Solid Earth Physics Seminar, Harvard University

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Faculty Lounge, 4th Floor, Hoffman Lab, 20 Oxford St

Understanding Sea Level Rise from Antarctica and Greenland

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Abstract:

Predicting the contribution that the Greenland and West Antarctic Ice Sheets will have to future global sea level in response to climate change is a long standing question that has garnered much recent attention. Despite such attention, though, most state-of-the-art ice sheet simulations and subsequent ice mass loss predictions are based partly on glaciological theory that has limited observational evidence or is completely ad hoc. Here, I present two parallel studies that will improve our ability to predict ice sheet mass loss from Greenland and West Antarctica, respectively. In Greenland, there is substantial debate on the role that meltwater has on lubricating the ice sheet, partly due to the difficulty of observing subglacial water pressure and the spatial distribution of this water. In the first part of this talk, I discuss a new seismological method that is able to measure both subglacial pressure gradients and average channel size, thus providing measurements of two key parameters of importance for predicting the future of the Greenland Ice Sheet. In West Antarctica, on the other hand, water pressures are known to be high, due to it being a marine ice sheet grounded below sea level. However, parameterizations for basal sliding commonly used for modeling such ice sheets are based on ad hoc rules that are contradictory. In the second part of this talk, I explain how a simple modification to basal sliding laws results in models that are physically well behaved and predict significantly different ice sheet stability criteria compared to those with traditional sliding laws. Together, the two parts of this work allow for improved estimates of global sea level rise from the Greenland and West Antarctic Ice Sheets, and therefore decrease one of the largest sources of uncertainty in predicting the response of sea level to climate change.