Simulation of Cold pool and its interannual variability in the tropical Indian Ocean

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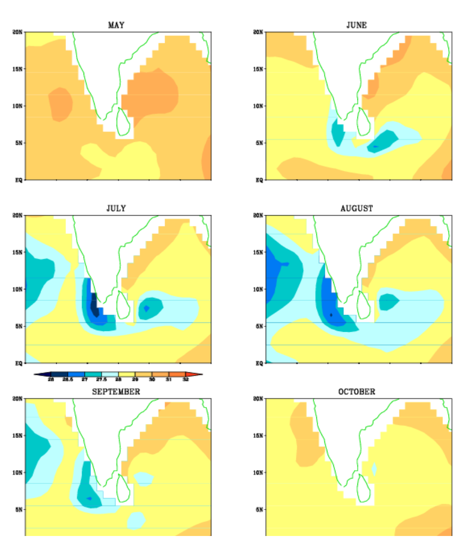
Annual cycle of sea surface temperature in the Indian Ocean shows warming in the equatorial region from February. This warm belt migrates northward till May. The observations also indicate a region of cold SST from June to September at the southern tip of India which shows importance for the convective heat source during the summer monsoon.

A 2½ layer thermodynamic ocean model has been used to simulate the cold pool in the Indian Ocean. Initially the model is spun up for ten years to reach the steady state with mean surface winds and heat fluxes those are obtained by averaging the five years daily NCEP surface winds and heat fluxes over the period 2000 to 2004. Since the numerical solution reached a quasi-equilibrium state after this integration, the model solutions by the end of this integration are considered as steady state solutions for the inter-annual runs. Further the model integration is carried out for 5 years for the period 2000 to 2004 with interannually varying daily NCEP surface winds and heat fluxes from the steady state. The warm sea surface temperature appears over equatorial region from February and further migrates northward, the sea surface starts cooling at the southern tip of India from June. The mean model simulated sea surface temperature from June to September shows that there is a cold region at the southern tip of India in the small domain 70° E-95° E, 5° N-10° N, where SSTs are below 28° C (Fig. 1). We define this as a '**cold pool'** which is also observed from OI SST V2. The model entrainment caused by the winds shows that this cold pool is a result of upwelling at the southern India and Sri Lankan coasts and the eastward advection of this upwelled cold water. Further to examine the interannual variability of this cooling, July and August months of the three years from 2002 to 2004 are considered in which the years 2002 and 2004 have deficient monsoon. The simulated cold pool (Fig. 2) shows interannual variability during the years 2002 to 2004. The results show that the areal extent of model simulated cold pool in the month of July and August during the years 2002 and 2004 is same as the domain mentioned above where as during the year 2003, it is much smaller. Such variability is compared and is in agreement with OI SST V2.

The interannual variability of convective heating is also examined by considering OLR as a proxy for convective heating. It is found that the shifting of atmospheric convection to the northeast of Bay of Ben ... ross equatorial low level jet (Joseph et al. 2004), ... 004 are dependent on the extent of the cold pool ... free due to the moisture transport to the norther ... heat flux (Behera et al. 2000). During the good ... activity and the axis of low level jet is seen ove ... gion. This may be due to the weakening of cold ... ux. The phenomenon of evolution of cold pool i ... of view and hence some observational experimen ... alidity of the same.



Model SST

References :

1. Joseph P. V. an ... y of the Low-Level Jet Stream of the As ... 458.
2. Behera S.K., P. ... ion of Interannual SST Variability in the ... 499.

Fig. 1 Mean model simulated cold pool in the Indian ocean

Model SST

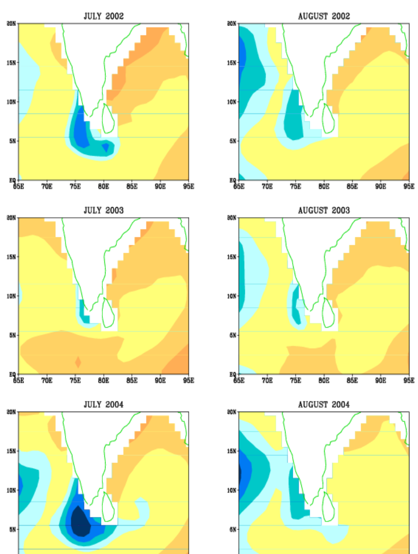


Fig. 2 Model simulated interannual variability in the cold pool

OLR (NOAA)

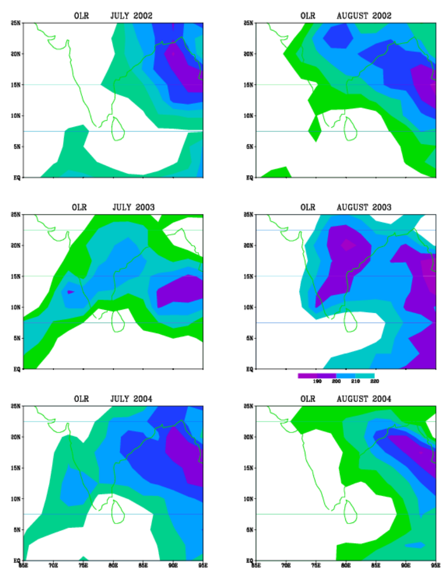


Fig. 3 Variability in Atmospheric convection in association with cold pool.