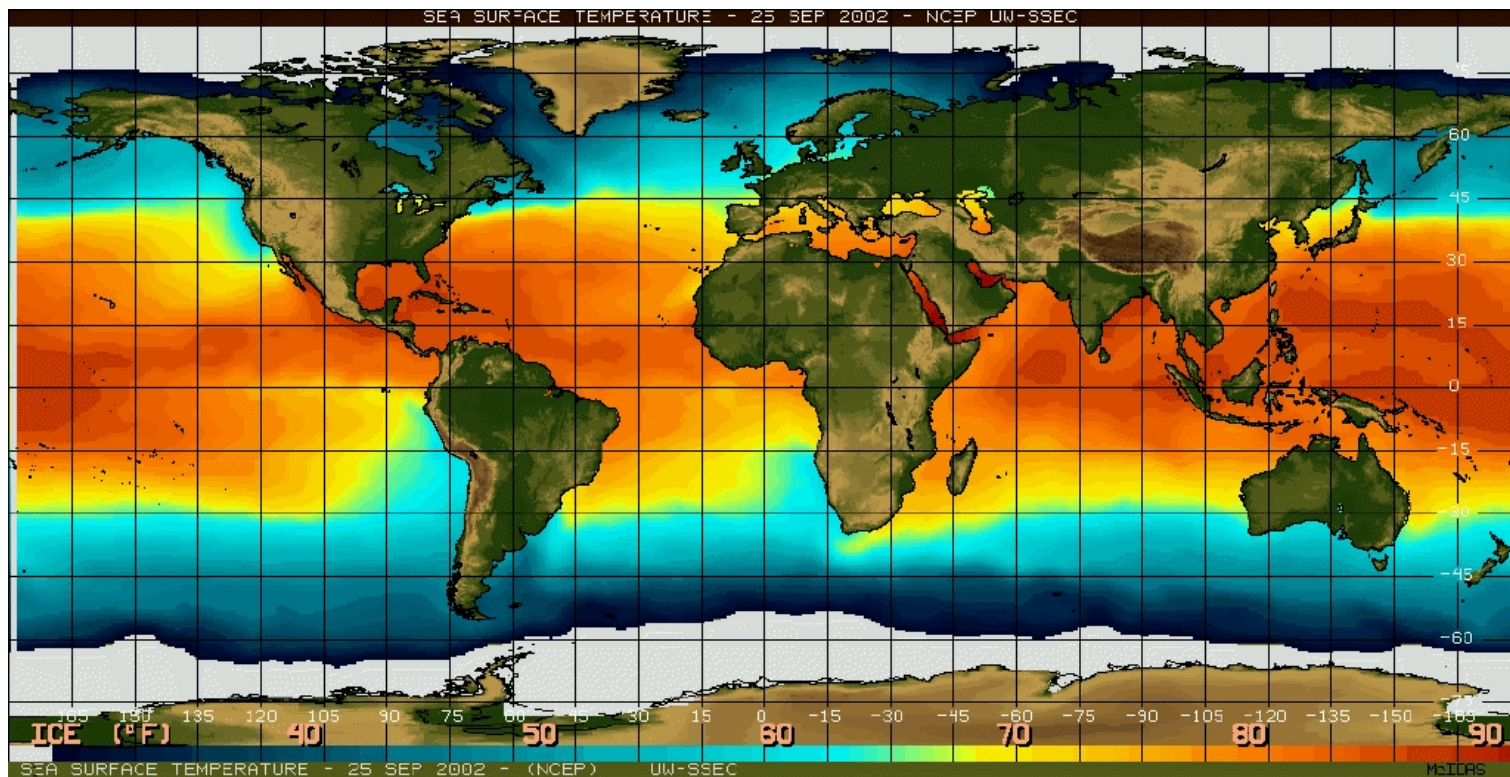


Paleoclimate

Range of ENSO variability, 1940-1980

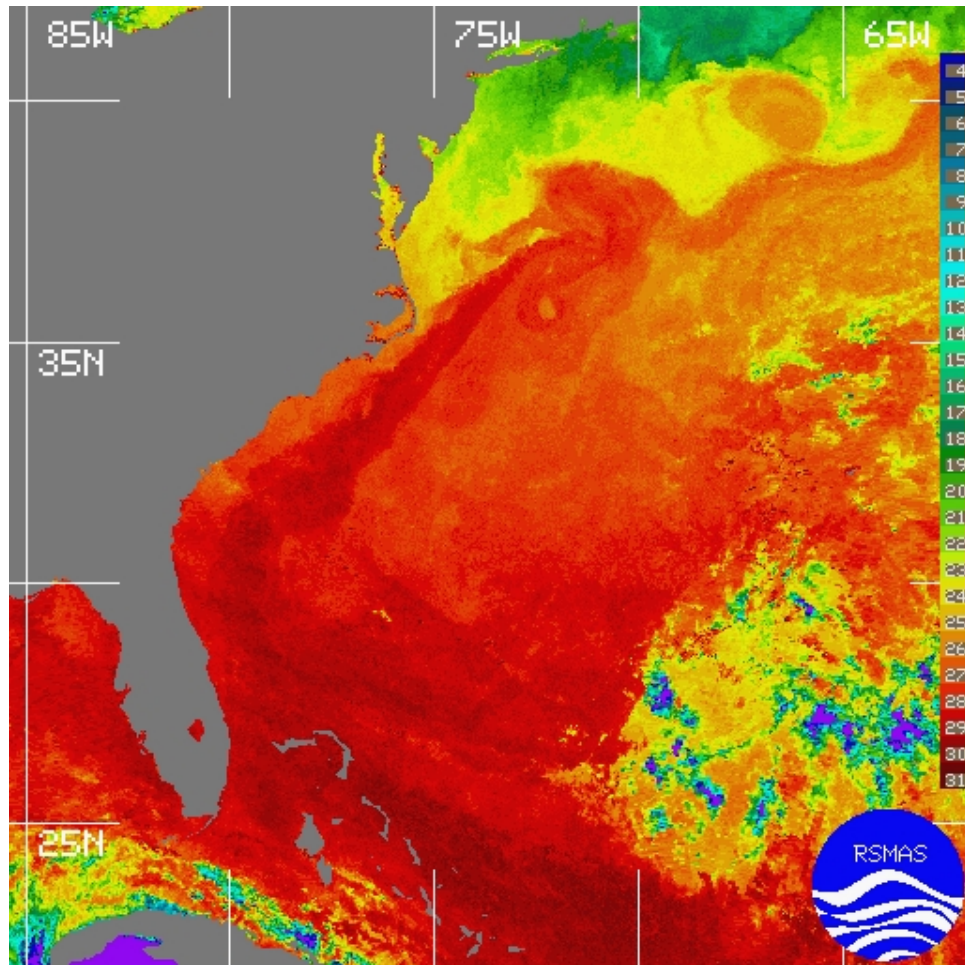


Satellite Observations: SST



<http://www.ssec.wisc.edu/data/sst.html>

Satellite Observations: Gulf Stream SST



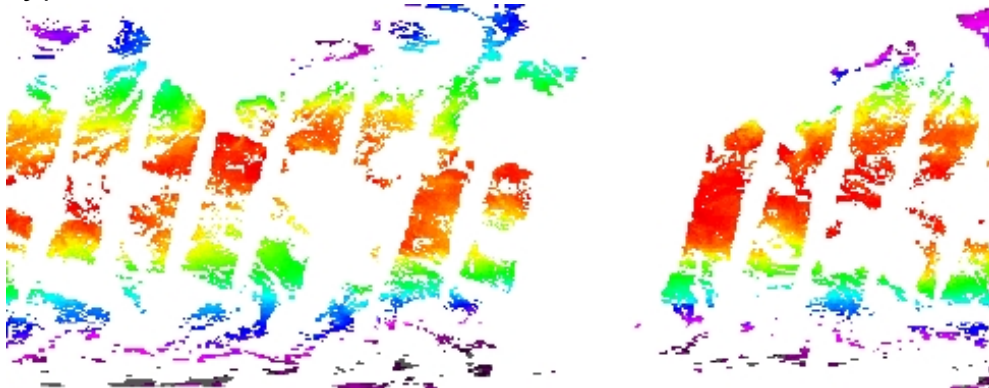
<http://www.rsmas.miami.edu/images.html>

Satellite SST Observations: Reality

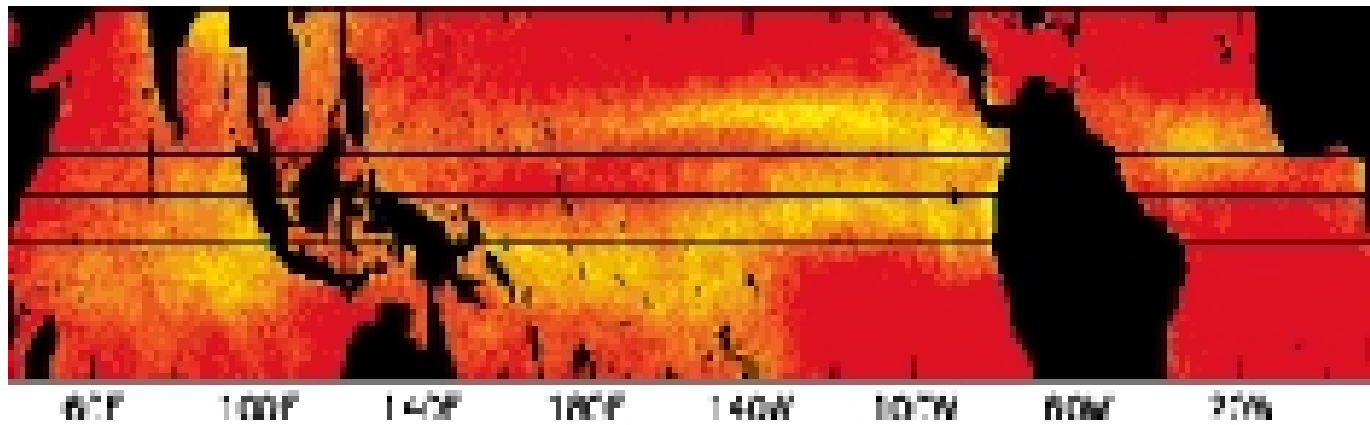
ascending (day) Jan 1, 1998



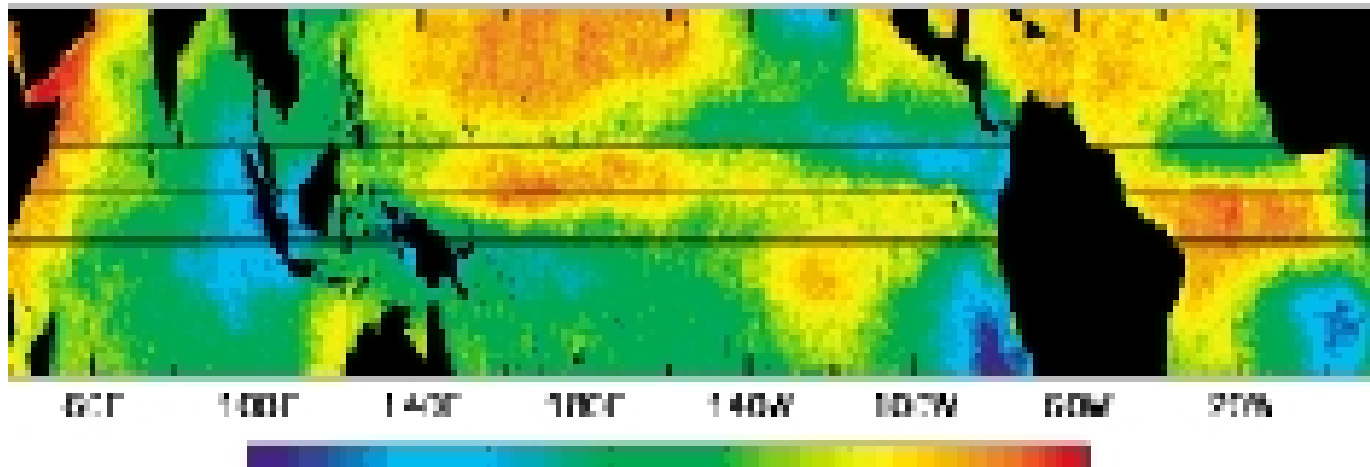
descending (day) Jan 1, 1998



Microwave versus Infrared SST



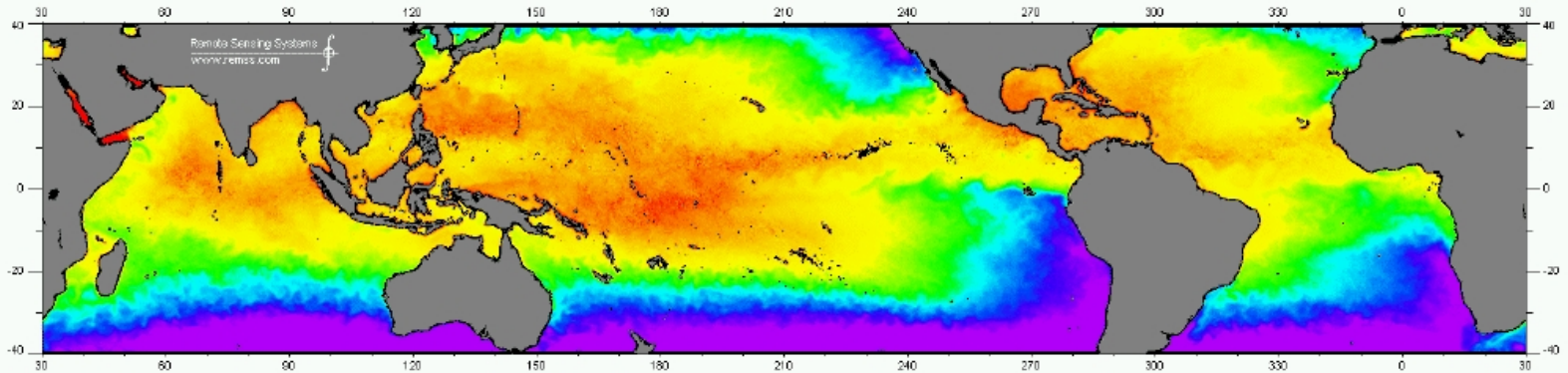
red Coverage



Chelton et al., *Geophys. Res. Lett.*, 27, 1239-1242, 2000.

Tropical Instability Waves

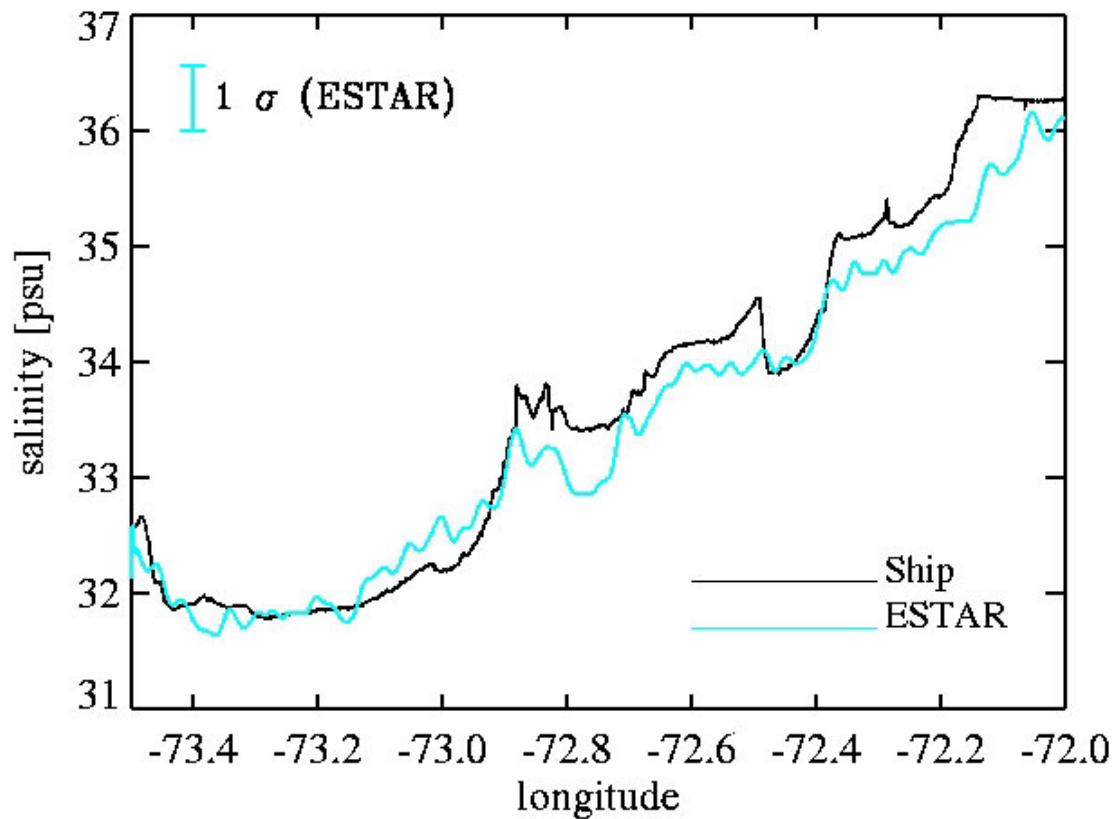
TMI Sea Surface Temperature: Week Ending September 21, 2002



http://www.ssmi.com/tmi/tmi_weekly.html

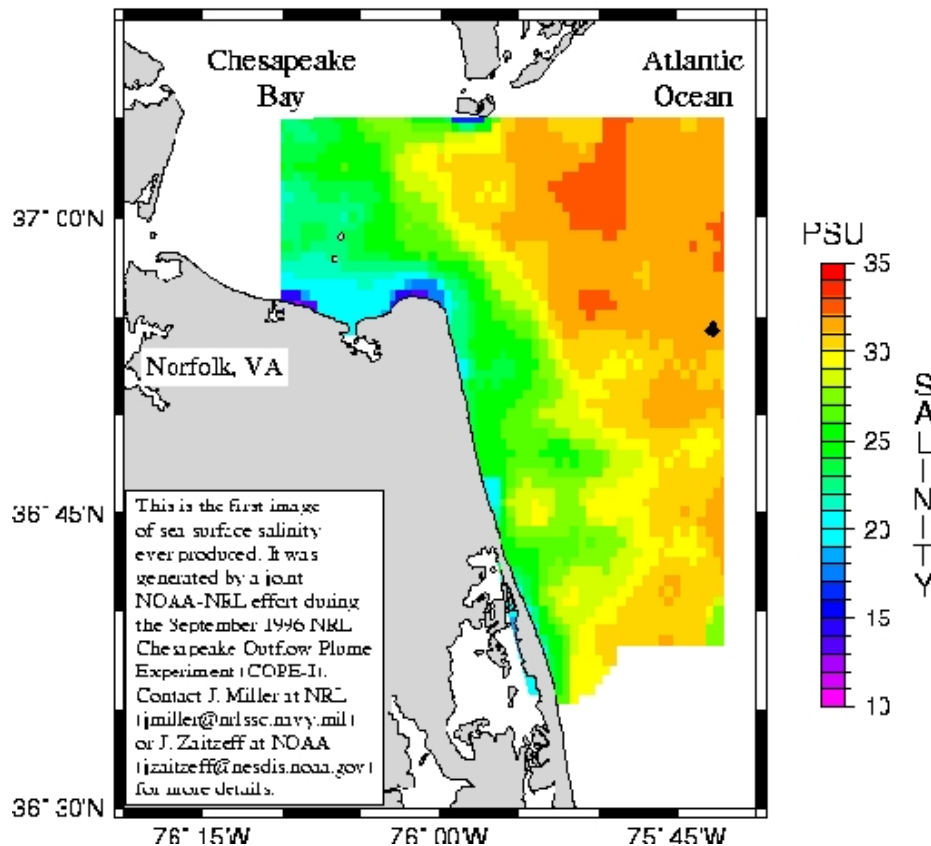
Salinity

Salinity Measurements 29 Aug 1999, E-W line at lat=38.65



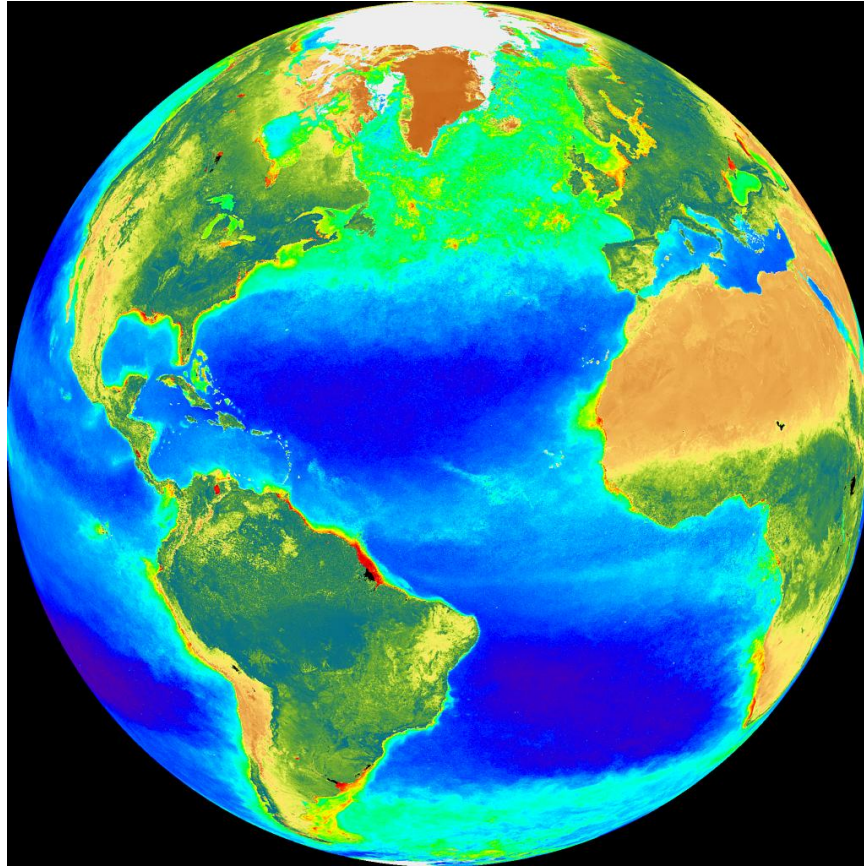
Salinity in the Chesapeake Bay

MICROWAVE SENSING OF SEA SURFACE SALINITY



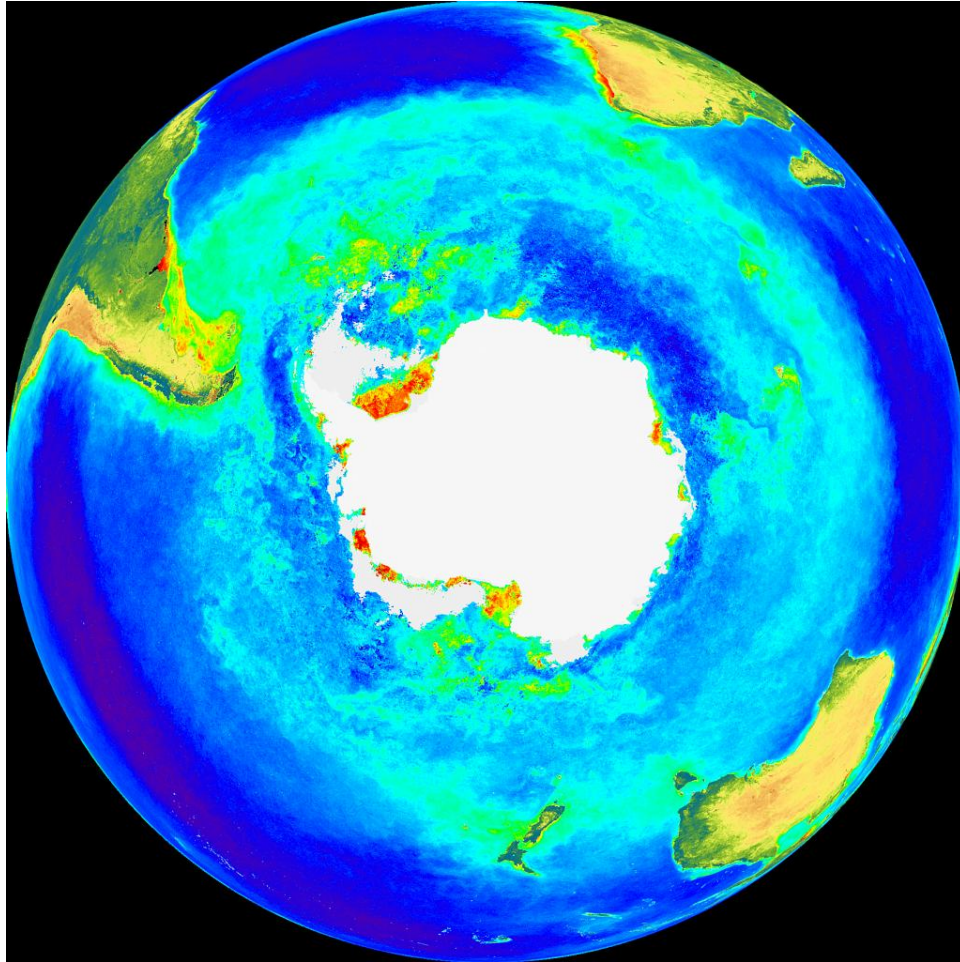
1 psu accuracy from aircraft <http://www.esr.org/ssiwg>

Ocean Color



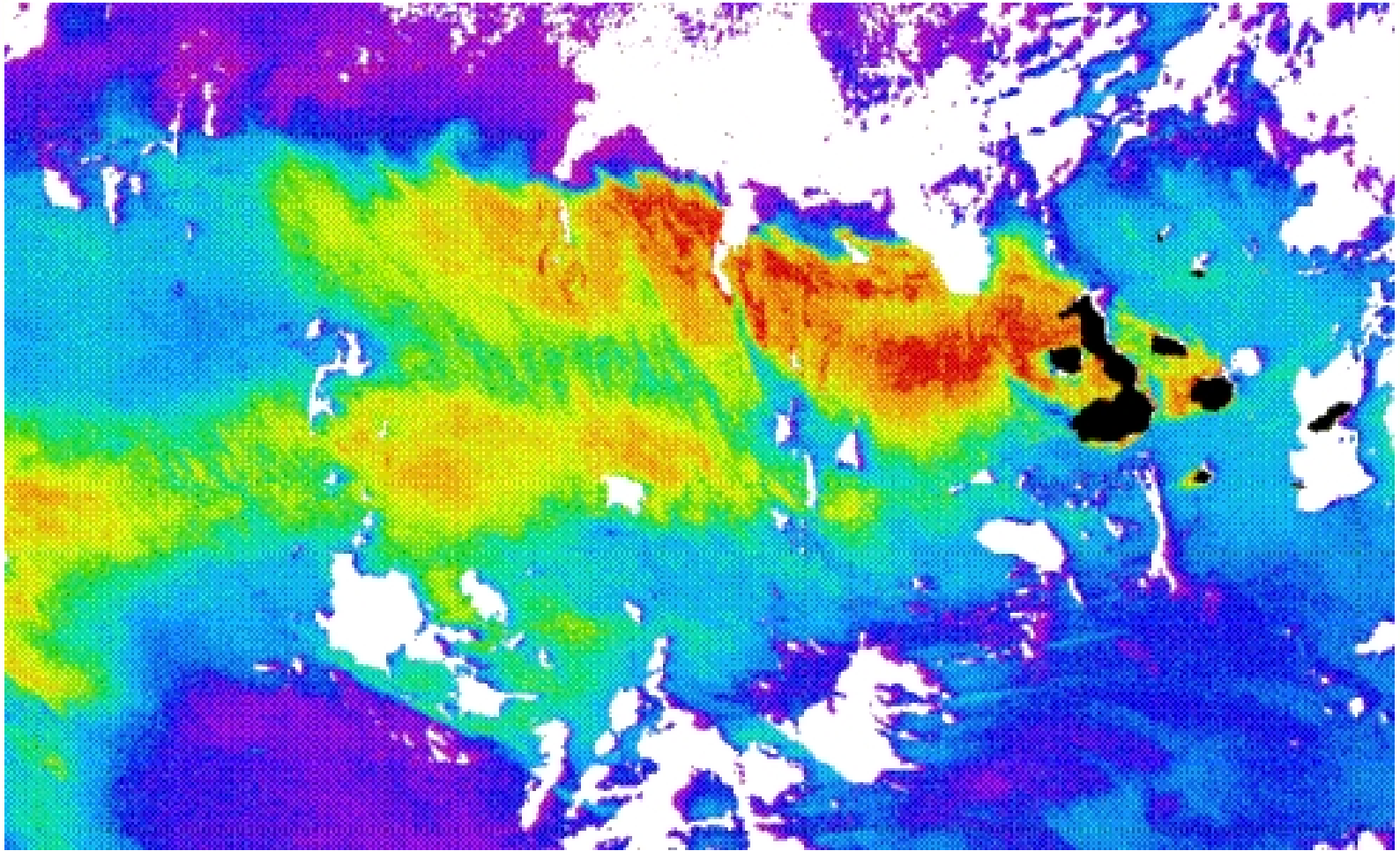
<http://seawifs.gsfc.nasa.gov/SEAWIFS.html>

Ocean Color



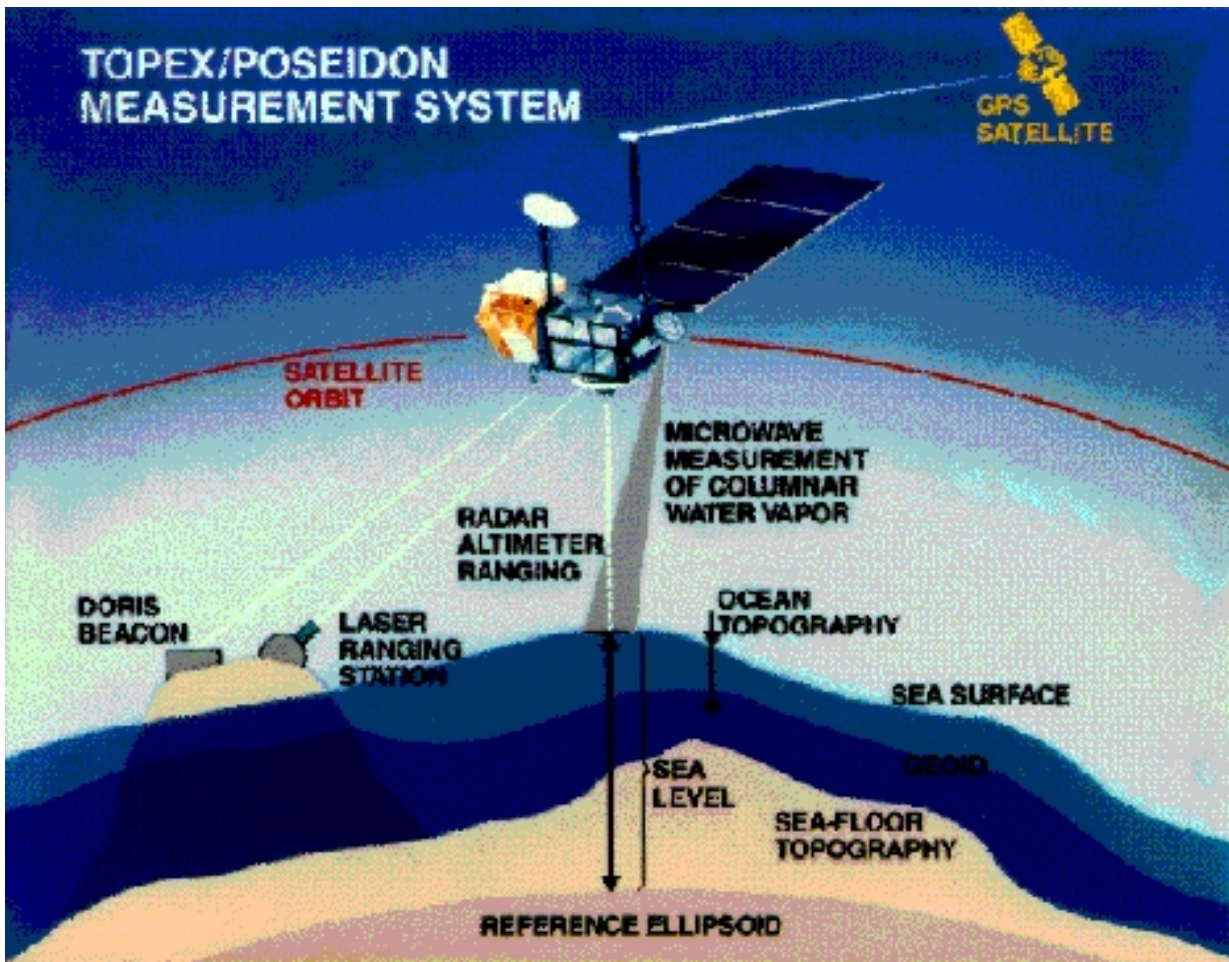
<http://seawifs.gsfc.nasa.gov/SEAWIFS.html>

Ocean Color: Galapagos Upwelling

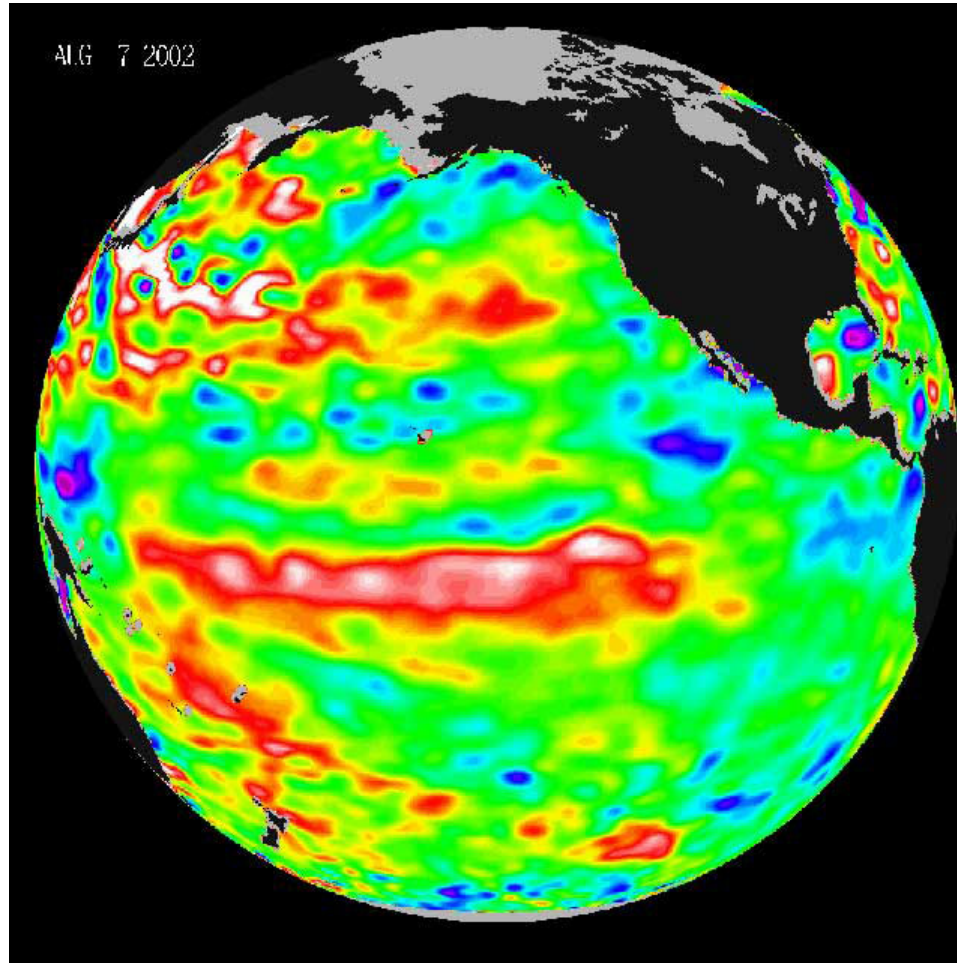


<http://seawifs.gsfc.nasa.gov/SEAWIFS.html>

Sea Surface Height: Altimetry

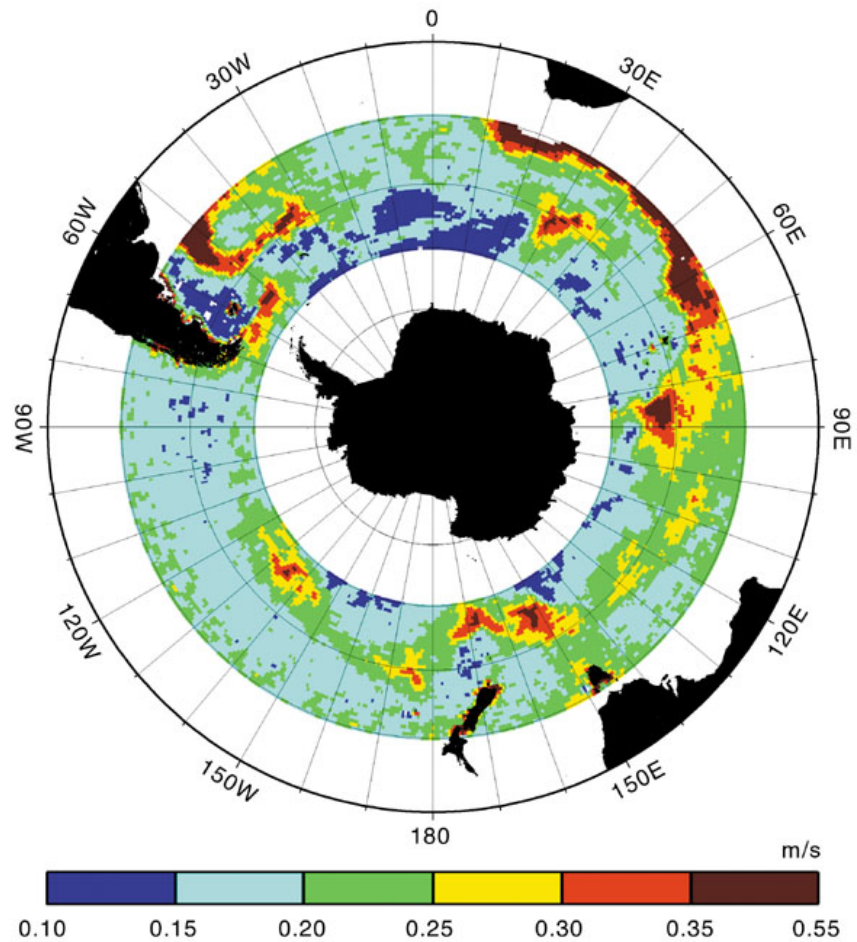


Sea Surface Height: Pacific Ocean Anomalies



<http://topex-www.jpl.nasa.gov/elnino/latest.html>

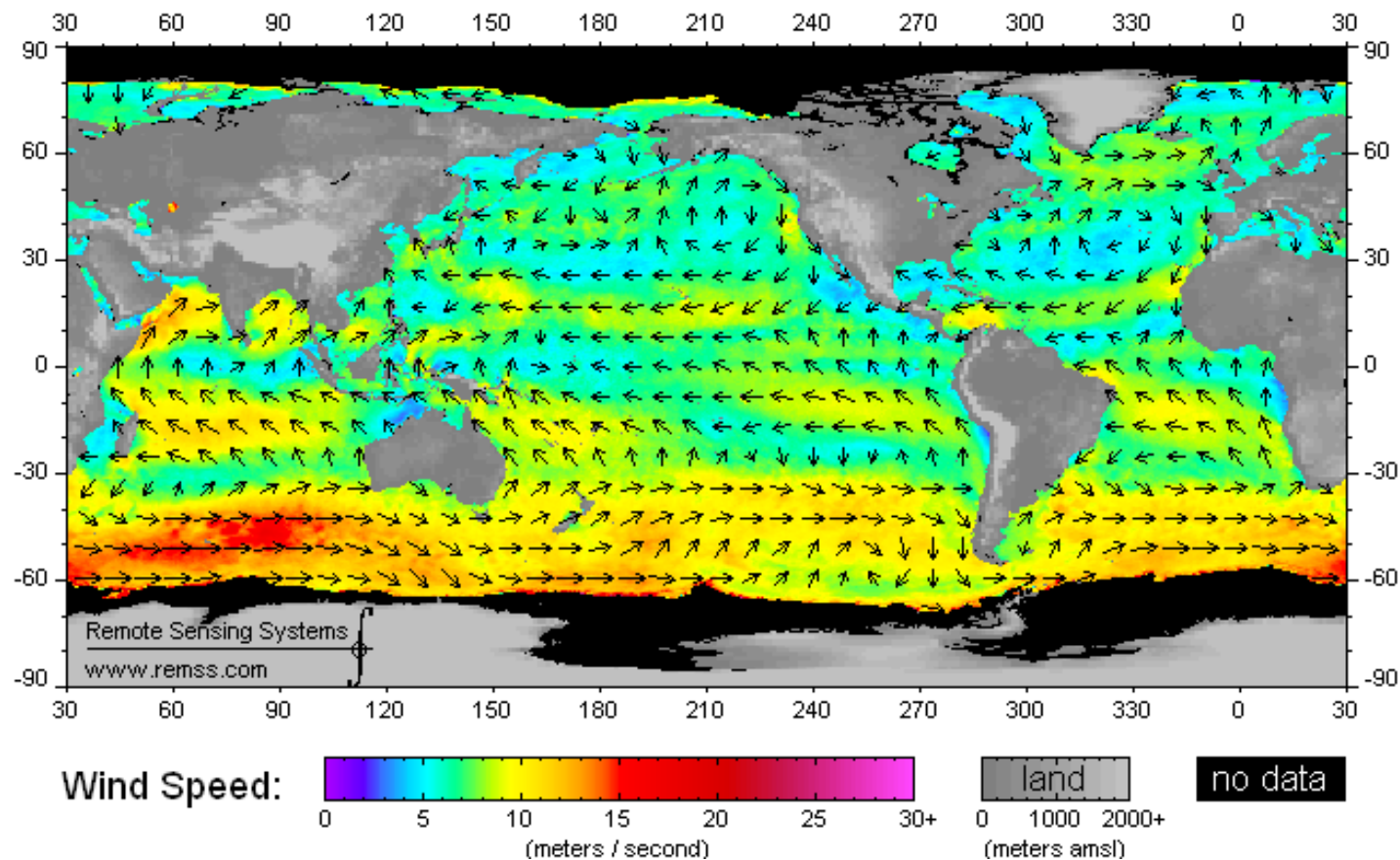
Sea Surface Height: Eddy Kinetic Energy



<http://topex-www.jpl.nasa.gov/http://topex-www.jpl.nasa.gov/science/investigations.html>

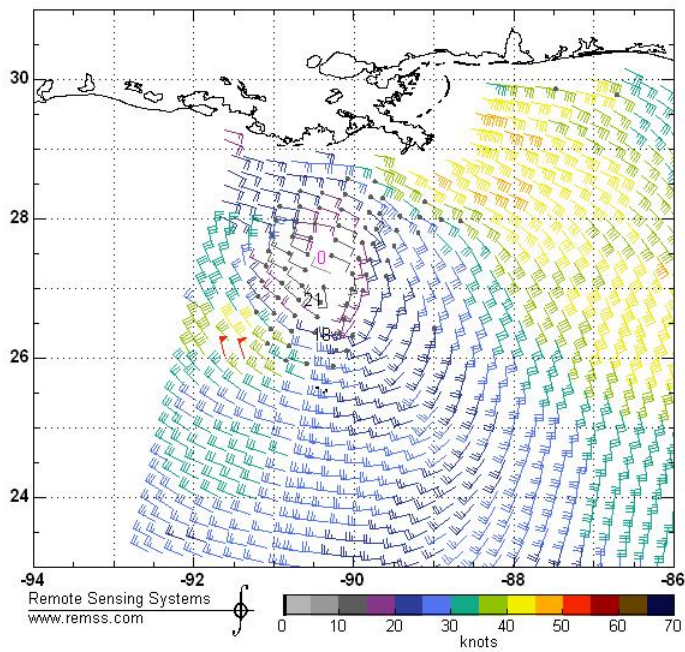
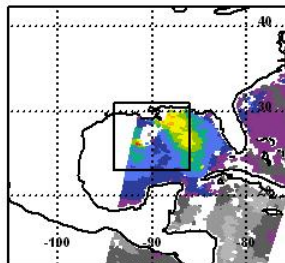
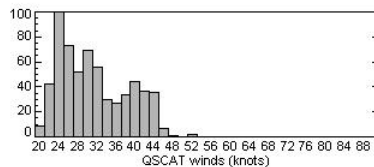
Wind Forcing: Scatterometry

QuikScat wind vectors: 2002/08 - monthly average - Global

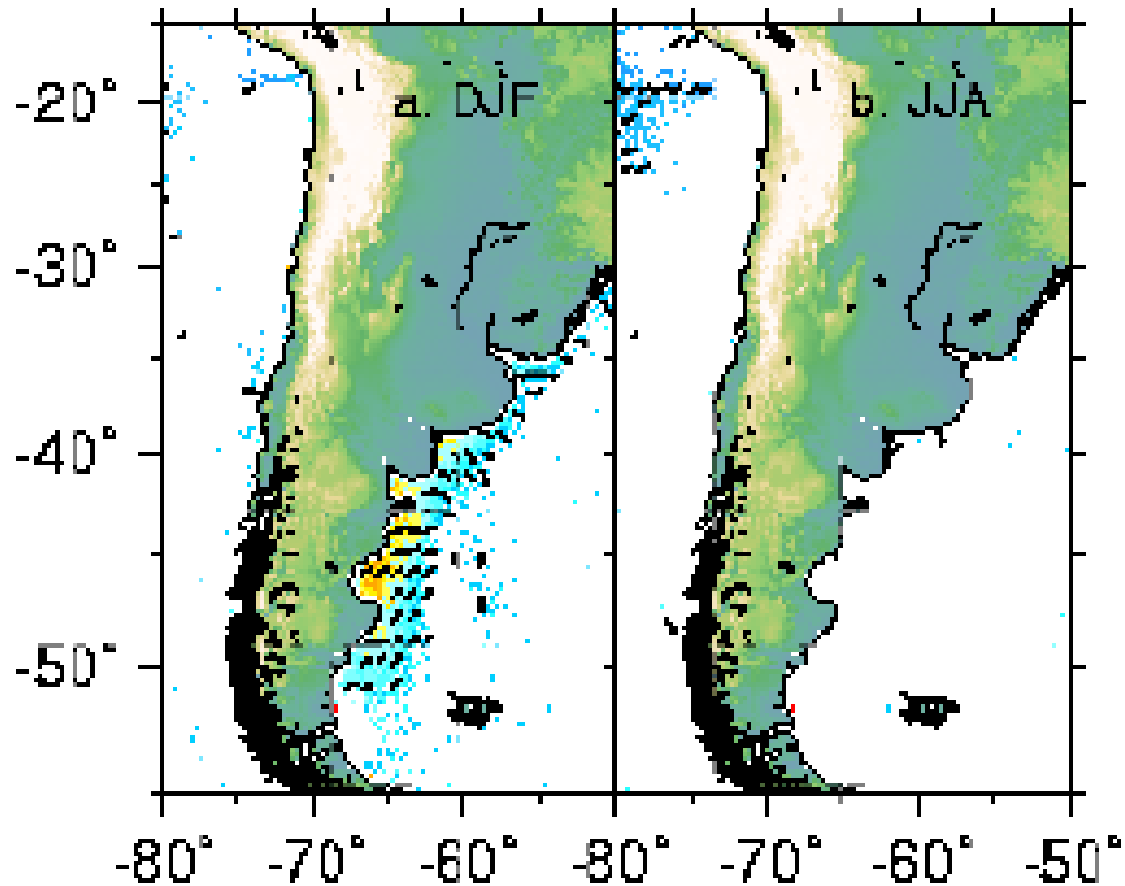


Tropical Storm Isidore (Sep 25 2002)

Trop. Storm Isidore
QSCAT rev 17023
Sep 25 23:43 Z



Sea Breeze from Scatterometry



from Gille, Llewellyn Smith, and Lee, submitted to GRL, 2002