

Coupling a thermodynamic sea ice model with WRF

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Sea ice plays a significant role in shaping the atmospheric dynamics of the Arctic and surrounding regions through the modification of surface characteristics such as surface roughness, heat conductivity, and albedo. These in turn have both thermodynamic impacts on the surface heat budget and direct dynamic impacts on the low-level winds. In numerical atmospheric models, the accurate treatment of sea ice is therefore of critical importance in producing realistic simulations, not only on the global scale but at local and regional scales as well. However, sea ice is an often-neglected component of mesoscale meteorological models, many times being treated as just another land cover type without the sufficient complexity necessary to properly characterize its thermodynamic effects. To address this deficiency, we have recently coupled a thermodynamic sea ice model with the latest version of the Weather Research and Forecasting (WRF) model in order to improve the latter's simulation of sea ice surface temperatures, and by extension its simulation of Arctic conditions as a whole. A series of case studies was performed in which results from the coupled and unmodified versions of WRF were compared to determine the efficacy of this approach in improving weather simulations along the Beaufort and Chukchi Sea coasts in northern Alaska. In addition to surface station data, observations made as part of the SHEBA and SEDNA field campaigns and by two buoys recently deployed in the Beaufort Sea were used to verify the model output.