Better forecasts for sea ice under climate change

November 25 2014

The Antarctic ice sheet. Credit: Stephen Hudson / Wikipedia

University of Adelaide-led research will help pinpoint the impact of waves on sea ice, which is vulnerable to climate change, particularly in the Arctic where it is rapidly retreating.

Published today in the *Proceedings of the Royal Society A*, the research

reports the first laboratory experiments testing theoretical models of wave activity in frozen oceans.

"Sea ice is both an indicator and agent of climate change," says project leader Dr Luke Bennetts, Research Fellow in the School of Mathematical Sciences.

"Sea ice covering the ocean surface is white and efficiently reflects the sun's rays, keeping the oceans cool. When it melts it reveals the dark ocean beneath, which absorbs the solar radiation and becomes warmer - and that, of course, further weakens the ice.

"Waves break up the ice so that it melts more easily. In addition, exposing larger areas of the ocean surface provides a larger area for the wind to generate waves, which further promotes the breaking."

To date, however, climate models haven't included the impact of waves on sea ice.

In collaboration with Dr Tim Williams, of the Nansen Environment and Remote Sensing Centre in Bergen, Norway, and Professor Dany Dumont, of the University of Quebec in Canada, Dr Bennetts conducted experiments modelling ocean waves travelling through ice floes in a wave basin and measuring the wave energy.

"Wave energy is scattered by ice floes and is transferred into collisions between ice floes and into waves running over the tops of the floes, both of which impact the ice cover," Dr Bennetts says.

"Wave-ice interactions occur over hundreds of kilometres into the ice-covered ocean. We need to develop models that predict the distances waves will penetrate so we can determine which regions of sea ice are more susceptible to breaking up.

"Regional variability in sea ice is presently not very well understood, with models under-predicting the extent of Antarctic sea ice and over-predicting the extent in the Arctic. Our research will lead to better physics in climate models and hopefully help answer these questions (among others).

"We need to take into account the impact of waves to accurately forecast future scenarios for sea ice."

More information: Water wave transmission by an array of floating disks, *Proceedings of the Royal Society A*, rspa.royalsocietypublishing.or … .1098/rspa.2014.0698

Provided by University of Adelaide