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The Influence of improved Arctic Parameterizations on the regime Behaviour of coupled Atmosphere-Ocean GCMs

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One main approach for understanding low-frequency variability is the concept of circulation regimes. Here, we investigate, how the regime-like behaviour in the Northern hemisphere, simulated by complex coupled atmosphere-ocean GCMs (AOGCM), is influenced by improved Arctic snow and sea-ice albedo parameterizations.

In order to have some realizations of the climate system, we are analysing several long-term control runs as well as long-term runs with realistic forcing (solar irradiance, volcanic aerosol, greenhouse gas concentration) from about 1500 to 2000 in each case with old and new parameterization schemes. The model simulations comprise simulations with the AOGCM ECHO-G (atmospheric model ECHAM4 with T30 resolution coupled to oceanic model HOPE-G) and with of the AOGCM ECHAM4/OPYC (atmospheric model ECHAM4 with T42 resolution coupled to oceanic model OPYC).

The presented study involves the determination of temporal-spatial patterns of variability and the application of the concept of circulation regimes to monthly winter (DJF) data in the middle troposphere and stratosphere. Circulation regimes are determined by analysing the spherical probability density function in a low-dimensional state space. Emphasis is put on the comparison of hemispheric regimes and sectorial regimes for the Pacific-North American region and the North Atlantic/European region and how they are influenced by the new Arctic snow and sea-ice albedo parameterizations.