Geophysical Research Abstracts
Vol. 14, EGU2012-5379, 2012
EGU General Assembly 2012

Impact of a new anisotropic rheology on the Arctic sea ice

Dr Tsamados
University College London, United Kingdom (m.tsamados@ucl.ac.uk)

A new rheology that explicitly accounts for the sub-continuum anisotropy of the sea ice cover is implemented into the Los Alamos CICE sea ice model (CICE). This is in contrast to most current models of sea ice included in GCMs (Global Circulation Models) that use a variant of the isotropic visco-plastic rheology. The model contains one extra prognostic variable, the local structure tensor A, that quantifies the degree of anisotropy of the sea ice, and two parameters that set the time scale of the reorientation and evolution of this tensor. The structure tensor is defined to capture the anisotropy that results from an underlying tilling of the Arctic sea ice which is assumed to be composed of orientated diamond shaped floes. Results over the Arctic of a "stand-alone" version of the model are presented and the influence of the new rheology on the state and dynamics of the sea ice cover is discussed. Under realistic forcing sea ice quickly becomes highly anisotropic over large length scales, as is observed from satellite imagery. The way the anisotropy affects the mechanical behaviour of the sea ice is presented and the Arctic basin scale distribution of concentration, thickness, stresses and strain rates in the new anisotropic and in the reference elasto-visco-plastic simulations are compared. Finally the influence of the new rheology on the spatial organisation of the deformation patterns and on its ability to reproduce more accurately the observed linear kinematic features of sea ice is assessed.