

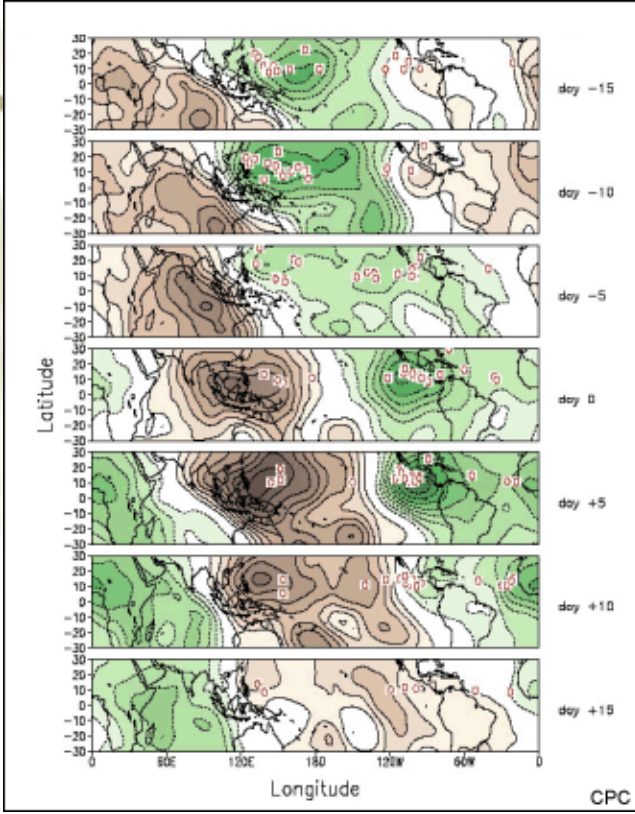


Argo detecting mixed layer intra-seasonal variations in Tropical Indian Ocean

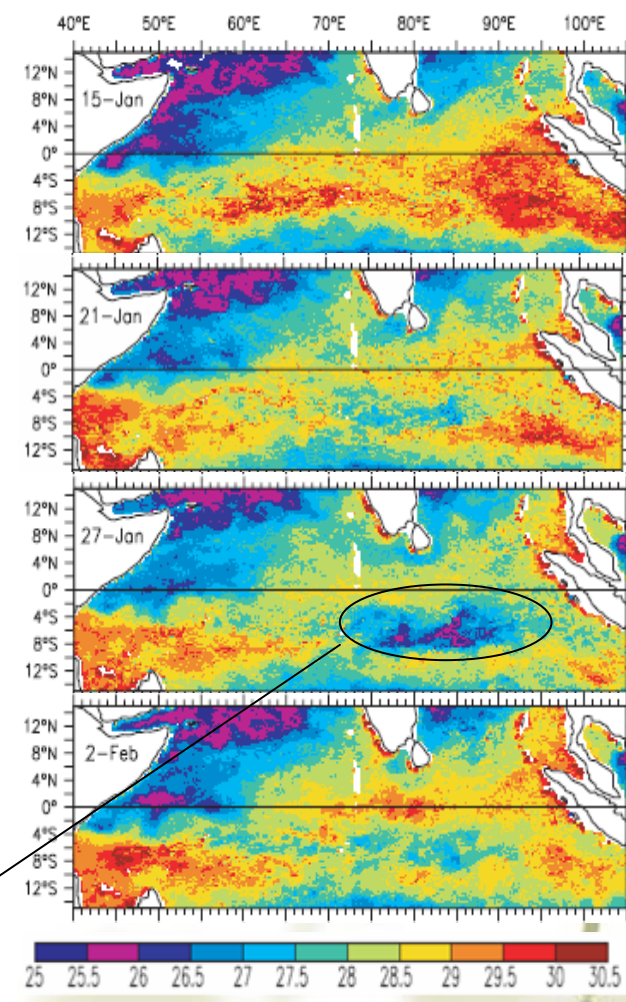
Weidong Yu
Lab. Marine Science and Numerical Modeling
First Institute of Oceanography, SOA
wdu@fio.org.cn

Tokyo, 9 Mar., 2007

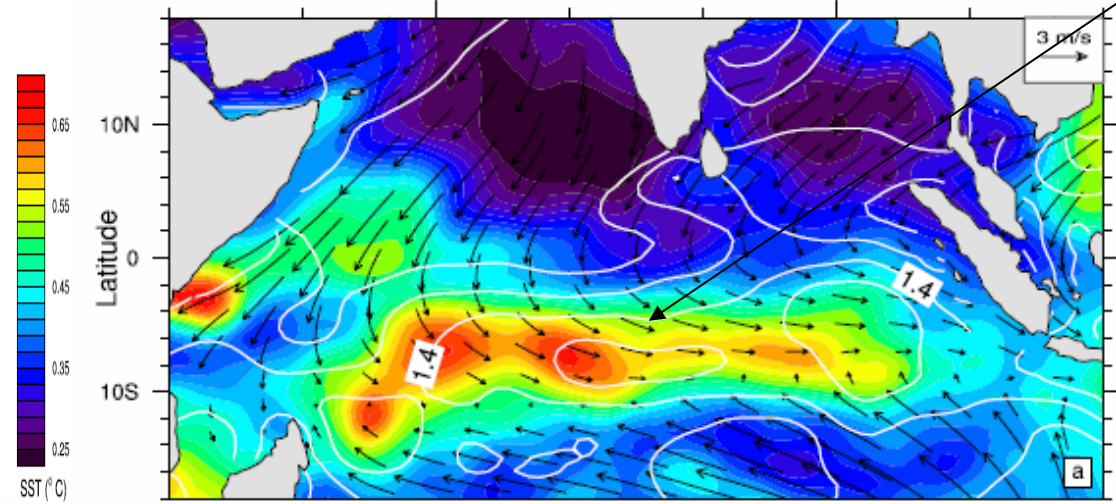
OLR



TMI SST



Harrison & Vecchi, 2001



Saji, N.H., S.-P. Xie, and C. -Y. Tam, 2006

Why SST cooling?

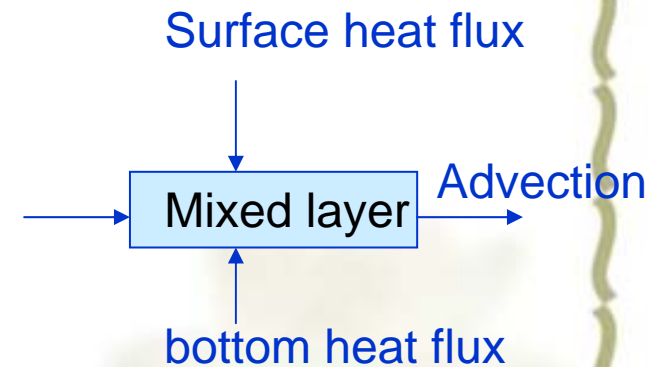
❖ What we have known ...

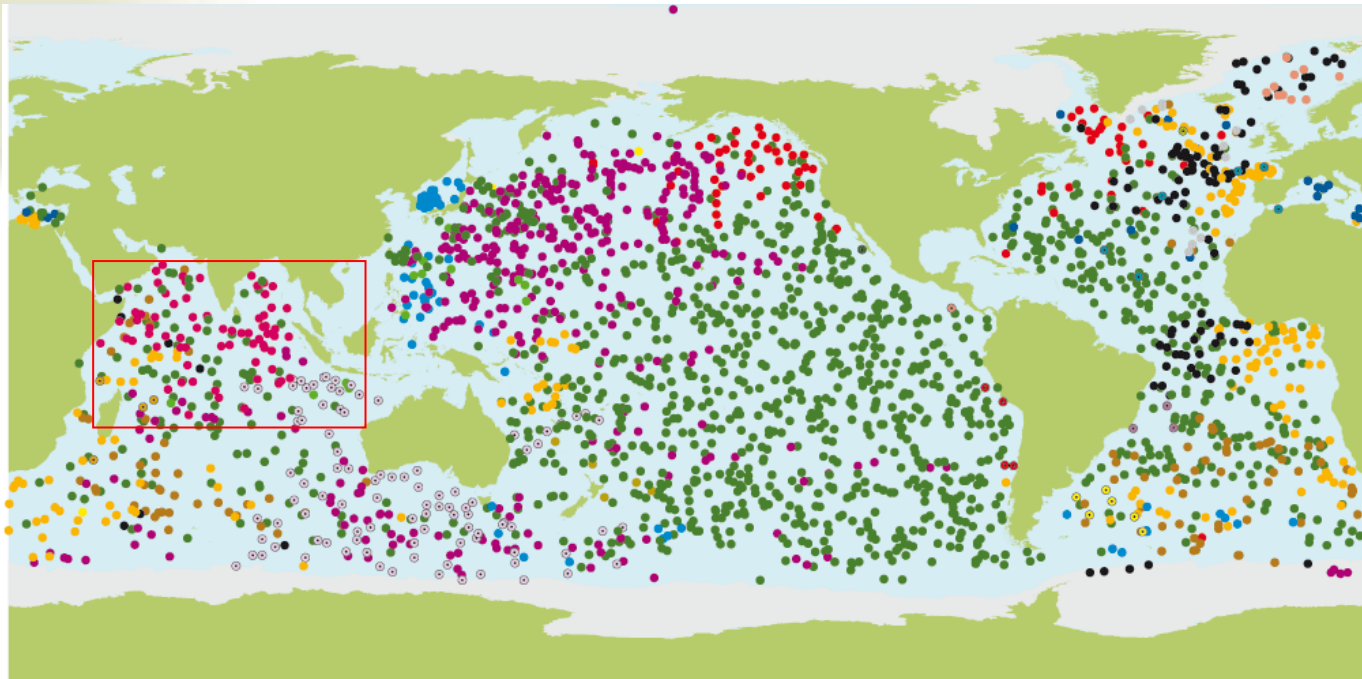
- ❖ Less solar radiation
- ❖ Stronger latent heat release

❖ What we are not sure ...

- ❖ Temperature advection
- ❖ Entrainment through the bottom of mixed layer

One key point: lack of subsurface observation

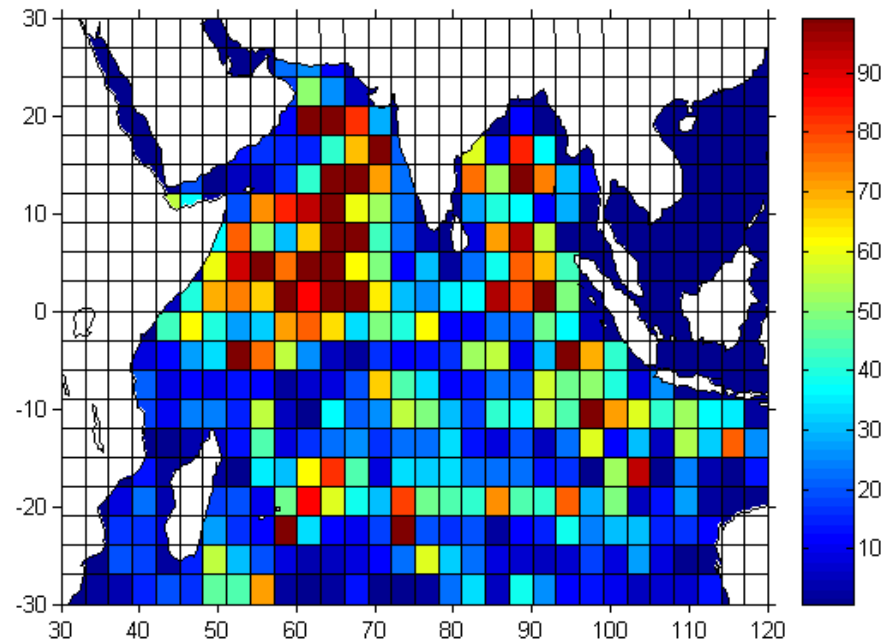




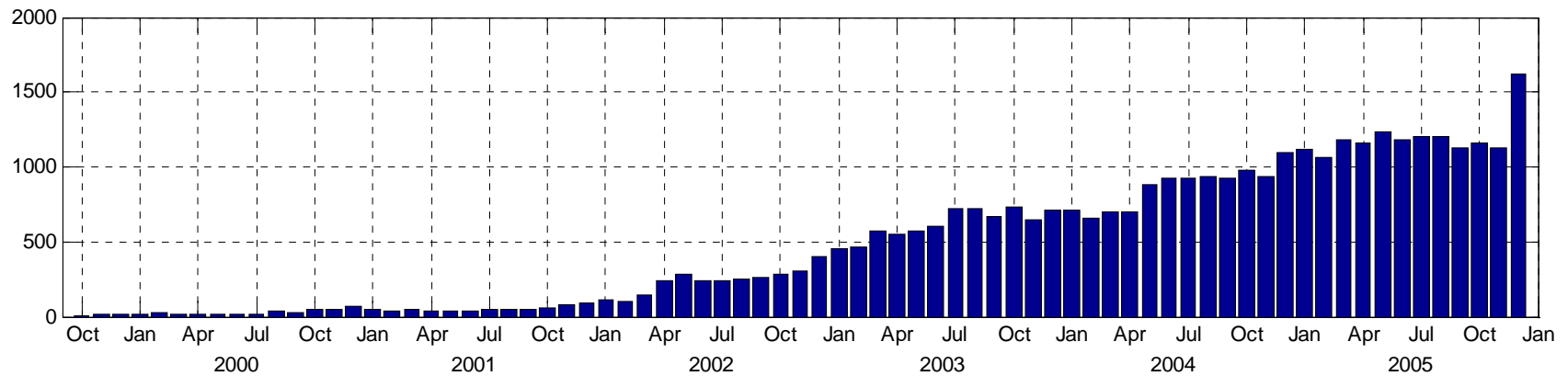
Argo Network, as of June 2006

2483 Active Floats

- | | | | |
|------------------|---------------------|-----------------------|------------------------|
| ● ARGENTINA (6) | ● COSTA RICA(1) | ● JAPAN (367) | ● NORWAY (10) |
| ● AUSTRALIA (96) | ● EUROPEAN UN. (18) | ● KOREA, REP. OF (84) | ● RUSSIAN FED. (3) |
| ● BRAZIL (3) | ● FRANCE (189) | ● MAURITIUS (4) | ● SPAIN (6) |
| ● CANADA (75) | ● GERMANY (111) | ● MEXICO (1) | ● UNITED KINGDOM (100) |
| ● CHILE (4) | ● INDIA (71) | ● NETHERLANDS (11) | ● UNITED STATES (1303) |
| ● CHINA (14) | ● IRELAND (1) | ● NEW ZEALAND (5) | |



Indian Ocean Argo Profile Density



Time evolution of the number of Argo Profiles in Indian Ocean



MLD data sets available

- ❖ Monterey and Levitus, 1997
- ❖ de Boyer Montégut et al, 2004

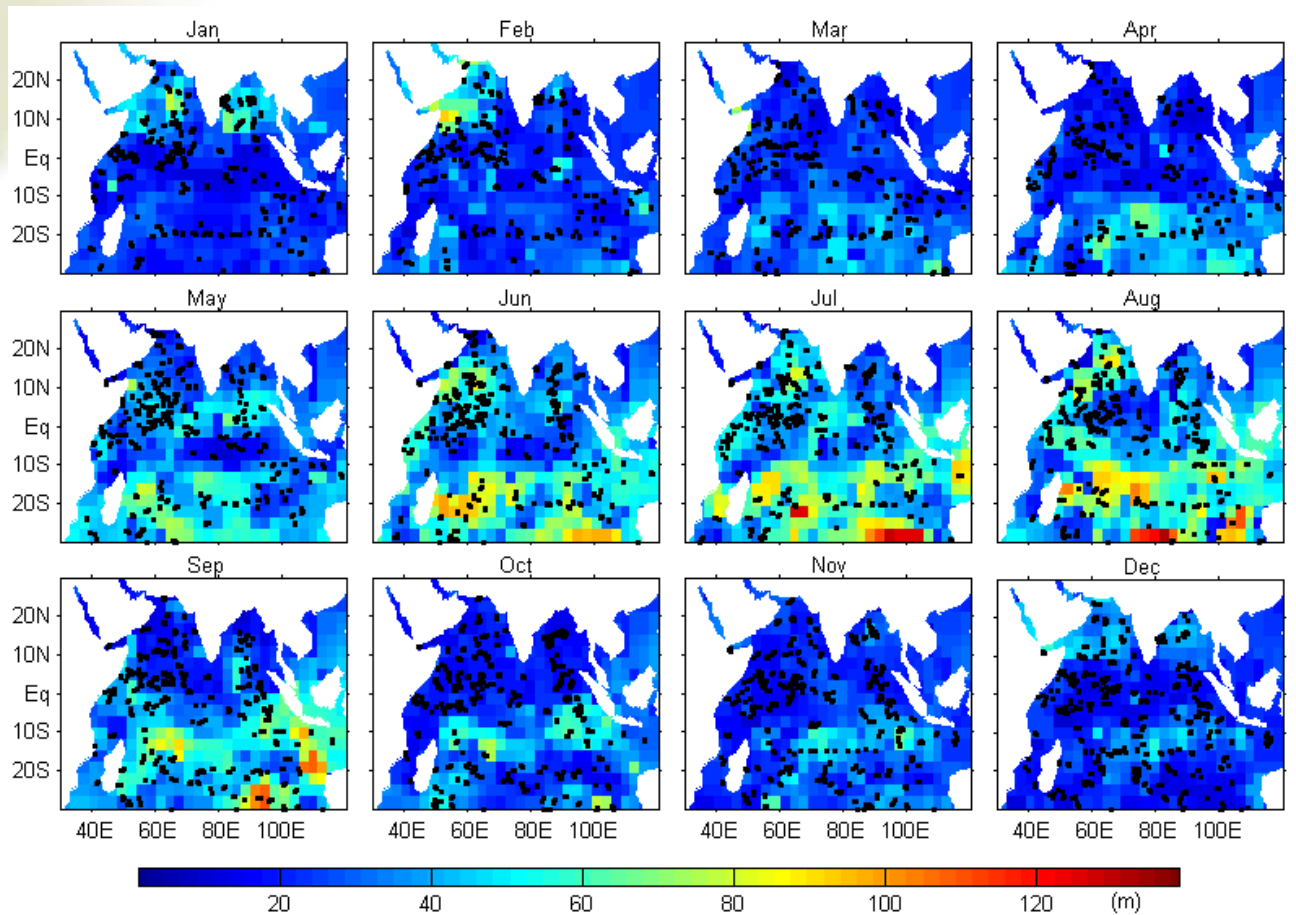
MLD Ref. level 10m below the surface
Potential Density Criteria: 0.03kg/m^3

BLT = ID - MLD

ID Ref. level 10m below the surface, Temperature criteria 0.2°C



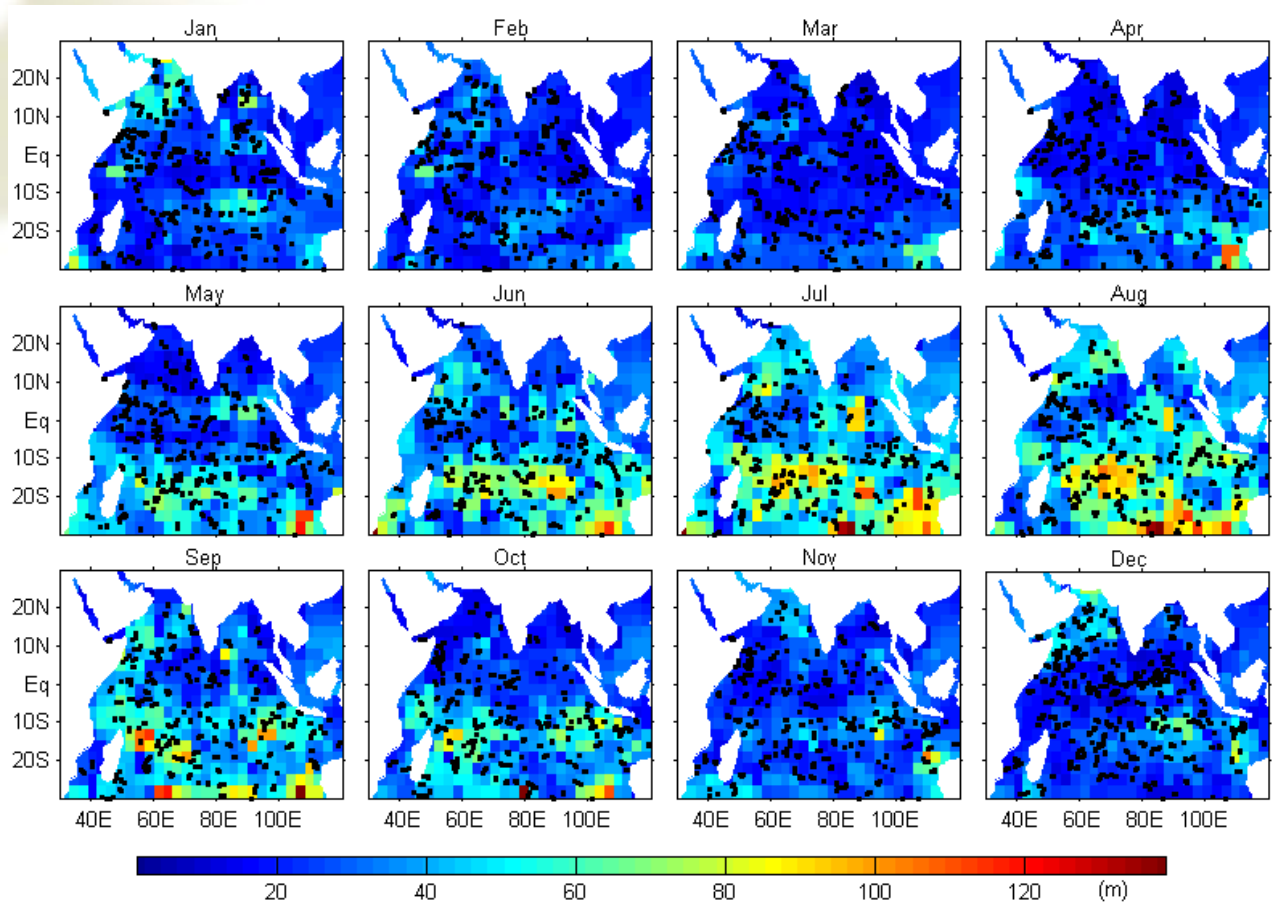
Monthly MLD products from Argo profile



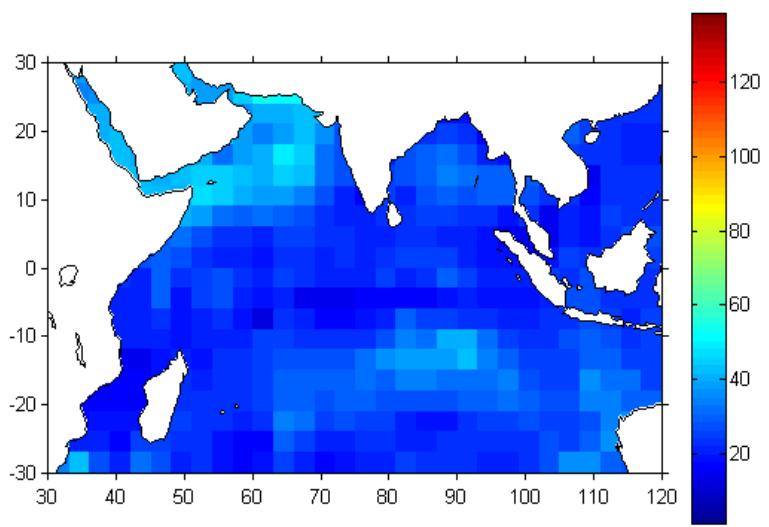
Year 2004



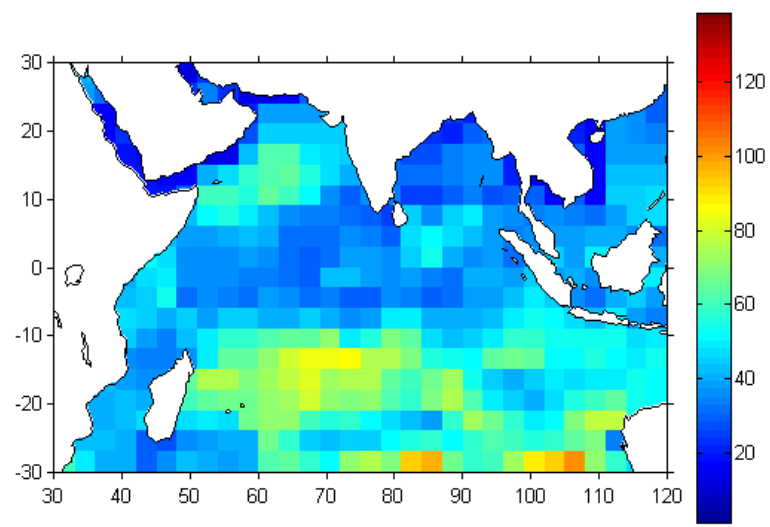
Monthly MLD products from Argo profile



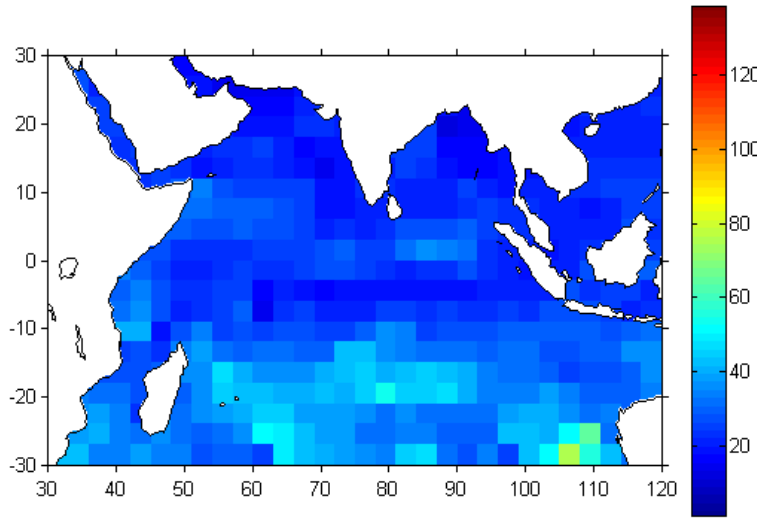
Year 2005



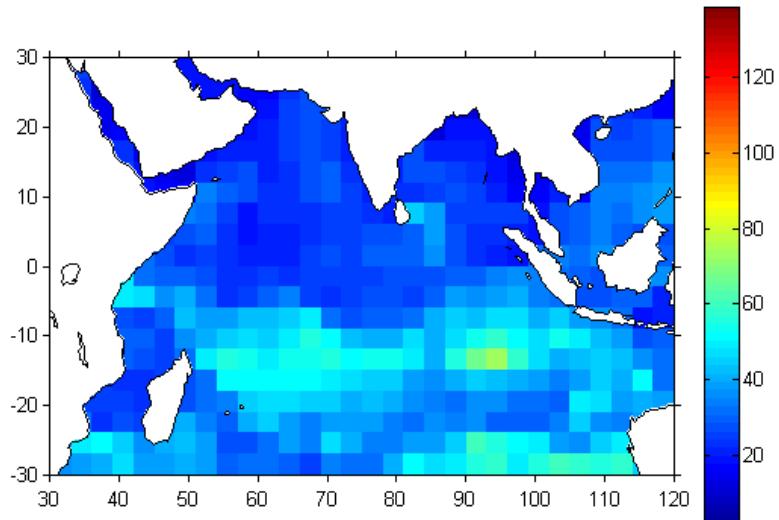
DJF



JJA



MAM

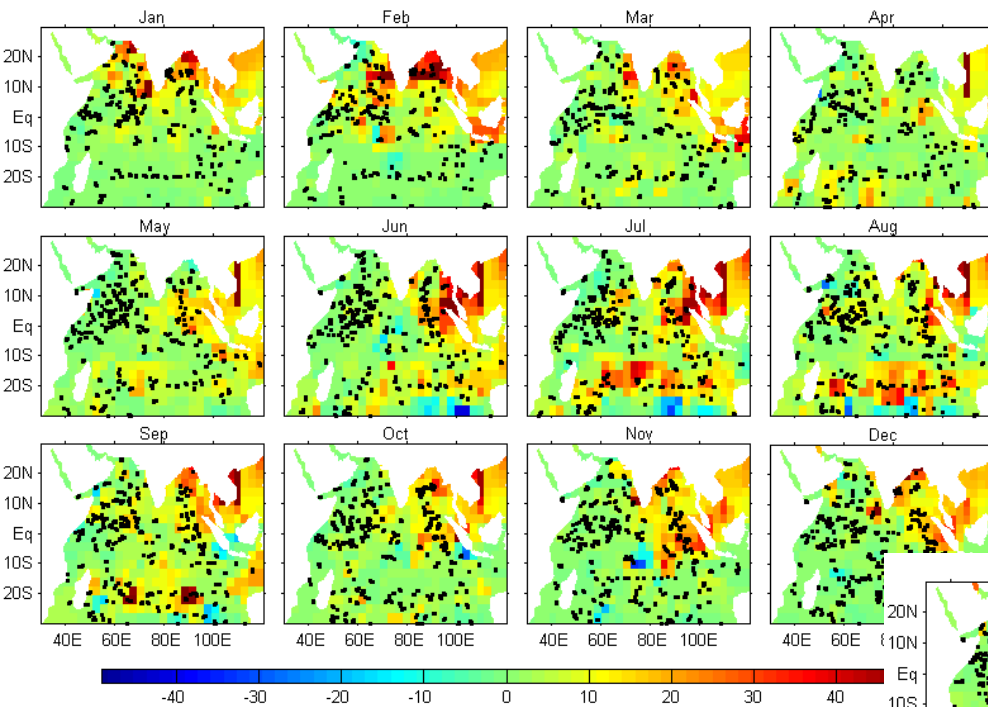


SON

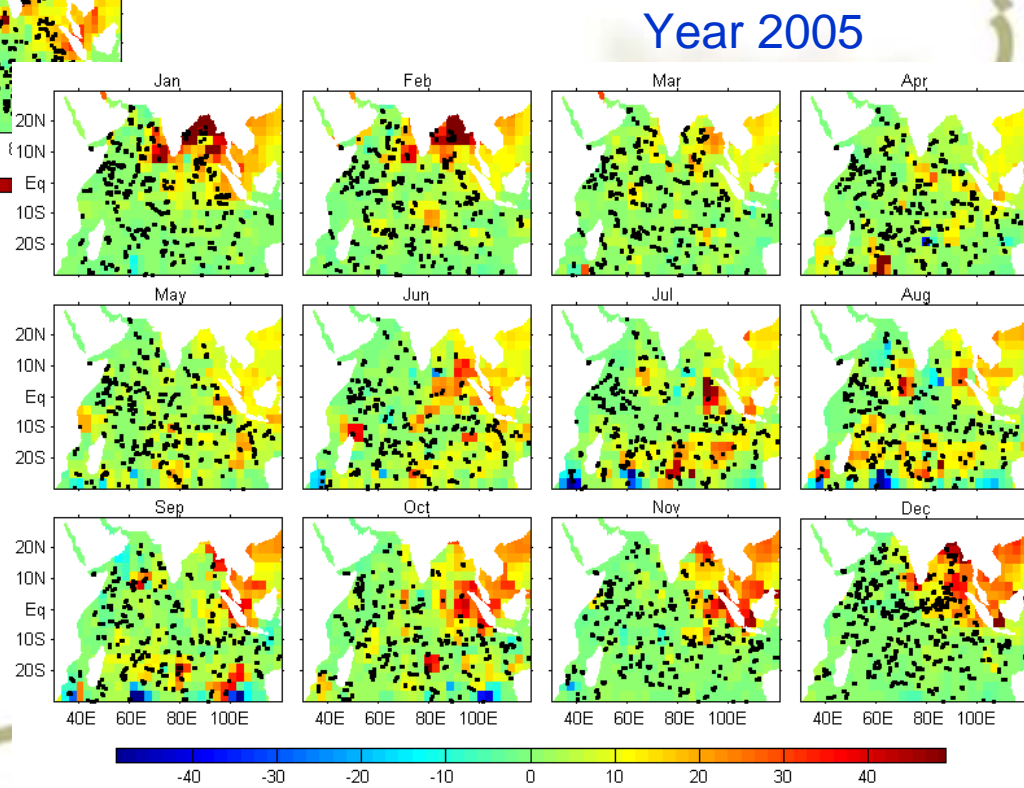
Seasonal Mean of Indian Ocean MLD



Monthly BLT products from Argo profiles

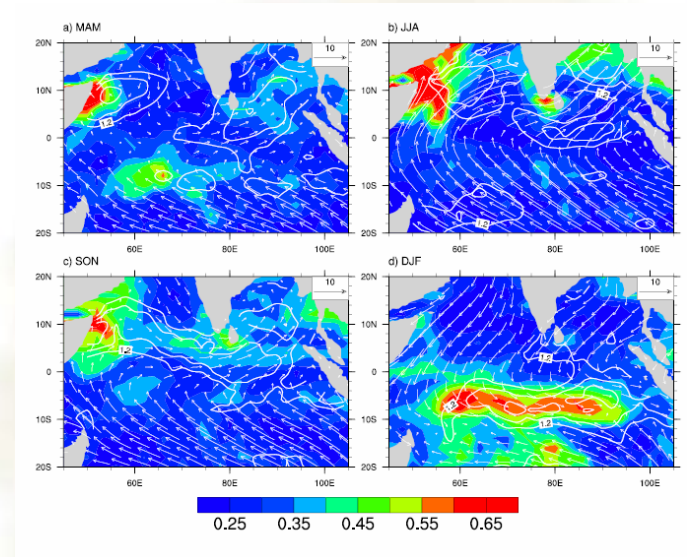
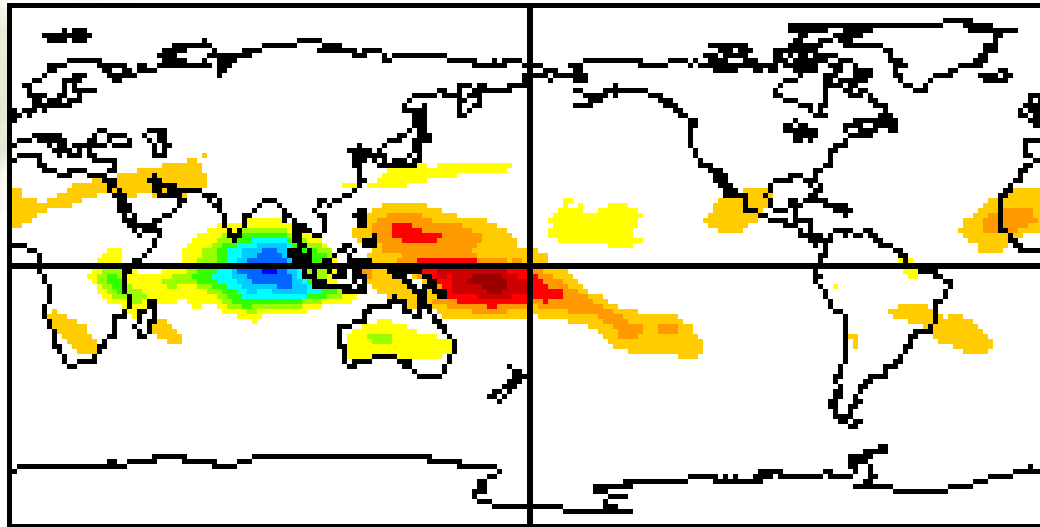


Year 2004



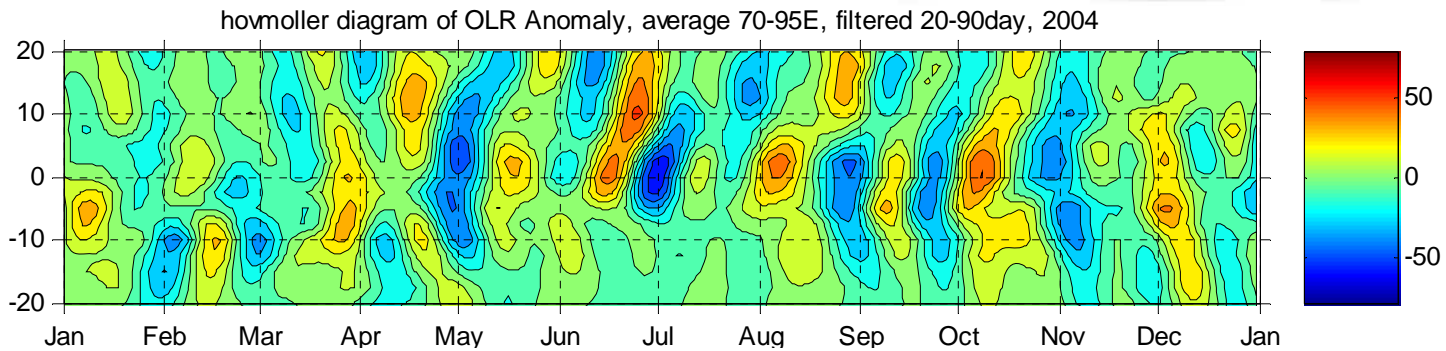


ISO

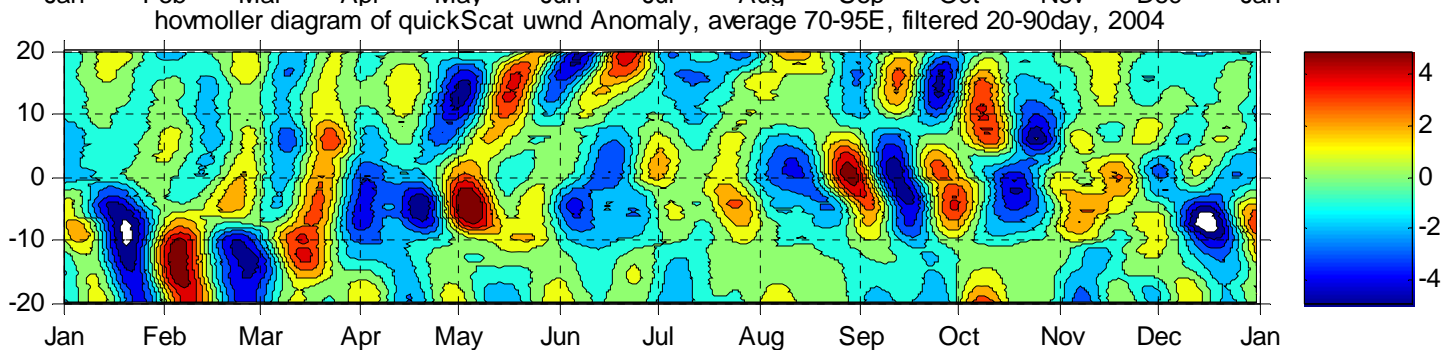




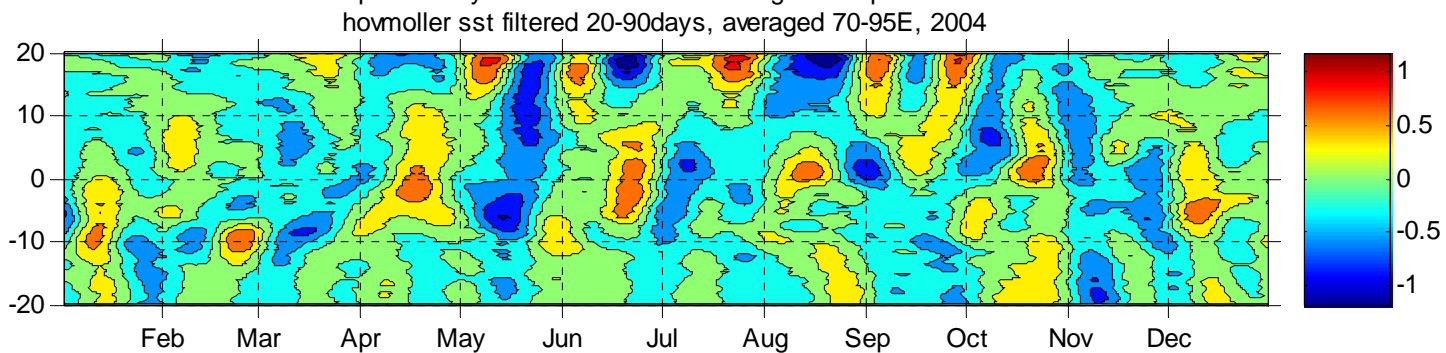
OLR



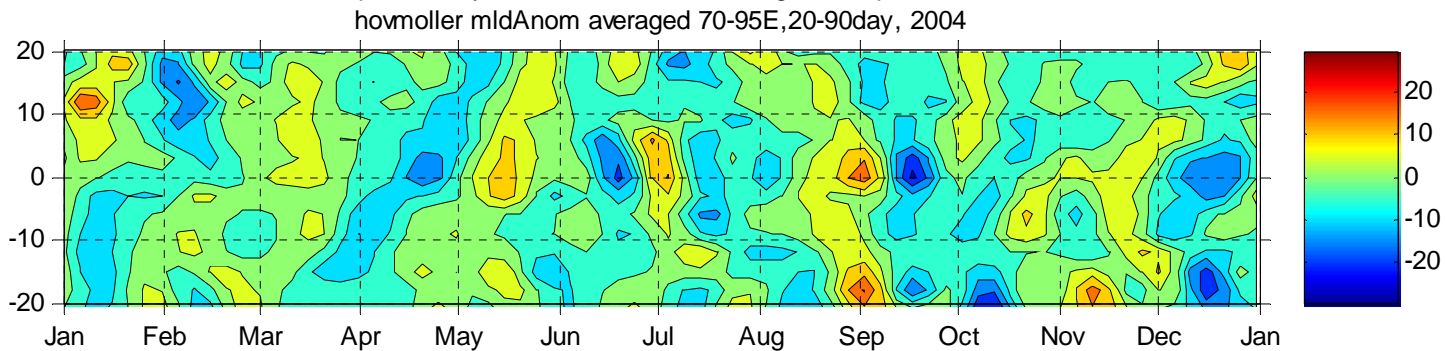
Zonal wind



SST

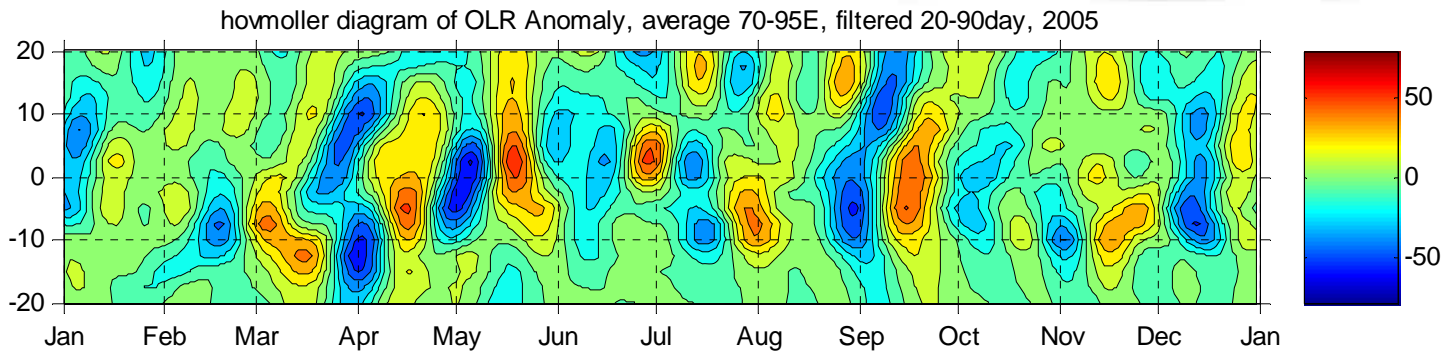


MLD
Year 2004

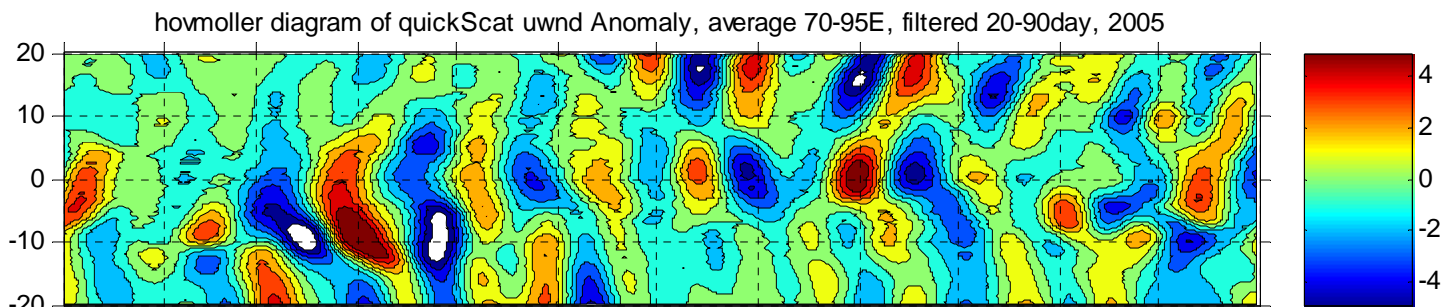




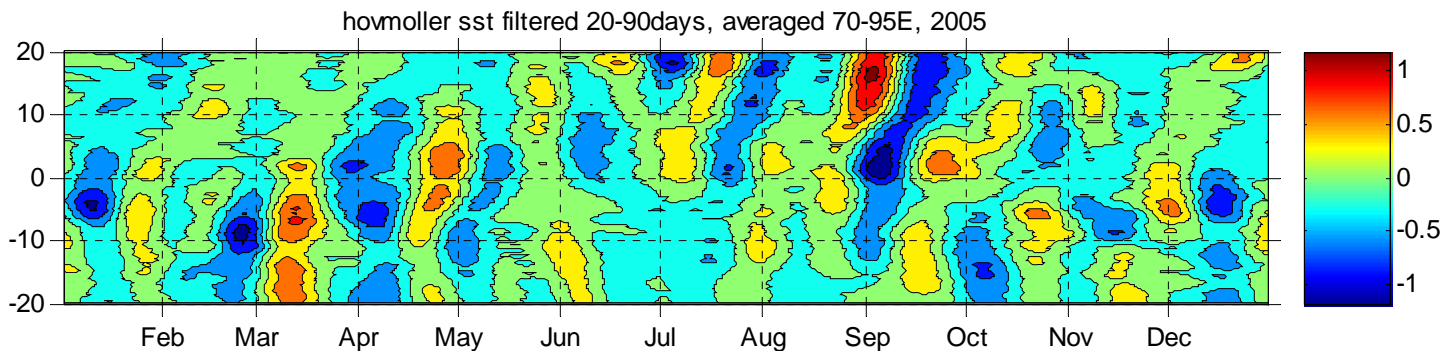
OLR



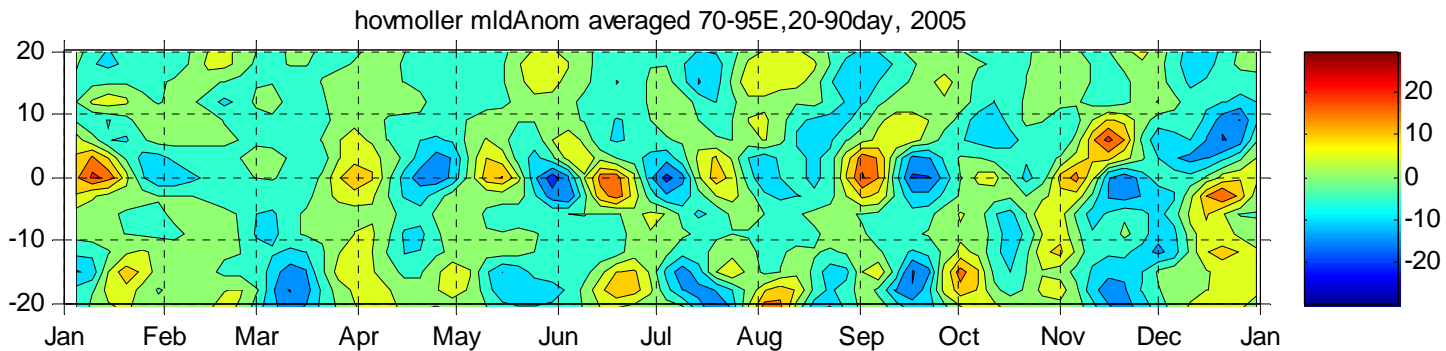
Zonal wind



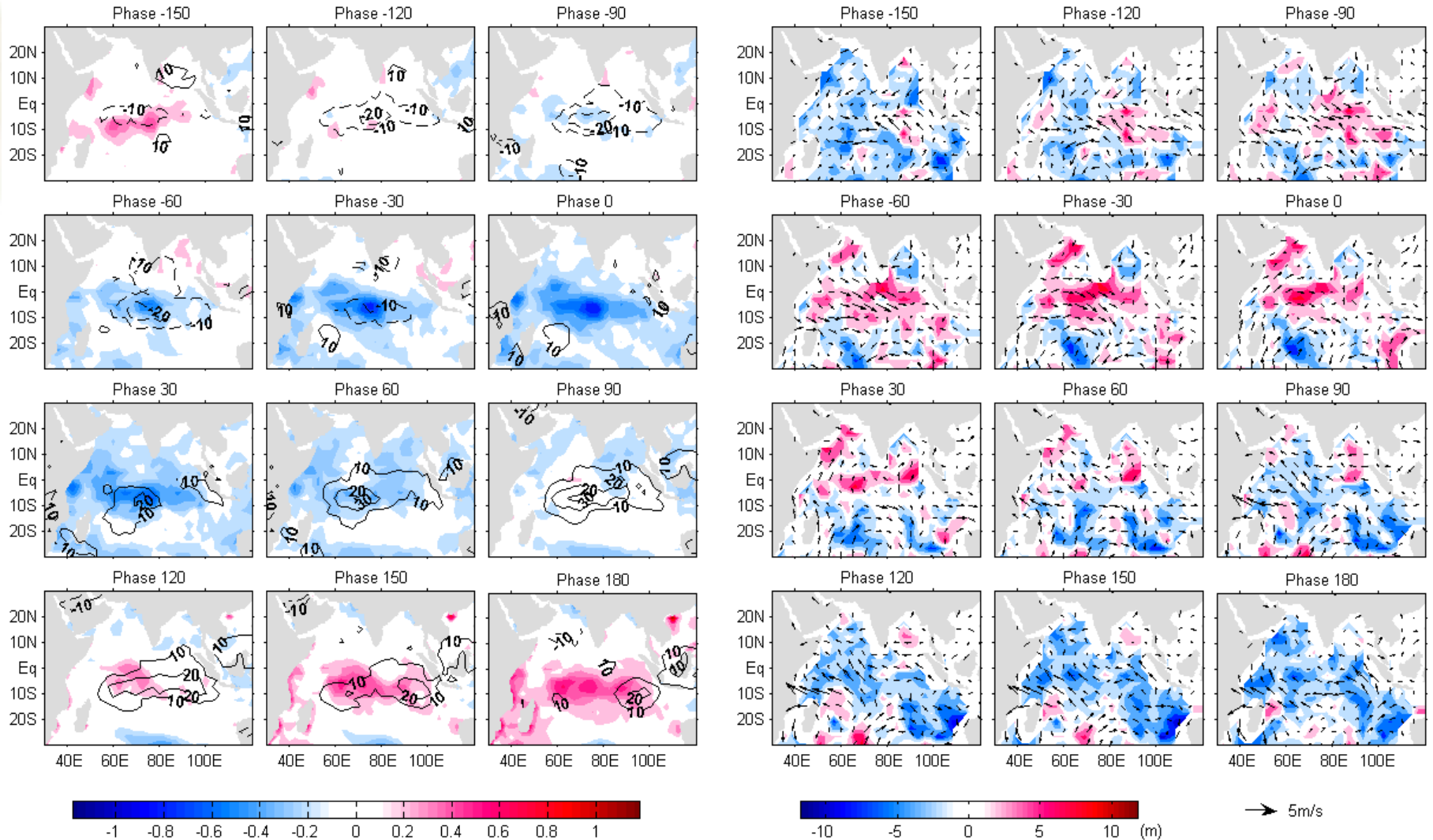
SST

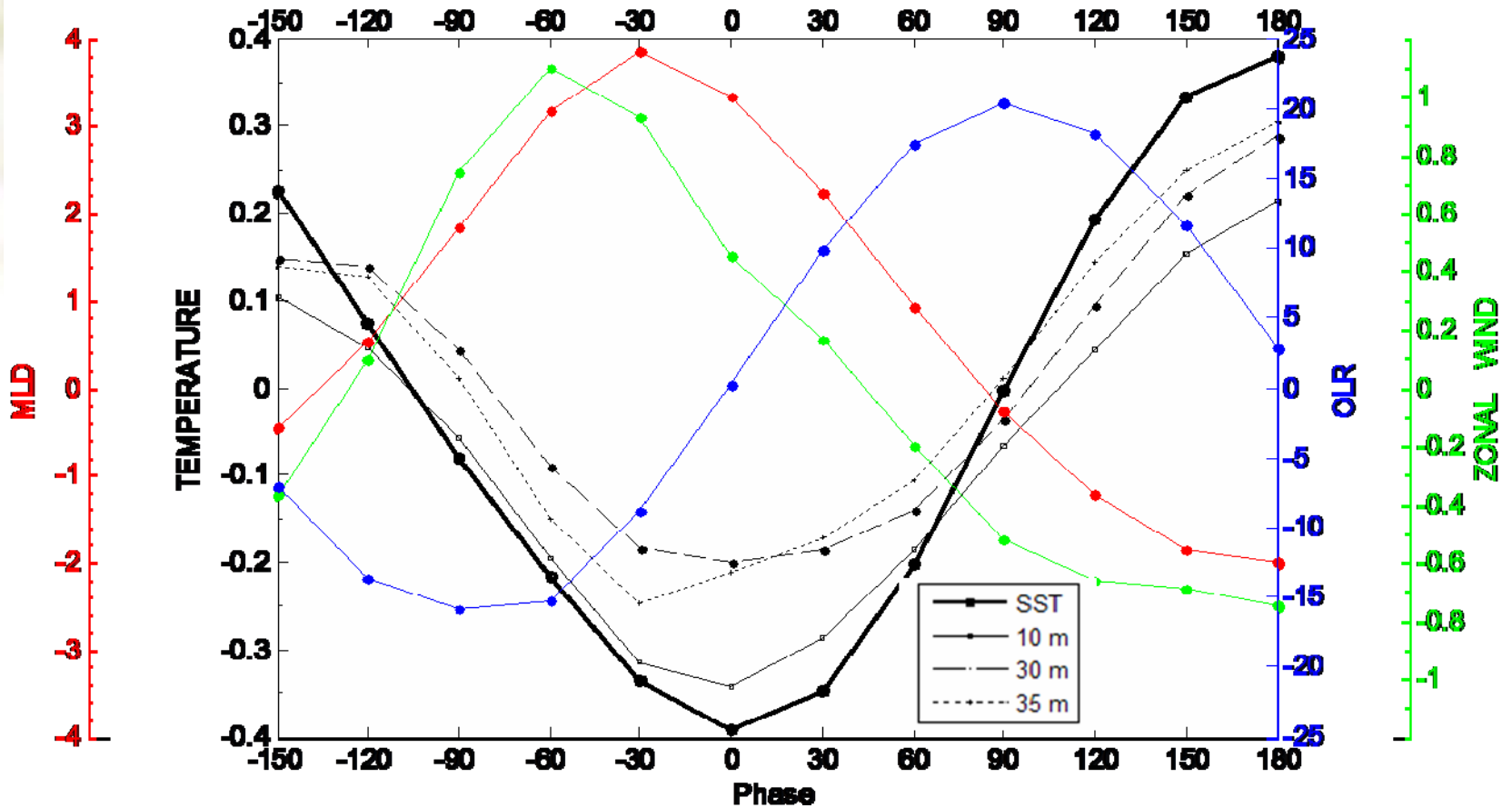


MLD
Year 2005



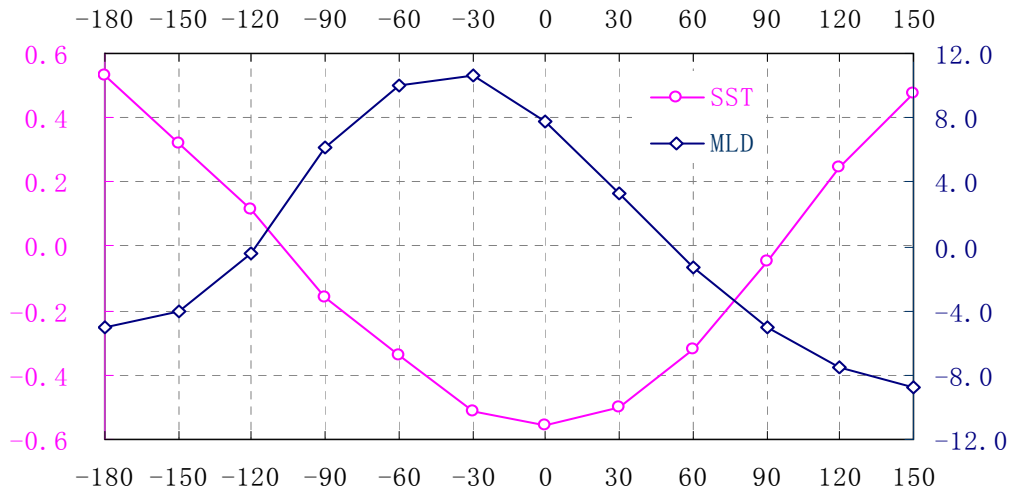
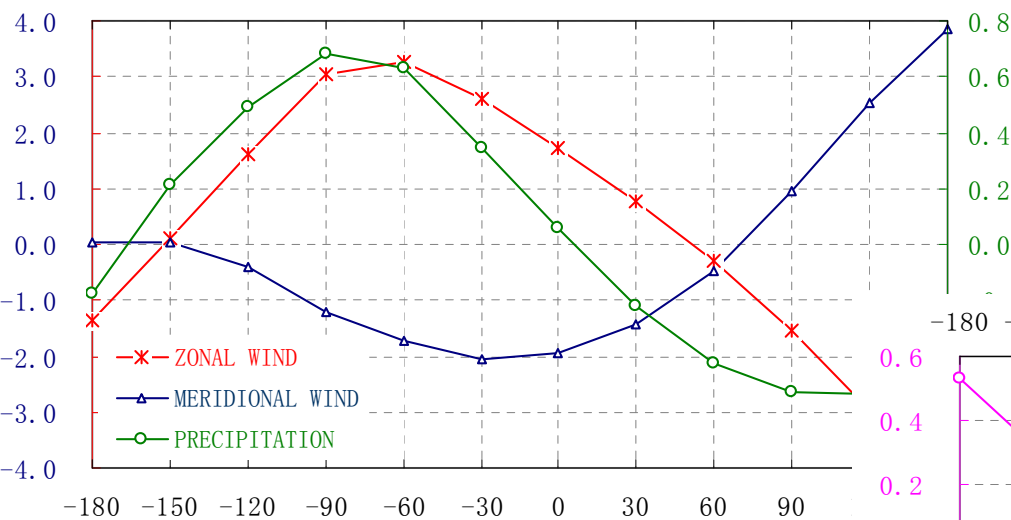
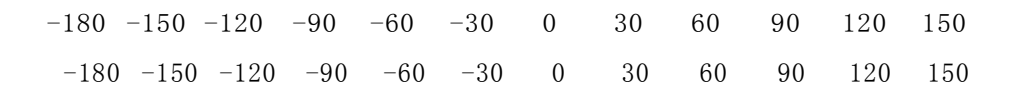
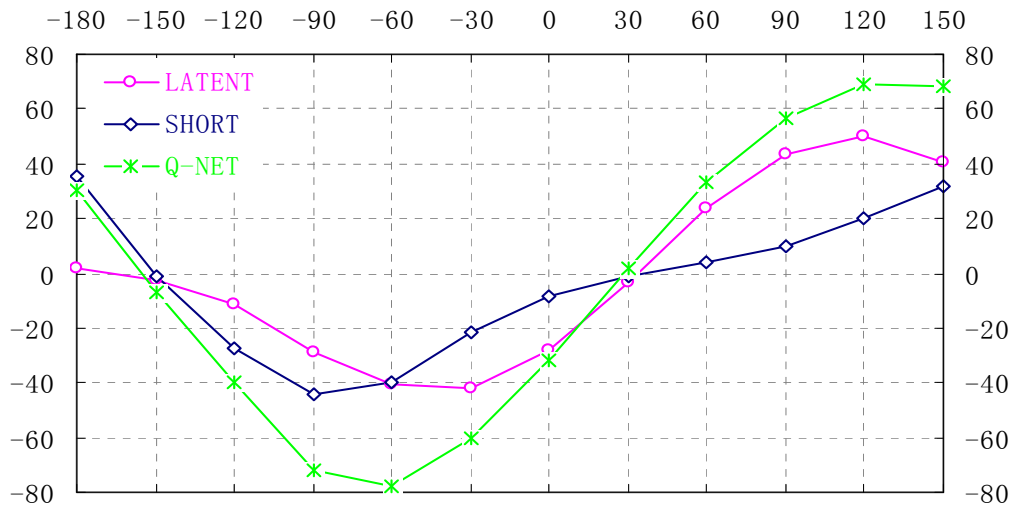
ISO composite based on three winters (2003-2005)

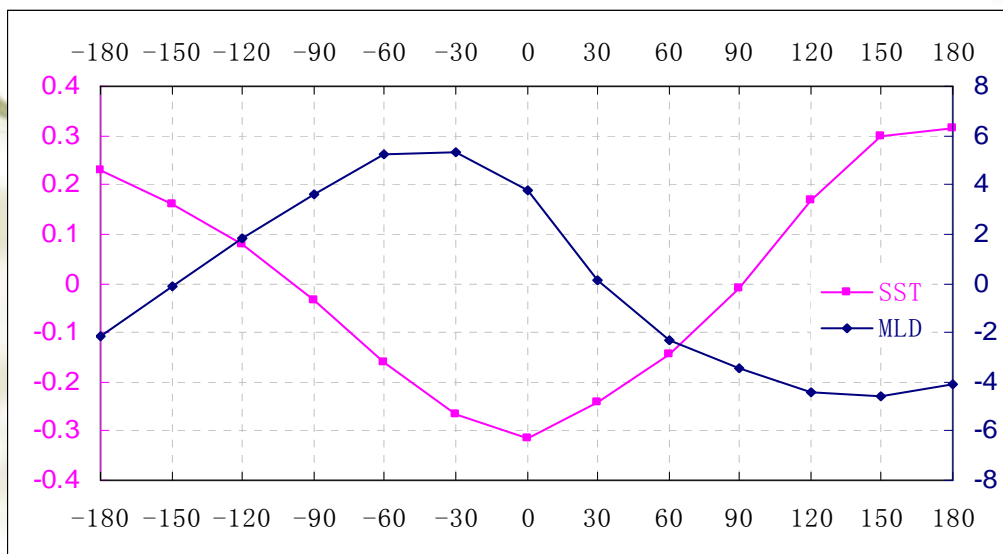




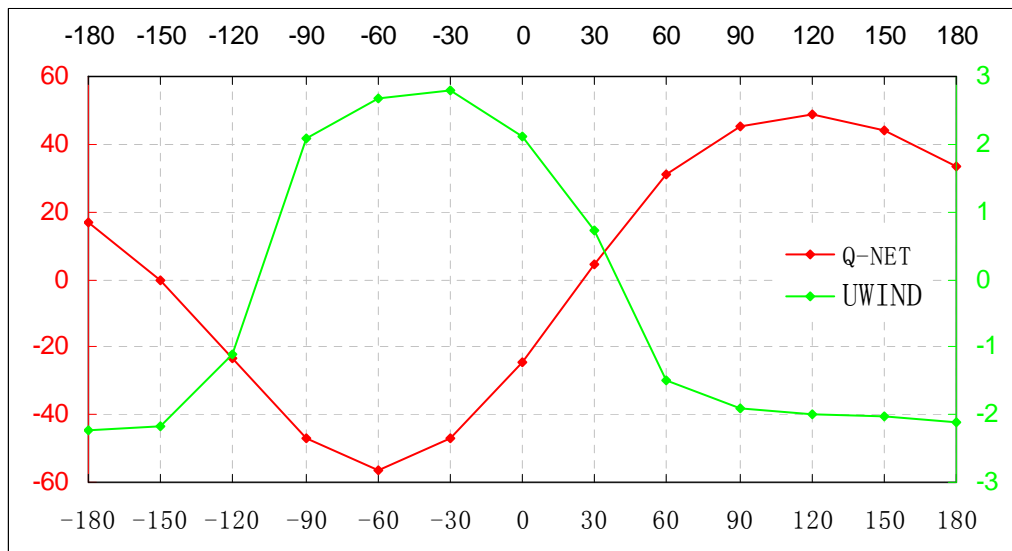
Phase relation among OLR, zonal wind, SST, subsurface temperature and MLD

PWP MLD model driven by WHOI IMET buoy data

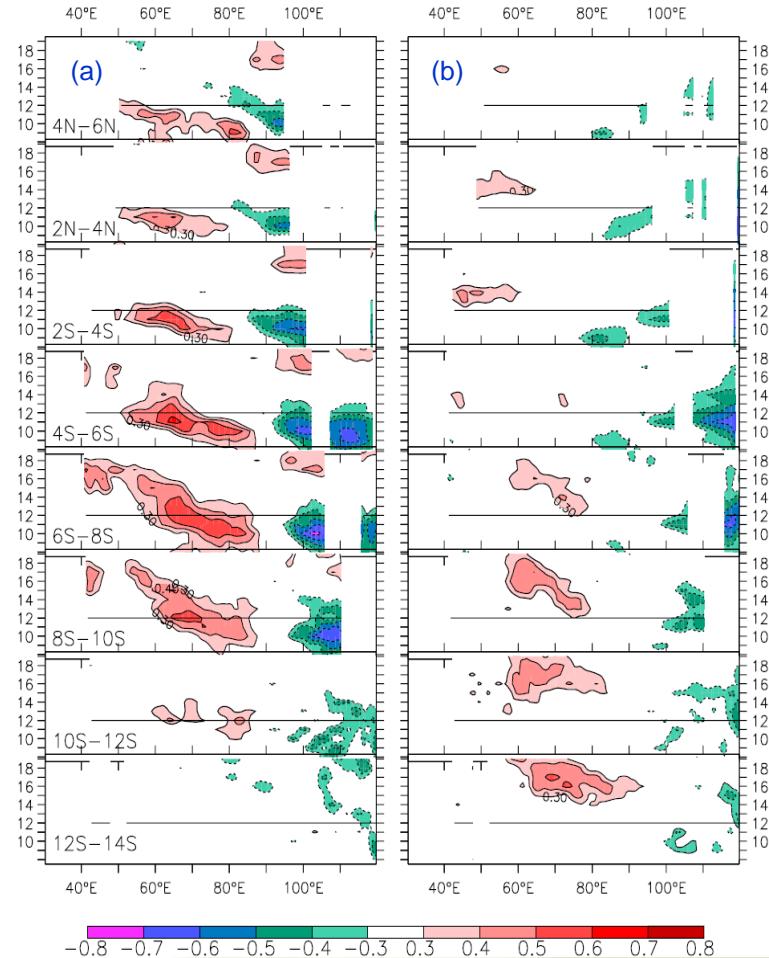
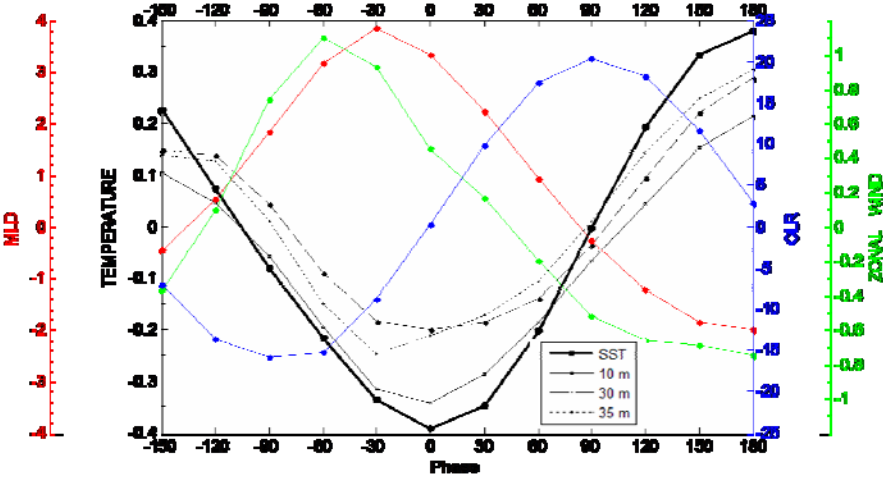




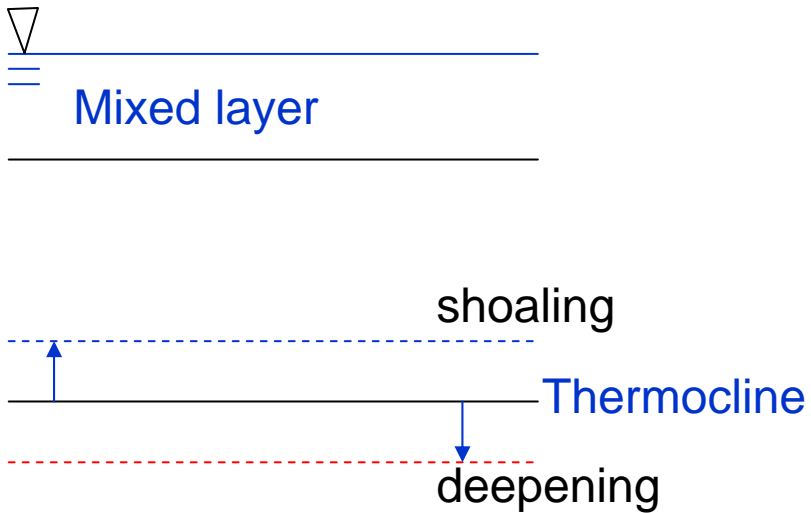
PWP MLD model driven by
OAflux + NCEP wind



Implication of the interannual ISO variations



Yu et al., 2006





Summary

1. Monthly MLD/BLT data sets derived from Argo
2. First evidence of the basin-scale mixed layer variations during ISO: negative correlation between MLD and SST
3. Ocean process contribute to the SST variations during ISO
4. Data basis for the ocean-atmosphere interaction during ISO
5. Potential implication for the interannual ISO variations