Since 1995, the National Environmental Prediction Center (NCEP) has been producing real time ocean analysis and reanalysis using Ocean Data Assimilation System (ODAS) (Ji et al. 1995). The ODAS was configured for the Pacific basin and used the Geophysical Fluid Dynamics Laboratory's Modular Ocean Model version 1 (MOM.v1) and a three-dimensional variational data assimilation scheme originally designed by Derber and Rosati (1989). The last version of the Pacific ODAS (referred to as RA6 hereafter) was a significant improvement over earlier versions and has been used widely in scientific community (Behringer et al. 1998).

The new Global Ocean Data Assimilation System (GODAS) was developed to be the replacement for RA6, and to provide oceanic initial conditions for the global Climate Forecast System (CFS) newly developed at NCEP (Saha et al. 2006). A simple evaluation of GODAS is reported by Behringer and Xue (2004), and a journal paper is in preparation.

The GODAS is based on a quasi-global configuration of the GFDL MOM.v3. The model domain extends from 75^{O}S to 65^{O}N and has a resolution of 1^{O} by 1^{O} enhanced to $1/3^{O}$ in the N-S direction within 10^{O} of the equator. The model has 40 levels with a 10 meter resolution in the upper 200 meters. This configuration represents a small improvement over RA6 which had a 1.5^{O} resolution in the E-W direction and 28 levels in the vertical. Other new features include an explicit free surface, the Gent-McWilliams isoneutral mixing scheme and the KPP vertical mixing scheme. The GODAS is forced by the momentum flux, heat flux and fresh water flux from the NCEP atmospheric Reanalysis 2 (R2). In addition the temperature in the top model level is relaxed to weekly analyses of sea surface temperature, while the surface salinity is relaxed to annual salinity climatology.

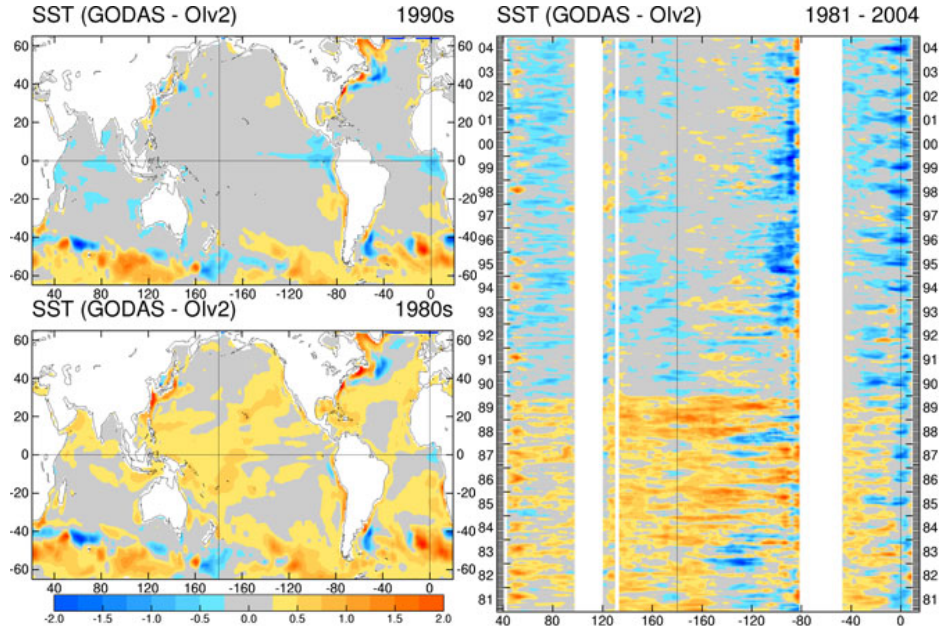
The GODAS assimilates temperature profiles and, in another new feature, assimilates synthetic salinity profiles as well. The assimilation method is the same 3DVAR scheme as used in RA6, but it has been modified to assimilate salinity. The standard GODAS has been used for a reanalysis extending from 1979 to the present. In this reanalysis GODAS assimilates temperature profiles from XBTs, from TAO, TRITON and PIRATA moorings and from Argo profiling floats.

The XBT observations collected prior to 1990 were acquired from the NODC World Ocean Database 1998, while the XBTs collected subsequent to 1990 are acquired from the Global Temperature-Salinity Profile Project. A synthetic salinity profile is computed for each temperature profile using a local T-S climatology based on the annual mean fields of temperature and salinity from the NODC World Ocean Database. The number of temperature profiles can vary significantly from month to month, but there are longer term trends as well. For example, there is a gradual decline in the monthly counts after 1985 followed by a sharp recovery in 1990 when the source of the profiles changed.

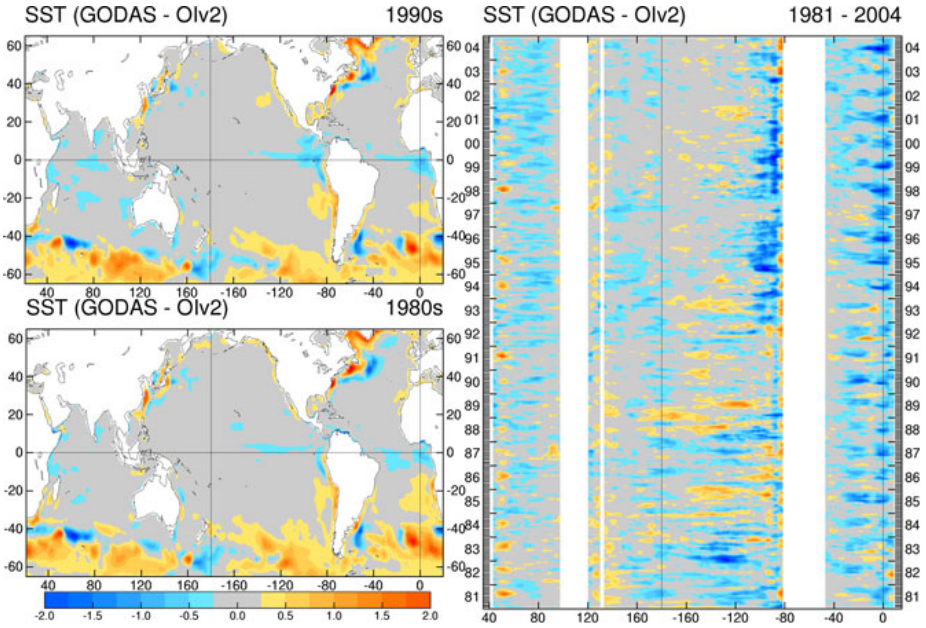
A comprehensive evaluation suggests that the temperature field in GODAS is closer to observations than that in RA6. Although this version of GODAS does not assimilate satellite sea level as RA6 does, GODAS does as well as or better than RA6 in comparisons with altimetry and tide gauge sea level records in 1990-2003. Despite of the improvement in the climatological salinity, GODAS seriously underestimates salinity variability. Similar to RA6, the equatorial currents contain large errors, which are suspected to be related to the errors in salinity. Another deficiency of GODAS is its mean shift in 1990. **It turned out that the warm biases before 1990 were due to a computational error in processing the XBT data for the years prior to 1990**. By making the correction, a new version of GODAS data is created and available at **http://cfs.ncep.noaa.gov/cfs/godas**. The monthly and pentad fields of the new GODAS are in subdirectories **monthly** and **pentad**, while those of the old GODAS are in **monthly_old** and **pentad_old**. The impacts of the corrections are illustrated in the following.

- Most of the changes are in 1979-1989 due to corrections of XBT profiles in that period.

SST Difference from OI data

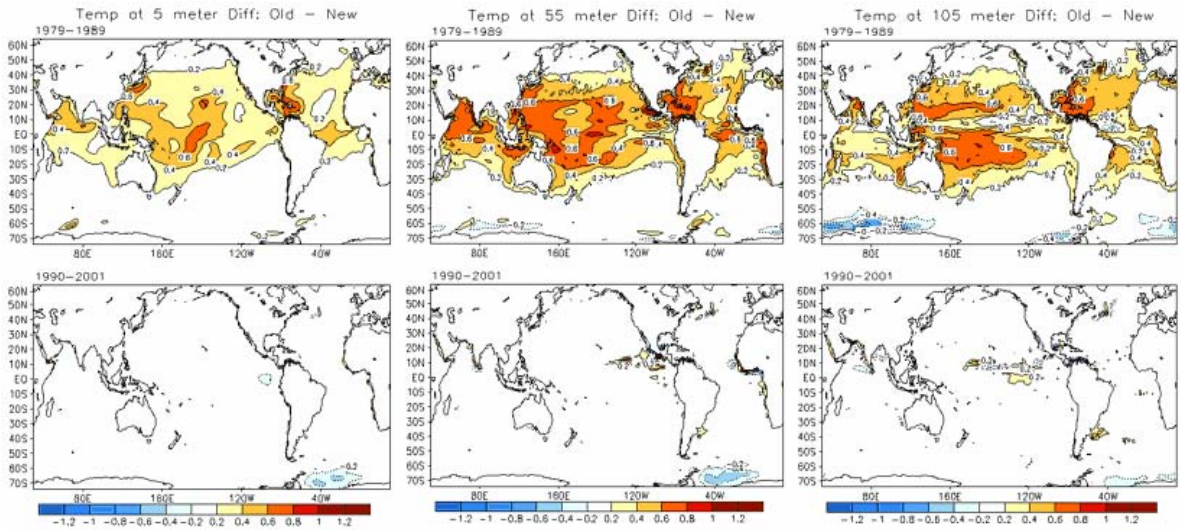


Old GODAS

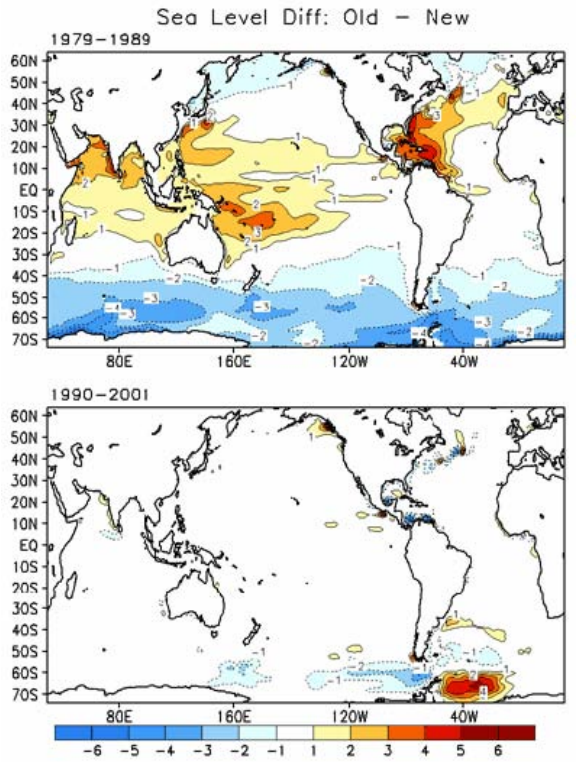


New GODAS

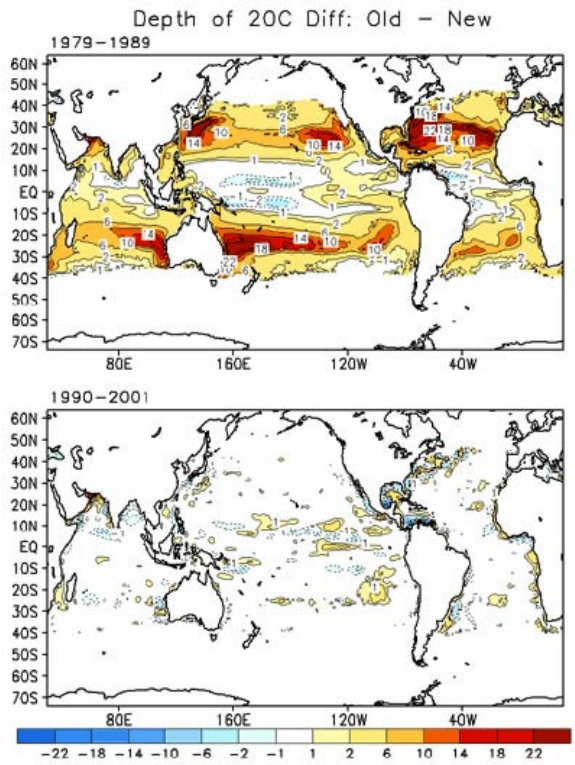
- Average reductions of temperature in 1979-1989 are about 0.5-0.6 degree, distributed approximately evenly in depth.



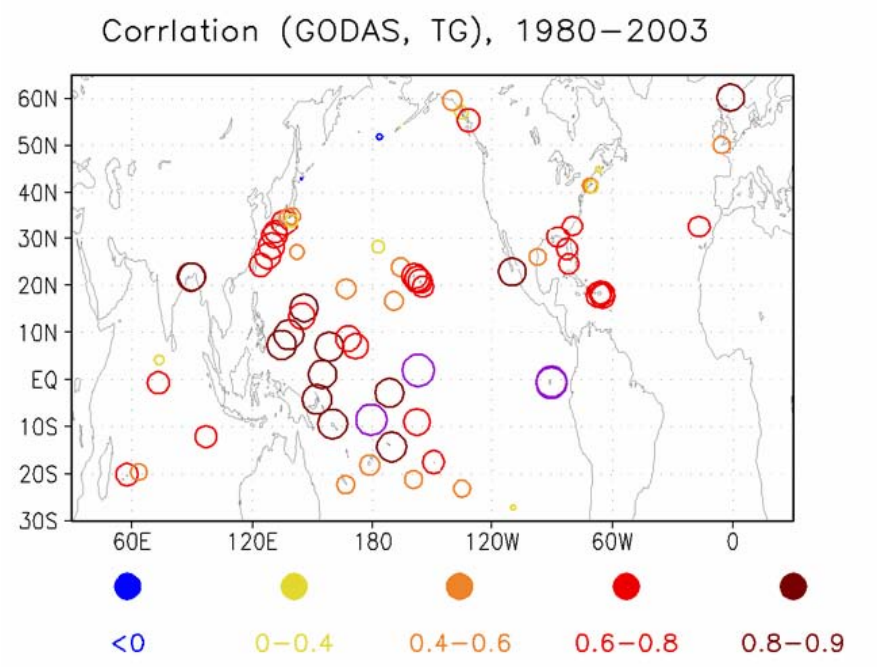
- Average reductions of sea level are 1-2 cm in tropical Indian and Pacific, and 3-4 cm in western tropical Atlantic.



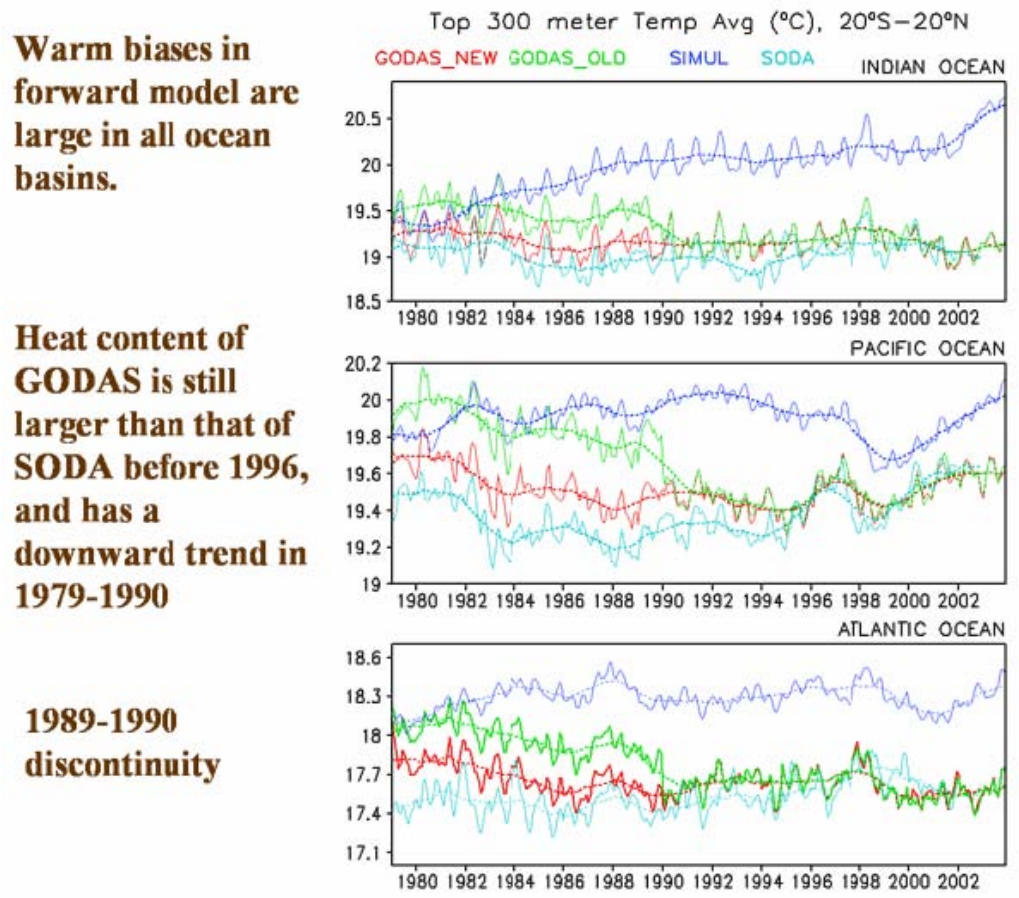
- Average reductions in depth of 20 degree are as large as 18 meter in midlatitude, but only 1-2 meter in the tropics.



- Correlation with tide gauge observations is improved, and it is about 0.7-0.9 in tropical Pacific, **equivalent or better than that of RA6**, and 0.4-0.7 in tropical Indian and Atlantic Oceans.



- Although the discontinuity in 1989/1990 is largely removed, there are remaining downward trends in 1979-1990, probably due to the warm biases in forward model.



More challenges are prompted to further improvement. First, the forward model has large warm biases in all ocean basins due to errors in model forcing and physics. Second, the forward model drifts away from initial conditions in Atlantic, probably due to simulation errors of thermohaline circulation. Third, the changes of observation network also contribute to discontinuity and trend in GODAS. To continue improving the GODAS, we are going to assimilate more observations, e.g. Altimetry sea level and Argo salinity, and improve the forward model by upgrading to MOM.v4 as well as improving the ocean data assimilation scheme.

Please send your comments on the GODAS web to

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