Abstract View

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Sea Surface Temperatures Computed by a Simple Ocean Mixed Layer Coupled to an Atmospheric GCM

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ABSTRACT

An ocean mixed layer with fixed depth (50 m) is coupled to a global atmospheric general circulation model (GCM). The mixed layer is a simple slab that allows for seasonal heat storage but has no dynamics (advection or diffusion). The an surface temperatures generated by the model are compared to observations for January and July. The overall simulation of ocean temperature is reproduced even with this simple ocean model. However, there are important Discrepancies. Because of the lack of dynamics, the tropical upwelling regions are too warm in the model. Most Northern Hemisphere midlatitude ocean areas are too cool during summer due to the absence of shallowing of the mixed layer at that time of year. In Southern Hemisphere midlatitudes where deep mixed layers persist year round, the model is warmer than observed for most of the year. Standard deviations of daily SSTs from the computed mixed layer are less than observed in most open ocean areas and oven smaller near western boundary current regions. This is attributed to the major role of ocean dynamics in SST variability. Magnitude and phase of seasonal heat storage is similar to observations in spite of the lack or ocean dynamics in the simple mixed layer. The computed surface energy balance is compared to observed values. The consequences of omitting ocean heat transport and dynamics are evidenced by adjustments mainly in the latent and sensible heat fluxes in the model. The compensations the model makes at the ocean surface to maintain the equilibrium demonstrate that this type of coupled model gives a reasonable ocean temperature distribution and is useful for climate sensitivity studies such as increasing atmospheric CO_2 content.

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