Monitoring the Variability of the Subtropical Gyres

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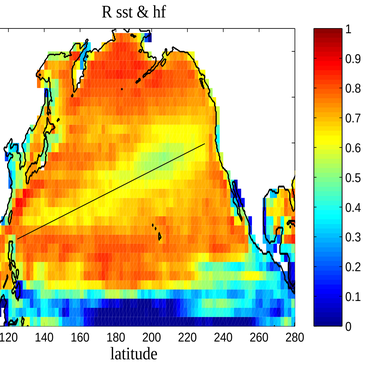
North Pacific Basin

Initial observations

Can this information be used to monitor the variability of the subtropical gyre?



e 1 shows the decorrelation of the applied heat flux SST of the model in the center of basin. Unlike gure, plots of the correlation between SST with pper steric height are highly correlated. Similar of decorrelation are seen when AVHRR observed erature anomalies are correlated with heat fluxes.

1. The Eastern North Pacific, subtropical gyre shows changes in steric height due to both a) the north/south migration of gyre and b) strong mixing (examples in 1989/1990 and 1999/2000). These changes can be observed from unfiltered Topex/Poseidon data. The end of 2001 shows a somewhat cooler eastern North Pacific.

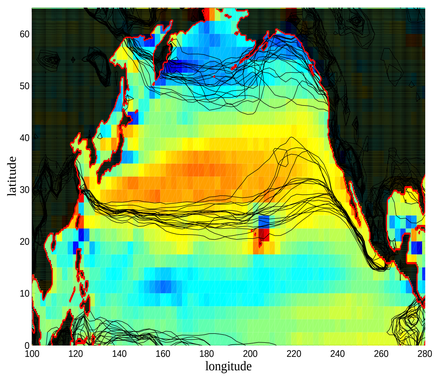


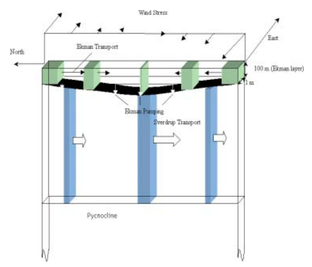
Figure 2 In color, the mean of the zonal wind stress curl. The black lines define the zero contour of the zonal wind stress for the mean of the winter months between 1979 and 1998. Note the narrowness of the distribution in the west (~30˚N) and broadening to the east, corresponding to the location of the decorrelated areas in Figure 1.

The years in which the "zero line" is furthest north correspond to the years with the highest NOI index.

As per the cartoon –

Strongest mixing occurs in the area of little wind stress & this area moves about from year to year.

Because of the deeper mixing; the SST is less likely to correlated with the applied heat flux – rather it will correlated with the layers below the surface.



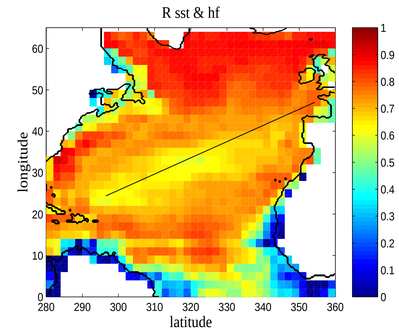


Figure 5 shows the decorrelation of the applied heat flux to the SST of the model in the center of Atlantic basin. Unlike this figure, plots of the correlation between SST with the upper steric height are highly correlated. Similar areas of decorrelation are seen when AVHRR observed temperature anomalies are correlated with heat fluxes.

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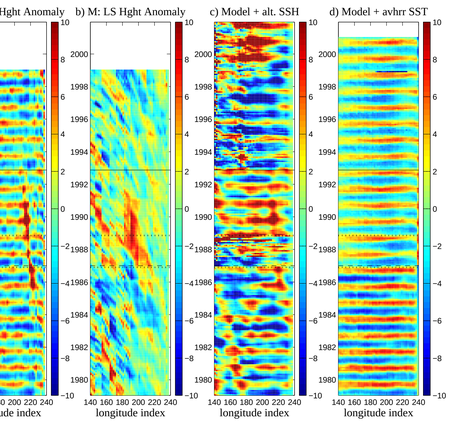


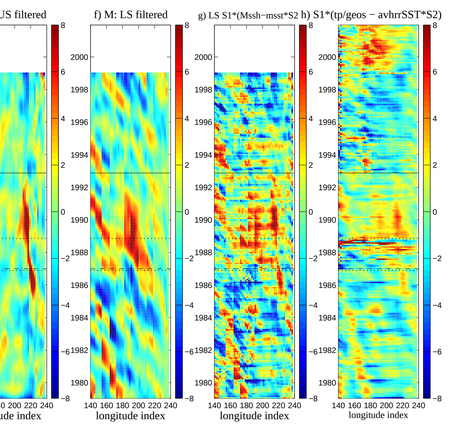


Figure 3 a –h are time–'longitude index' plots of the time varying anomalies of

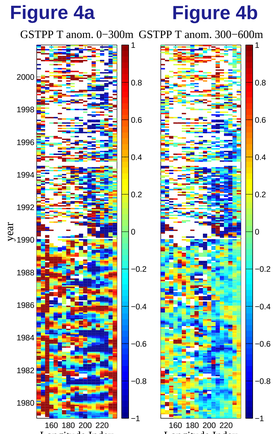
a) upper steric height of model (0~300m)
b) lower steric height of model (300–bottom)
c) model SSH + T/P/Geosat/ERS SSH fields (altimeter SSH ~1986/87 & ~1992.5 – end of 2001)
d) SST from model (1979–1986) + AVHRR (1987–2000)
e) filtered(> 1yr) of upper steric height
f) filtered (> 1yr of lower steric height
g) computed "lower steric height" using model SSH + model SST such that α*(SSH – β*sst)
h) computed "lower steric height" using model/alt SSH + model/avhrr SST such that α*(SSH – β*sst) {using c & d} No temporal filtering has been applied.

*** latitudes corresponding to longitude index are along the diagonal in Figure 1.**

Figure 4: An independent data set of subsurface temperatures shows that the eastern basin of the subtropical gyre is warmer after 1999, than between 1989 and 1999. The Topex/Poseidon estimated rise in temperatures around 200˚E, 35˚N is somewhat consistant with in situ data retrieved from the PFEG (NOAA lab) LAS – www.pfeg.noaa.gov. The lines to the right indicate that source of the data.

a) average temperature anomaly over top 300m
b) average temperature between 300 and 1000m (note some depths may be missing)
c) extraction of estimated steric height change in subsurface layers of ocean from altimeter data + AVHRR data

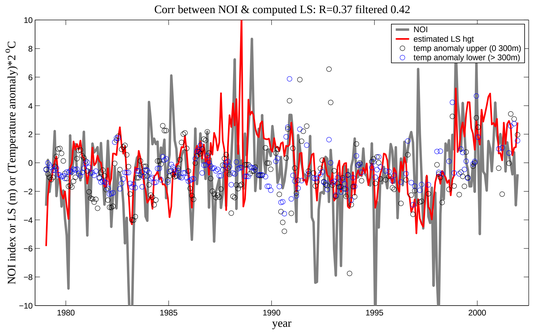
Figure 4a **Figure 4b**



Topex Poseidon + ERS Fields
Geosat Fields
AVHRR SST Fields
Model Fields

GTPSS real time temperature monthly Fields (1999–2001)
GTPSS temperature "Best" monthly Fields (1991–1998)
WOD 98 (Levitus) Fields – 3 month moving avg (1979 – 1990)

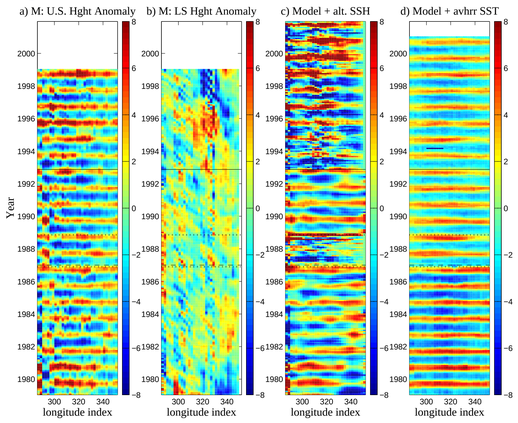
Figure 4c



These data are provided via the PFEL (Pacific Fisheries Environmental Lab) – Live Access Server – and are monthly means of MEDS (Canada's Marine Environmental Data Service) subsurfac temperature observations which are received from NODC (NOAA's National Oceanographic Data Center) by PFEL. The temperature data have been averaged on a 1 degree latitude/longitude grid and interpolated to 19 standard depth levels. The interpolation procedure to produce isotherm depth is a simple linear interpolation which begins at the surface.

Real–Time GTSPP – These data are received monthly and are are posted to this site around the middle of the month following the month of observation.
Best Copy GTSPP – NODC receives higher resolution delayed–mode data which often duplicates or supercedes real–time profiles. The Best Copy data provide the most complete dataset, however the real–time data is updated more frequently.

Figure 7



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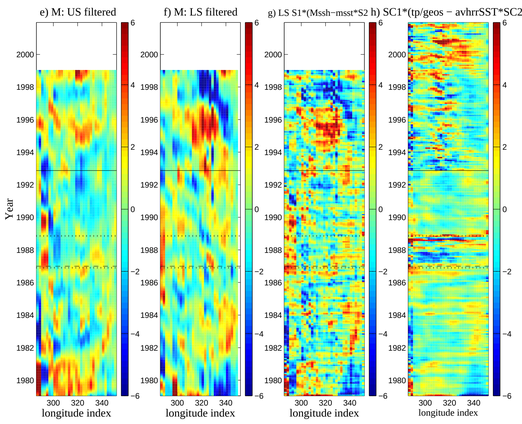
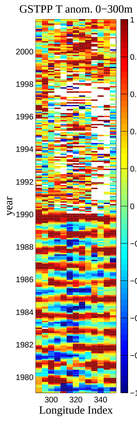


Figure 8a



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