Geophysical Research Abstracts, Vol. 8, 09755, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09755

Improving passive microwave retrievals of snow depth over sea ice with a Lagrangian sea-ice model

T. Maksym(1) and T. Markus

(1) Hydrospheric and Biospheric Science Laboratory, NASA GSFC (maksym@gsfc.nasa.gov)

Passive microwave observations of snow depth on Antarctic sea ice have the potential to provide an important data source for driving sea-ice models and an estimate of precipitation over the Southern Ocean - a vital climatological record which is currently poorly known. Accurate retrieval of these parameters is complicated by a variety physical processes that occur in the snow and sea ice. First, the microwave brightness temperature is dependent not only on the snow depth but also on grain size, snow layering, and wetness, which are controlled by the environmental conditions experienced by the sea ice and snow cover. Second, ice drift and new ice formation mean that the ice and snow cover within each pixel will have a variety of ages and histories. Finally, since as much as half the total accumulated snow may be converted into snow ice, snow-depth observations provide only a partial record of total precipitation. Assimilation of passive microwave data into a time-evolving snow and sea-ice model has the potential to alleviate these difficulties and improve the accuracy of snow-depth retrievals, simulations of sea-ice evolution, and estimates of total precipitation.

We examine these prospects using a sea-ice model which includes an evolving snow cover and explicitly models flooding and snow-ice formation. A Lagrangian approach is taken so that the time-dependent evolution of each ice parcel is continuously tracked. Passive microwave retrievals of ice concentration, ice drift, and snow depth are assimilated into the model. Two main issues are explored: 1) the potential for improving snow-depth retrievals through tracking of ice drift, and 2) the role of snow-ice formation in the mass balance of Antarctic sea ice and estimates of the total snow accumulation over sea ice.