2016 Geodynamics Seminar

Commitment to Future Retreat of the Antarctic Ice Sheet and Implications for New England

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Thursday, April 14
1:30 - 2:30 p.m.
Clark Lab 507, Quissett Campus, WHOI

Abstract

A numerical, continental ice sheet/shelf model including new treatments of meltwater-enhanced calving (hydrofracturing) and the dynamics of marine terminating ice-cliffs is used to explore future commitments to sea-level rise, given a range of future greenhouse gas emissions targets- including those discussed in Paris at COP21. In this case, the ice-sheet model physics are calibrated against past ice-sheet response to temperatures warmer than today and the ice-sheet model is coupled to highly resolved atmosphere and ocean-model components.

Both the short and long-term potential rise in global mean sea level will be discussed in light of the greenhouse gas emissions targets discussed in Paris, versus unregulated, 'business as usual' emissions. Antarctica's contribution to future sea-level rise is found to be small, only if an aggressive mitigation plan is followed due to threshold/instability behavior of key West Antarctic grounding lines.

In high emissions scenarios, Antarctica is found to have the potential to contribute a meter or more of global mean sea-level rise by 2100 CE, and more than 15 meters by 2500- much more than in previous modeling studies that don't consider hydrofracturing and ice-cliff physics. In addition to the potential for massive meltwater forcing of the Southern Ocean, the U.S. East Coast would be among the most heavily impacted regions in terms of sea-level rise, due to Earth gravitational and rotational effects. Boston in particular has much to fear from substantial retreat of the West Antarctic Ice Sheet, with every meter of equivalent global mean sea level rise producing ~1.25 meters of sea-level rise in Boston.

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