Geophysical Research Abstracts
Vol. 19, EGU2017-12583, 2017
EGU General Assembly 2017


# Climate models agree remarkably well on Arctic sea ice reductions

Jens H. Christensen (2,1), Shuting Yang (1), Peter L. Langen (1,2), Peter Thejl (1), and Fredrik Boberg (1)

(1) Danish Meteorological Institute, Research and Development, Copenhagen, Denmark (jhc@dmi.dk), (2) Niels Bohr Institute, University of Copenhagen, Denmark

Coupled global climate models have been used to provide future climate projections as major tools based on physical laws that govern the dynamics and thermodynamics of the climate system. However, while climate models in general predict declines in Arctic sea ice cover (i.e. ice extent and volume) from late 20th century through the next decades in response to increase of anthropogenic forcing, models show wide inter-model spread in hindcast with simulated sea ice extend as low as 50% or as high as 200% of the observed present day conditions. Likewise models show a wide range in the timing of projected sea ice decline, raising the question of uncertainty in model predicted polar climate and casting doubt on the robustness of the findings based on multi-model approaches, such as provided by the Coupled Model Intercomparison Project phase 5 (CMIP5).
Constrained estimates of when global mean temperature pass a certain threshold leading to a new sea ice state in the Arctic with summer time open water conditions are in increasing demand both for scientific reasons, but also from policymakers and stakeholders in general. Climate models are used to pursue this, but due to model inadequacies or 'errors' mentioned above, as well as a wide spread in possible future projections, uncertainties due to model deficiencies have been seen as the main source of uncertainty in providing the demanded information with sufficient accuracy. As an effort within the ERC-Synergy project Ice2Ice, here we demonstrate that relating relative changes in sea ice area with global mean temperature change from individual models using all available information from the CMIP5 archives from historical and the RCP4.5 and RCP8.0 future scenarios, together with the observed variation from 1979-2015 shows that i) simulated and observed sea ice area cannot at the 95% level be seen as coming from different statistical populations; ii) the Arctic could as a combination of natural variability and anthropogenic warming be in a state of open water conditions, when global mean temperature reaches ∼0.3 K above the warmest year on record 2016 or very close to the COP21 Paris Agreement to preferably keep global mean temperature increase below 1.5 K.