EMS Annual Meeting Abstracts
Vol. 8, EMS2011-267, 2011
11th EMS / 10th ECAM

Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Observations and parameterizations of the albedo of the ice-covered sea

A. I. Weiss, J. King, T. Lachlan-Cope, and R. Ladkin
British Antarctic Survey, Cambridge, United Kingdom (aiw@bas.ac.uk)

Sea ice plays an important role in the development of the maritime atmospheric boundary layer, due to its large impact on the energy and radiation budget. To deepen our understanding of the albedo of Antarctic sea ice areas we analyzed ship- and aircraft-based field measurements conducted in the Weddell and Bellingshausen Seas. We give an overview of the observations and discuss aspects of the parameterization of the sea ice albedo in numerical models. This study addresses three main goals:

First, we present regional differences in the sea surface albedo between the Bellingshausen and Weddell Sea. The averaged surface albedo varies between 0.13 and 0.81. The differences of the albedo can be explained in terms of sea ice parameters that influence the sea surface albedo, such as the average percentage of prevailing sea ice type, sea ice concentration and surface temperature. Second, we present typical area-averaged sea surface and sea ice albedo values which are representative of sea ice areas adjacent to the Antarctic Peninsula. The ice cover of the Bellingshausen Sea which consisted mainly of first year ice showed an averaged sea ice albedo of αi=0.64$\pm$0.2. The mean sea ice albedo of the pack ice area in the western Weddell Sea was αi=0.75$\pm$0.05. In the southern Weddell Sea, where new, young sea ice prevails, a mean albedo value of αi=0.38$\pm$0.8 was observed. The radiative properties of sea ice are influenced by various factors, however, most climate and weather prediction models cannot take into account all of the factors that influence the albedo of a sea ice area. In fact, very often the albedo parameterizations in numerical models are relatively simple and assume a constant value for a model grid cell or parameterize the sea ice albedo solely with the surface temperature. Therefore, the third goal of this study is to investigate whether commonly-used albedo parameterizations are appropriate to describe the albedo of the sea ice areas in the Weddell and Bellingshausen Sea. For mixtures of ice of different age, thickness and surface cover we determine typical temperature-albedo parameterizations and compare them with commonly-used ones. The study shows that the temperature can act as proxy for different sea ice characteristics, such as for sea ice thickness or snow cover. The sea ice thickness is a particularly important factor for the albedo of sea ice areas where new and young sea ice prevails and the snow cover for the albedo of sea ice areas where first or multi year sea ice prevails.