Abstract View

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Development of a Simple Upper-Ocean and Sea-Ice Model

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ABSTRACT

Results are described for three simple numerical models of the upper ocean and sea ice with prescribed atmospheric forcing. The ability of each model version to simulate the observed sea surface temperature (SST) is assessed as a basis of comparison for future coupled experiments with atmospheric GCM'S.

lie upper-ocean model versions raw from a slab of fixed thickness to a variable-depth mixed layer above a variable exponential temperature gradient representing the seasonal thermocline. Sea-ice thickness is determined thermodynamically by local melting or accretion, and the effects of ice transport and leads are neglected. Each version is tested by integrating to equilibrium with horizontal advection neglected, using .monthly climatological atmospheric data for a selected north-south section in the mid-Pacific Ocean, and the results for different model versions are compared with each other and with available observations.

It is found that the fixed-slab version gives realistic sea-ice thickness and extent, and temperatures within 1–2°C of observed SST's over much of the mid-Pacific. However. a variable-depth mixed layer is required to maintain this level of accuracy for summer SST's north of 40°N, and also to produce the correct phases of the annual cycles of temperature at all extratropical latitudes. Mixed-layer depths in the latter version are somewhat too shallow in winter, but the overall seasonal pattern agrees with that observed.