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Feedbacks between the Arctic and the global climate system

K. Dethloff (1), A. Rinke (1), S. Saha (1), E. Sokolova (1), W. Dorn (1), D. Handorf (1), J. E. Haugen (2), M. Ø. Køltzow (2), L. P. Roed (2), J. H. Christensen (3), M. Stendel (3), P. Kuhry (4) S. Holzkämper (4), P. Wassmann (5), M. Reigstad (5), B. Rockel (6), A. Benkel (6), R. Döscher (7), K. Wyser (7), M. Meier (7)

(1) Alfred Wegener Institute for Polar and Marine Research, Research Unit Potsdam, Germany, dethloff@awi-potsdam.de, Fax: ++49 331 288 2178, (2) Met. No. Oslo, Norway, (3) Danish Meteorological Institute Copenhagen, Denmark, (4) Stockholm University, Sweden, (5) University Tromsoe, Norway, (6) Institute of Coastal Research, GKSS, Germany, (7) Rossby Center, SMHI, Sweden.

For climate variations in mid-latitudes, the cryosphere in the Arctic plays an important role. The complex snow/sea ice-albedo-temperature feedback is one of the most important interactions both between the cryosphere and atmosphere as well as between the Arctic and the global climate system. The GLIMPSE project assesses and quantifies the uncertainty and biases of regional climate models in the Arctic and look for key Arctic processes which have the potential to be of global importance. Focussing on the data of the SHEBA year allows the extensive evaluation of the regional model results with observations because this year provides the best available field observations and satellite data sets. On this basis, a new sea ice surface albedo scheme taking into account three different surface types (snow, pure sea ice, melt ponds) and being dependent on snow cover and surface temperature as well as a new snow surface albedo scheme distinguishing between forested and non-forested areas have been developed. Using the new albedo scheme, the surface albedo is increased, especially in April to June. This leads to a better agreement with the AVHRR polar pathfinder albedo data as well as with the SHEBA data. The surface cooling in the same months leads to a better agreement with the Willmott temperature data. Additionally, a remote influence over the Arctic Ocean is seen in the mean sea level pressure which suggests a global impact of Arctic processes. Therefore, the new albedo parameterization has been introduced for the Arctic region in a global coupled model. The simulations show the

largest temperature signal in the Arctic, but also significant changes over the rest of the globe up to the Antarctic indicating global connections. The dynamical explanation of this global link can be found in the changes of the planetary wave patterns.