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Winter climate Regimes in forced AOGCM Simulations

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One main approach for understanding low-frequency variability is the concept of circulation regimes. Here, we consider whether low-frequency variability, simulated by complex coupled atmosphere-ocean GCMs (AOGCM), resembles regime-like behaviour as it is analysed in observational data. Since every model run is only one realization of the climate system, we are using three long-term model runs with realistic forcing (solar irradiance, volcanic aerosol, greenhouse gas concentration) from about 1500 to 2000. The three runs comprise two runs of the AOGCM ECHO-G (atmospheric model ECHAM4 with T30 resolution coupled to oceanic model HOPE-G) with different initial conditions spanning the 1500-1990 and 1000-1990 AD period, and one run 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. Circulation regimes are determined by analysing the probability density function in a low-dimensional state space. To better take into account the nonlinear character of climate variations, more sophisticated nonlinear methods for the detection of climate regimes are applied.

Emphasis is put on the comparison of hemispheric regimes and sectorial regimes for the Pacific-North American region and the North Atlantic/European region. For the latter region the consistency of observed and simulated regime behaviour is estimated

by applying the same methods to reconstructed data for the North Atlantic/European region from 1659 onwards.