Geophysical Research Abstracts
Vol. 13, EGU2011-10158-1, 2011
EGU General Assembly 2011

Modelling Coulombic failure of sea ice with leads

Alexander Wilchinsky and Daniel Feltham

Centre for Polar Observation and Modelling, UCL, London, United Kingdom (daniel.feltham@cpom.ucl.ac.uk, +44-020 7679 7883)

Sea ice failure under low confinement compression is modelled through adopting a linear Coulombic criterion that can describe either fracture or frictional granular yield along slip lines. To study the effect of anisotropy we consider a simplified anisotropic sea ice model where the sea ice thickness depends on orientation. Accommodation of arbitrary deformation requires failure along at least two intersecting slip lines that are determined by finding two maxima of the yield criterion. Due to the anisotropy these slip lines generally differ from the standard slip lines symmetrically positioned around the compression direction, and therefore different tractions at these slip lines gives rise to a non-symmetric stress tensor. We assume that the skew-symmetric part of this tensor is counterbalanced by additional elastic stress in the sea ice field that surpresses floe spin. A simplified case of only two leads initially formed under isotropic conditions is considered when the compression direction changes. Decoupled and coupled models of leads are considered and it is shown that for this particular case they both predict lead re-activation in exactly the same way. The coupled model must, however, be used in determining the stress as the decoupled model does not resolve the stress asymmetry properly when failure occurs in one lead and at a new slip line.