On the assimilation of ice velocity and concentration data into large-scale sea ice models

V. Dulière(1), and **T. Fichefet**(1)

(1) Institut d'astronomie et de géophysique G. Lemaitre, UCL, Louvain-la-neuve, Belgium
(contact : duliere@astr.ucl.ac.be)

Data assimilation into sea ice models designed for climate studies has started about 15 years ago. In most of the studies conducted so far, it is assumed that the improvement brought by the assimilation is straightforward. However, some studies suggest this might not be true. In order to elucidate this question, we analyze here results from a number of twin experiments (i.e. experiments in which the assimilated data are model outputs) carried out with a simplified model of the Arctic sea ice pack. Such an idealized experimental design appears to be an appropriate step towards real satellite data assimilation into a global sea-ice-ocean model. Our objective is to determine to what degree the assimilation of ice velocity and/or concentration data improves the global performance of the model and, more specifically, reduces the error in the computed ice thickness. A simple nudging technique is used, and outputs from a control run and from perturbed experiments without and with data assimilation are thoroughly compared. Our results indicate that, under certain conditions depending on the nudging coefficient and the type of model error, the assimilation of ice velocity data enhances the model performance. The assimilation of ice concentration data can also help in improving the model behavior, but it has to be handled with care because of the strong connection between ice concentration and ice thickness.