Session: C11 Poster: M115A

A data assimilation approach for reconstructing sea ice volume in the Southern Hemisphere

François Massonnet[†]; Pierre Mathiot; Thierry Fichefet; Hugues Goosse; Christof Konig Beatty; Martin Vancoppenolle
[†] Université Catholique de Louvain, USA
Leading author: francois.massonnet@uclouvain.be

Passive microwave observations of Arctic and Antarctic sea ice concentrations have revealed asymmetric trends in sea ice extent from the late 1970s up to now. While the sea ice extent in the Northern Hemisphere has been sharply decreasing for the last three decades, it has shown a very slight positive increase in the Southern Hemisphere, resulting from regional contributions with opposite trends in sea ice concentration. Observations of sea ice concentration are well distributed in time and space in both hemispheres, but data of sea ice thickness are still too sparse to allow a large-scale view of the sea ice volume history, and in particular its trend for the last decades. Here, we conduct a global simulation over the period 1979-2007 with the ocean-sea ice model NEMO-LIM2 in which an Ensemble Kalman Filter is implemented for the sea ice module. We assimilate global daily products of sea ice concentration during this period. Based on a series of performance metrics for sea ice, we point out the direct and indirect benefits of data assimilation in both hemispheres, e.g. how the simulation of sea ice thickness benefits from the assimilation of sea ice concentration, through the statistical links between these two variables. We then focus on the Southern Hemisphere and propose reconstructions of the Antarctic sea ice volume (mean state and seasonal-to-interannual variability), disentangling (i) the contributions of sea ice area and thickness, and (ii) the contributions of the different sectors around Antarctica.