Abstract View

Volume 14, Issue 12 (December 1984)

Journal of Physical Oceanography
Article: pp. 1921–1929 | Abstract | PDF (630K)

A Thermodynamic Coupled Ice-Ocean Model of the Marginal Ice Zone

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(Manuscript received October 19, 1983, in final form September 18, 1984)

DOI: 10.1175/1520-0485(1984)014<1921:ATCIOM>2.0.CO;2

ABSTRACT

A coupled ice-ocean model for thermodynamic growth of sea ice suitable for coupling with a similar dynamic model is considered. The model is balanced locally in that no horizontal (or vertical) advection or diffusion of properties are considered. Furthermore, the emphasis is on short time scales and focusing on applicability to the marginal ice zone. A main assumption is the inclusion of lateral growth and decay only, in that imbalances in the vertical heat fluxes give rise to a change in compactness rather than thickness of ice: The vertical heat fluxes are simply parameterized to be proportional to the temperature difference across thin boundary layers adjacent to the ice-atmosphere and ice-ocean interfaces. The ocean is treated as a two-layer model in which the lower deep layer acts as a heat source. The temperature of the upper (mixed) layer is predicted. The model exhibits time scale for freezing (~ 2 days), and melting (~ 6.5 days), which are of the same order of magnitude as for similar dynamic models. Thus, interesting interaction between dynamics and thermodynamics may occur if the two models are coupled.