Arabian Sea Warm Pool during two contrasting monsoons 2002 and 2003

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Sea Surface Temperature (SST) over the South East Arabian Sea (SEAS) attains a maximum over 30^{o}C (warmest in the world ocean) during April - May, which is called as the Arabian Sea mini warm pool. The warming continues throughout the pre-monsoon period and it collapses with the onset of southwest monsoon. The warm pool location is very important in the sense that over this part of the Arabian Sea, the monsoon onset vortex (a depression which supports monsoon to its faster northward march) normally forms. One of the objectives of the Arabian Sea Monsoon Experiment (ARMEX) during 2002 and 2003 was to understand the mechanism responsible for the evolution and collapse of the Arabian Sea warm pool. The contrasting monsoon years (2002 and 2003) and the coincidental ARMEX observations during these years give a unique opportunity to understand how the ocean during this period responded to the local and remote forcing. The three-dimensional ocean model (POM) of the North Indian Ocean (NIO) [20^{o}S to 25^{o}N, 35^{o}E to 115^{o}E] is used to simulate temperature over the Arabian Sea warm pool region. The model forced by the accurate Quikscat winds could simulate the observed temperature and the temperature inversions in the southeast Arabian Sea region very well.

The early onset of Somali Jet in May, its disintegration in June and near disappearance in July have played major role in the drought-like situation over the subcontinent in 2002 monsoon. In contrast, stronger cross-equatorial flow during June-July 2003, has contributed substantially to the normal rainfall over the Indian subcontinent. Figure 1 compares the model simulated SST (the temperature of the first level) with the TMI SST for 2002 and 2003 respectively. The model SST's are well comparable with the TMI SST's over the entire Arabian Sea especially over the warm pool region. The model is able to reproduce the cooling of SST in July 2002 over Arabian Sea. Also in 2003 the model simulated SST shows a good agreement with TMI observed SST. The pre-monsoon warming and gradual decrease of SST over Arabian Sea with the advection of cold water from the Somalia coast were well represented by the model. Even though the 2002 monsoon was weaker, the cooling in the Somali coast during 2002 was found stronger than the 2003 season. Strong temperature inversions of about 1.5^{o} C magnitudes were recently observed in the XBT observations over the southeastern Arabian Sea and the adjacent regions at a depth of 20 to 40 m. The model could simulate these temperature inversions very well (Figure 2). The study found that the temperature inversions form every year and are mainly propagated from the Bay of Bengal. Also these inversions are found propagating westward along with the annual Rossby Waves (Figure not shown) in the Arabian Sea. The study also highlights the importance of accurate wind forcing in simulating the interannual variability in SST.

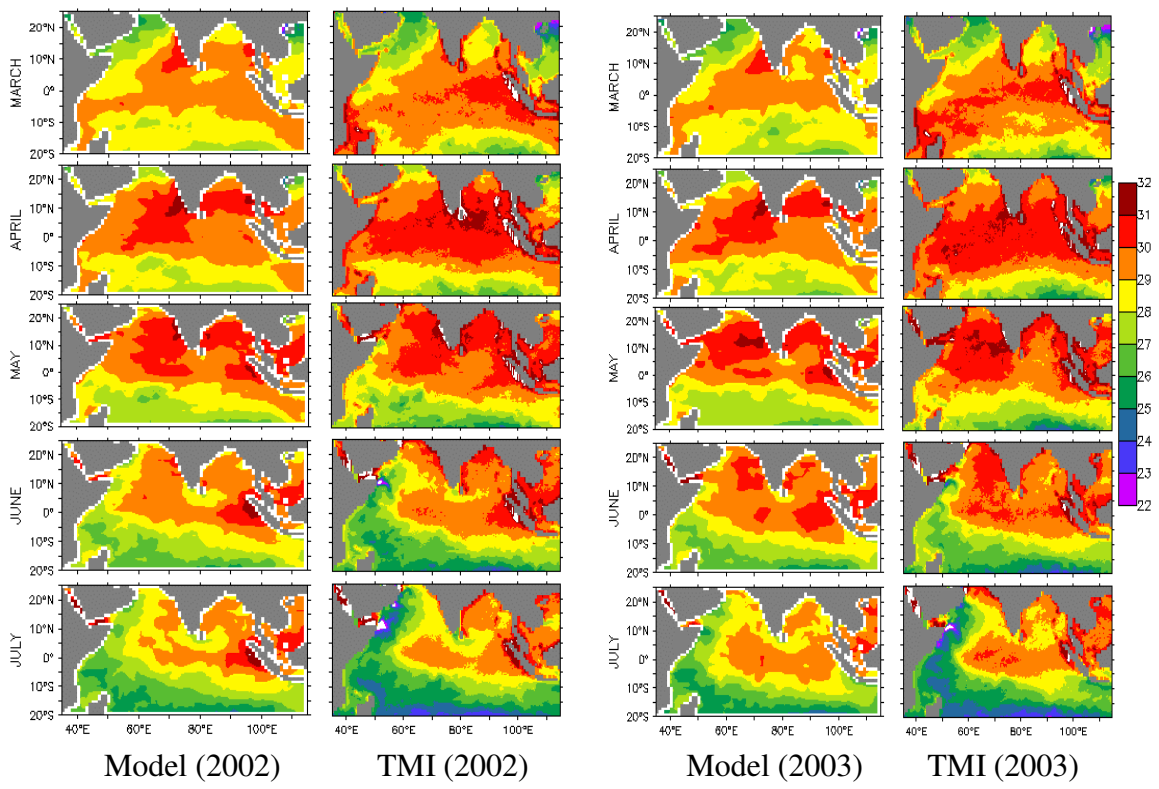

Figure 1: Observed and model simulated Sea Surface Temperature during 2002 and 2003

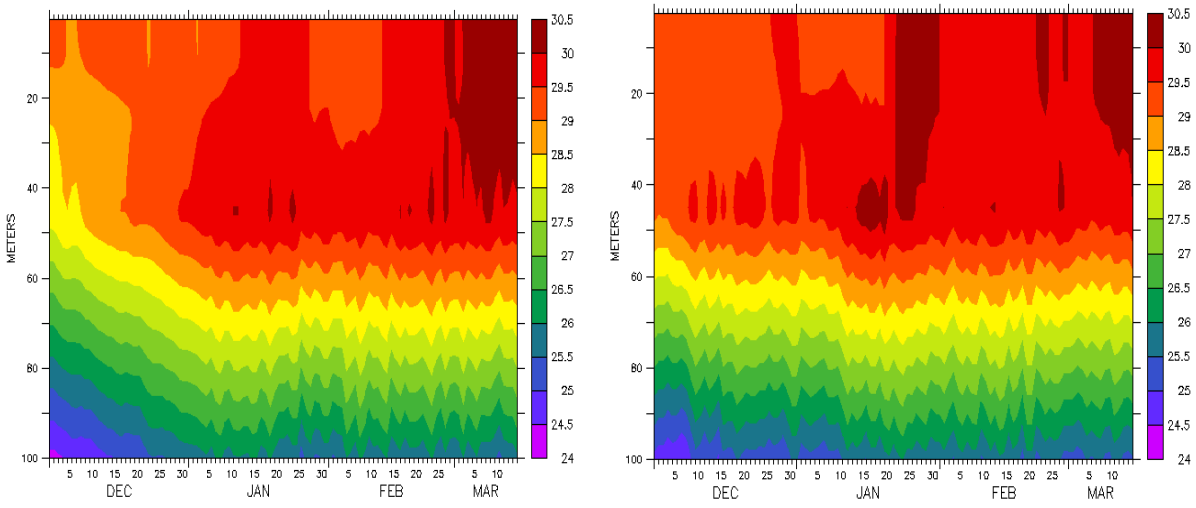

Figure 2: The Temperature inversions at 10 N, 75 E during December 2001 to March 2002 (left panel) & during December 2002 to March 2003 (right panel)