Geophysical Research Abstracts
Vol. 17, EGU2015-5805, 2015
EGU General Assembly 2015

Intensification of the Antarctic hydrological cycle in a future warming climate: a study with CESM

Jan Lenaerts (1), Miren Vizcaino (2), Jeremy Fyke (3), Leo van Kampenhout (1), and Michiel van den Broeke (1)

(1) Institute for Marine and Atmospheric research Utrecht, Utrecht University, The Netherlands (j.lenaerts@uu.nl), (2) Department of Geoscience and Remote Sensing, Delft University of Technology, The Netherlands, (3) Los Alamos National Laboratory, Los Alamos, USA

The Antarctic ice sheet is currently losing mass through enhanced ice calving in West Antarctica. The strong interannual and seasonal variability of Antarctic ice sheet mass, however, is controlled by its surface mass balance (SMB), mainly solid precipitation. In the coming centuries, a future warming climate is expected to lead to enhanced precipitation in the Antarctic, partially compensating for dynamic ice sheet loss. Here we present the climate and SMB of Antarctica as simulated by the fully coupled Community Earth System Model (CESM). It has a resolution of $\sim$1 degree and a multilayered snow model, and is run for 350 years (1850-2200) and two climate change scenarios (RCP2.6 and RCP8.5). We show that CESM realistically simulates the contemporary climate and SMB of the ice sheet. The model shows no significant trend in Antarctic SMB from 1850 to present-day, although interannual variability is large. In both future scenarios, SMB increases linearly with Antarctic near-surface temperature, but also exhibits stronger extremes. In East Antarctica, months with anomalously (return period of 10 years) high SMB are projected to occur much (5-30 times, depending on scenario) more often at the end of the 21st century than nowadays.