Geophysical Research Abstracts
Vol. 14, EGU2012-1203, 2012
EGU General Assembly 2012

Inclusion of a katabatic wind parameterization in a coarse-resolution global coupled climate model

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A parameterization of katabatic winds and polar easterlies is developed to deal with their dramatic underestimation by the atmospheric component of a coarse-resolution global coupled climate model. This parameterization relies on a comparison of the atmospheric surface circulation simulated by the model with the one provided by a regional atmospheric model, and consists of wind stress corrections in the vicinity of the Antarctic coast. Corrections are spatially varying and different for both wind components. The impacts of the parameterization on the modelled Antarctic sea ice and World Ocean's properties on long timescales are assessed, showing that katabatic winds thin sea ice and strongly enhance its production along the continent. Consequently, the formation rate, salinity and temperature of the Antarctic Bottom Water are increased. This leads to model results in better agreement with observations, especially in the deep ocean where the mean errors on temperature and salinity decrease by 9 % and 37 %, respectively. Hence, parameterizing katabatic winds seems to be an appropriate way to improve the representation of sea ice-related surface processes around Antarctica.