Geophysical Research Abstracts
Vol. 17, EGU2015-9945, 2015
EGU General Assembly 2015

Stochastic sea ice parameterizations and impacts on polar predictability

Stephan Juricke (1,2), Helge Goessling (2), and Thomas Jung (2)

(1) Atmospheric, Oceanic and Planetary Physics, University of Oxford, Oxford, United Kingdom (juricke@atm.ox.ac.uk), (2) Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany

Stochastic sea ice parameterizations are implemented in a global coupled model to include first estimates of model uncertainty in the assessment of sea ice predictability. The impact of incorporating estimates of model uncertainty in the sea ice dynamics is compared to the impact of atmospheric initial condition uncertainty. In this context a set of ensembles with stochastic sea ice strength perturbations and a set of ensembles with atmospheric initial condition perturbations are investigated. Seasonal integrations show that especially during the first weeks the incorporation of model uncertainty estimates in the sea ice dynamics leads to a significant increase in ensemble spread of sea ice thickness in the central Arctic and along coastlines when compared to the ensembles with atmospheric initial perturbations. The latter, in contrast, produce significantly larger variability along the ice edge. During the first weeks of the integration, applying the combined perturbations leads to an accumulation of spread from both uncertainties pointing at the importance of including estimates of model uncertainty for subseasonal sea ice predictions. After the first few weeks, however, the differences between ensemble spreads become mostly insignificant so that estimates of seasonal potential sea ice predictability for the Arctic remain largely unaffected by uncertainty estimates in the sea ice dynamics. For the Antarctic sea ice, differences in sea ice thickness spread between the different ensemble configurations are less pronounced throughout the year.
Stochastic perturbations are also applied to the sea ice thermodynamics, namely the sea ice albedo parameterization, to investigate the diverse impacts of the incorporation of uncertainty estimates in different parts of the sea ice model, affecting different regions of the polar regions and at different times during the annual cycle.