Geophysical Research Abstracts
Vol. 18, EGU2016-9252, 2016
EGU General Assembly 2016

Strong coupling among Antarctic ice shelves, ocean circulation and sea ice in a global sea-ice - ocean circulation model

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The thermodynamic effects of Antarctic ice shelf interaction with ocean circulation are investigated using a global, high-resolution, isopycnal ocean-circulation model coupled to a sea-ice model. The model uses NASA MERRA Reanalysis from 1992 to 2011 as atmospheric forcing. The simulated long-period variability of ice-shelf melting/freezing rates differ across geographic locations. The ice shelves in Antarctic Peninsula, Amundsen and Bellingshausen sea embayments and the Amery Ice Shelf experience an increase in melting starting from 2005. This increase in melting is due to an increase in the subsurface (100-500 m) ocean heat content in the embayments of these ice shelves, which is caused by an increase in sea-ice concentration after 2005, and consequent reduction of the heat loss to the atmosphere. Our simulations provide a strong evidence for a coupling between ocean circulation, sea ice and ice shelves.