Seasonal variations of mass and heat in the Indian Ocean estimated from observations and numerical Modeling.

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Climatological winds and air-sea fluxes data sets are used to force a 2 and 1/2-layer model over the Indian Ocean. Hydrographic profiles over 1980-1995 derived from Smith (1995) provide climatological data sets that are used for comparison and analysis of the model simulations. The change rate of heat content in the upper ocean over 400m compares well in amplitude and phase with the simulated one; the largest discrepancies show up on the eastern side of the equator, where data (model) indicate a change of 200W/m2 (50W/m2), and in the western region, at the center of the cyclonic gyre south of the equator, where data (model) indicate a change of 10W/m2 (250W/m2). Averaged zonally, the meridional heat transport calculated from hydrographic data and from the model air-sea fluxes agrees to some extent with the simulated one. The phase is particularly well reproduced by the model. Between May and October, the model simulates a southward cross-equatorial heat transport of 1.3 PetaWatts (PW), and during the rest of the year, the northern ocean replenishes its heat content at a rate of 0.9 PW. The corresponding figures for the observed estimates are 0.9 PW and 0.5 PW respectively. We are presently analyzing OGCM simulations obtained with the OPA model over the Indian Ocean with the same climatological forcings. Our objective is to understand the reasons for the similarities and discrepancies between the various observed and simulated estimates of cross-equatorial heat transport.