Geophysical Research Abstracts, Vol. 8, 05391, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05391

Indian Ocean warming over 1960-1999

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The Indian Ocean Thermal Archive (IOTA) is a new compilation of temperature profiles, from the historical cruises to the ARGO era, carefully quality controlled using the standards set during WOCE. Linear trends in subsurface temperature can be estimated after 1960. The analysis shows a general surface warming over 1960-1999 in agreement with other SST datasets. This warming is particularly large in the subtropics and sub-Antarctic, and extends down to 800 m around the subtropical front. It is reproduced in most of the IPCC climate model simulations for the 20^{th} century. Using a set of these realistic models, we relate the subtropical warming to a southward displacement of the subtropical gyre over the same period. Analysis of the wind fields and calculation of Sverdrup transports demonstrate the southward shift is mostly wind-forced. Analysis of decadal temperature variance during the 40 year period indicates the warming is likely due to anthropogenic forcing rather than natural variability. In the tropics, the surface warming is associated with subsurface cooling, corresponding to a shoaling of the thermocline and an increasing vertical stratification.