

# Introduction of NCC-GODAS and Optimal Estimation of the Background Errors Covariance Matrix of NCC-GODAS by Means of Neural Network

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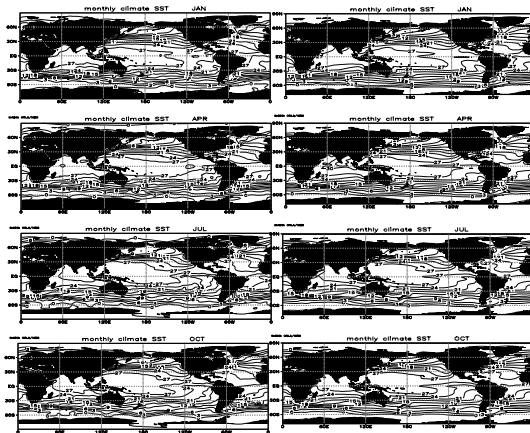
The global ocean data assimilation system of National Climate Center of China (NCC-GODAS), based on 3-Dimensional variation scheme, has been established and operationalized, and employed to offer the initial field on marine part to air-sea coupled model. This system mainly consists of three parts such as data pre-processing, variational analyses interpolation and dynamic model, which is L30T63 OGCM (IAP/LASG) Version 1.0.

A new method is proposed to estimate the background errors covariance matrix (BEC) of NCC-GODAS on the basis of the neural network method. Firstly, we suppose that BEC can be described by a unified formula (Gaussian type function) and its value is determined by the amplitude and the correlation length, which are spatial and time function. Then, we deduce a constrain relation on BEC. In order to solve this relation, we construct an object function consisting of squared deviation of NCC-GODAS from the observations on some points selected previously. The neural network is introduced and trained by optimizing this object function so that a relative reasonable shape of BEC may be obtained.

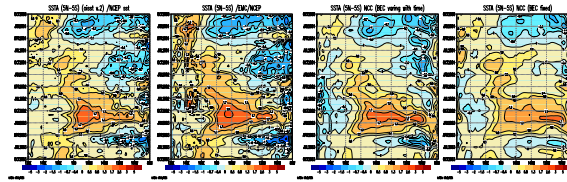
Using the observation data from 1997 to 2001, we have performed several numerical experiments and get a set of BEC by this way. Then, we run NCC-GODAS with this BEC from 1982 to 2003. Comparing with NCEP's results, NCC-GODAS with this BEC has been improved.

Following figures show the preliminary results. It should be pointed out that the results have no any modification and post-processing, and no sea surface temperature data but profiles have been used in this system.

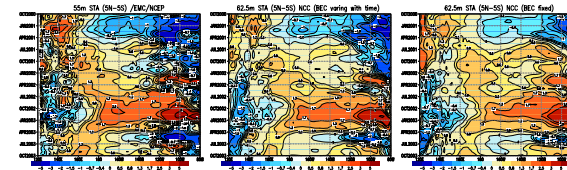
In the figures, "BEC varying with time" refers to using the new BEC and "BEC fixed" means using the old BEC.



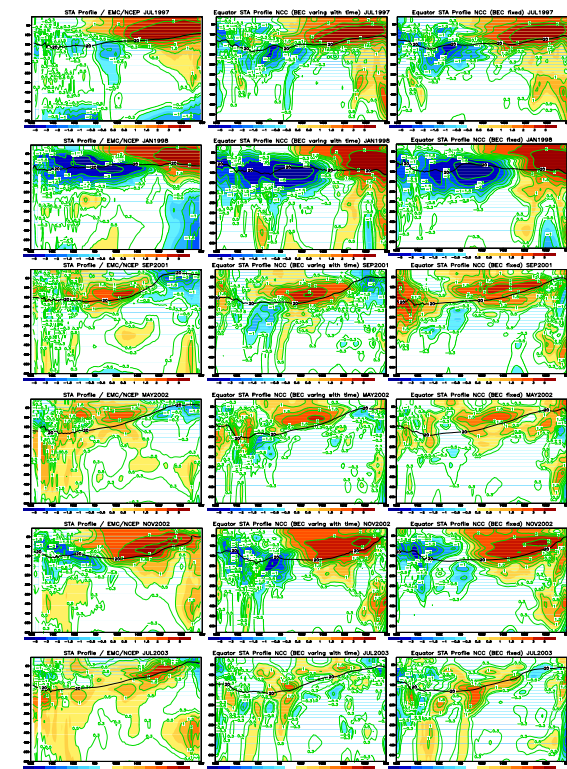
Monthly SST climatologically:  
Levitus 94 (left) and NCC-GODAS (right).



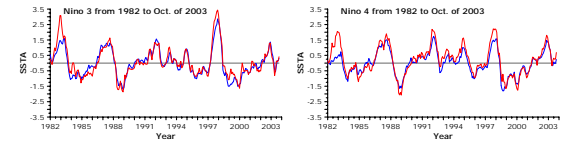
Cross section of 5°S-5°N averaged SSTA for OISST v.2, EMC/NCEP, NCC-GODAS and NCC-GODAS from left to right, respectively.



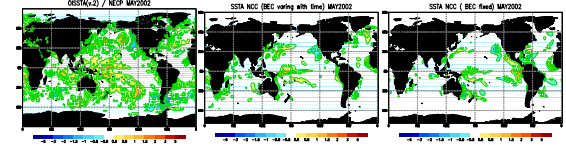
Cross section of 5°S-5°N averaged STA for EMC/NCEP(left), NCC-GODAS (middle) and NCC-GODAS (right), respectively.



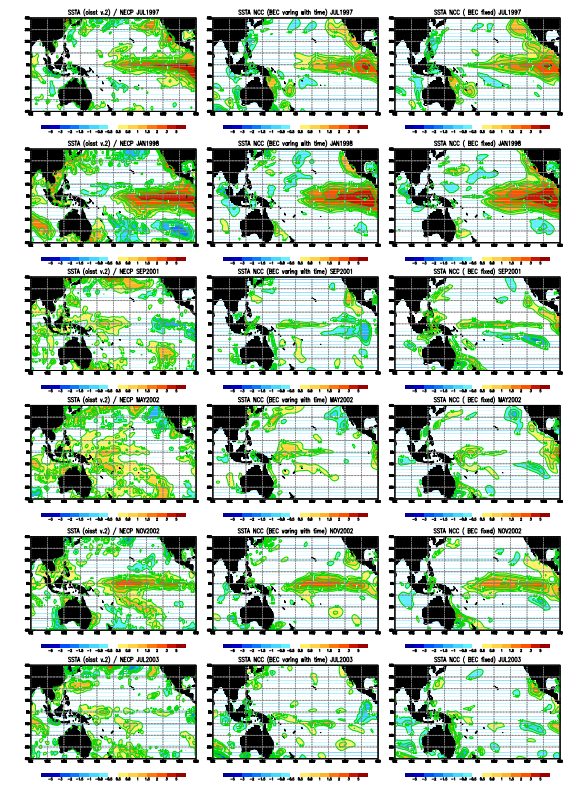
Cross section of equator STA for EMC/NCEP(left), NCC-GODAS (middle) and NCC-GODAS (right), respectively.



Monthly SSTA index for Nino3(left) and Nino4(right) area respectively:  
NCEP OISST v.2 (red) and NCC-GODAS (blue).



Global SSTA for NCEP OISST v.2(left), NCC-GODAS (middle) and NCC-GODAS (right), respectively.



Pacific SSTA for NCEP OISST v.2 (left), NCC-GODAS (middle) and NCC-GODAS (right), respectively.