Geophysical Research Abstracts
Vol. 20, EGU2018-6609, 2018
EGU General Assembly 2018

Arctic sea-ice change tied to its mean state through thermodynamic processes

Francois Massonnet (1,2), Martin Vancoppenolle (3), Hugues Goosse (1), David Docquier (1), Thierry Fichefet (1), and Edward Blanchard-Wrigglesworth (4)

(1) Université catholique de Louvain, Georges Lemaitre Centre for Earth and Climate Research, ELIC, Louvain-la-Neuve, Belgium (francois.massonnet@uclouvain.be), (2) Earth Sciences Department, Barcelona Supercomputing Center, Barcelona, Spain, (3) Sorbonne Universités (UPMC Paris 6), LOCEAN-IPSL, CNRS/IRD/MNHN, Paris, France, (4) Department of Atmospheric Sciences, University of Washington, Seattle, Washington, USA

One of the clearest manifestations of ongoing global climate change is the dramatic retreat and thinning of the Arctic sea-ice cover. All state-of-the-art climate models reproduce consistently the sign of these changes but largely disagree on their magnitude. The fundamental reasons remain contentious and consensual methods to reduce uncertainty in projections are lacking. Here we propose a process-oriented approach to revisit this question. We show that inter-model differences in sea-ice loss and, more generally, in simulated sea-ice variability, can be traced back to differences in the simulation of growth and melt processes. In turn, we show that the way these processes are simulated is a strong function of the background ice thickness, and is surprisingly independent of the complexity of the sea-ice model used. The results prompt modelling groups to focus their priorities on the reduction of sea-ice thickness biases, as we provide physical evidence that Arctic sea-ice projections from models with unrealistic current thickness should be discarded. We finally show that because of the larger role played by thermodynamic processes as sea ice thins, the recent and future changes in sea-ice thickness induce a transition of the Arctic towards a state with high seasonality but reduced interannual variability and persistence, before summer ice-free conditions eventually occur.