Abstract View

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A Model for the Thermodynamic Growth of Sea Ice in Numerical Investigations of Climate

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ABSTRACT

A model is presented whereby the thickness and extent of sea ice may be predicted in climate simulations. A basic one-dimensional diffusion process is taken to act in the ice, with modifications due to penetration of solar radiation, melting of internal brine pockets, and accumulation of an insulating snow cover. This formulation is similar to that of a previous study by Maykut and Untersteiner, but the introduction of a streamlined numerical method makes the model more suitable for use at each grid point of a coupled atmosphere-ocean model. In spite of its simplicity, the ice model accurately reproduces the results of Maykut and Untersteiner for a wide variety of environmental conditions. In 25 paired experiments, annual average equilibrium thicknesses of ice agree within 24 cm for 75% of the cases; and the average absolute error for all cases is 22 cm. The new model has fewer computational requirements than one layer of ocean in the polar regions, and it can be further simplified if additional savings of computer time are desired.