Calhoun: The NPS Institutional Archive

DSpace Repository

Faculty and Researchers | Faculty and Researchers' Publications

2005-09

On recent changes in sea ice and ocean conditions and their potential feedback to Arctic climate

Maslowski, W.

Arctic Climate Workshop

http://hdl.handle.net/10945/70600

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

Downloaded from NPS Archive: Calhoun

http://www.nps.edu/library

Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

On recent changes in sea ice and ocean conditions and their potential feedback to Arctic climate

W. Maslowski

Department of Oceanography, Naval Postgraduate School, Monterey, California, USA

One of the outstanding goals in climate modeling is proper representation of feedback processes between the atmosphere and ocean / sea ice. This is of particular importance in the polar regions where sea ice thickness distribution, ice edge position, winter leads and polynyas, and mesoscale patterns of sea surface temperature (SST) distribution have significant effect on the atmosphere via different than climatology heat fluxes. We use a coupled ice-ocean model of the Pan-Arctic region to study effects of variable atmospheric forcing on sea ice and ocean conditions at scales ranging from seasonal to decadal. In particular, we have completed an ensemble of four runs forced with realistic daily 1979-2003 ECMWF data and with variable restoring to surface temperature and salinity, to investigate Arctic climate change through a one-way coupling of the atmosphere to the sea

ice and ocean. The overall sea ice conditions are quite robust among the four cases and show dramatic melting of multi-year sea ice in the late 1990s and 2000s. In addition, our analyses indicate that increased oceanic advection of heat into the central Arctic might be in part responsible for the recent reduction in the sea ice extent and volume. We argue that such changes in sea ice conditions and the temperature distribution in the upper ocean must affect the surface atmospheric conditions and possibly vertical atmospheric structure over the Arctic Ocean. We conclude that a proper representation of air/sea ice/ocean interactions and feedbacks is needed and can be accomplished in a high-resolution regional climate model of the Arctic Ocean. This approach should advance our understanding of causes and effects of climate change in the Arctic, which is going to be one of the most important questions to address by field and modeling activities within the upcoming IPY in 2007-2008.