Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12028, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12028
EGU General Assembly 2008

An objective classification scheme for Central Europe and its Application on AOGCMs

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"European Großwetterlagen" are continental scale patterns that dominate European weather over a time period of several days. They differ from Circulation Weather Types in that they represent periods with the same basic flow rather than variations due to travelling lows and highs on a (sub-)daily basis, and are operationally identified by forecasters of the German Weather Service on a subjective basis. An objective classification scheme has been developed in order to define European "Großwetterlagen" (GWL) from (Re-)analysis and GCM data. The procedure is based on the calculation of the average sea level pressure pattern for each GWL, using the operational subjective classifications as a basis. Using these pressure patterns, an objective classification is carried out by identifying the closest GWL pattern for each day in the re-analysis data. It turns out that the subjective and the objective assignments to a GWL differ for more than 50% of the days in the period 1958-1998. Possible reasons for and consequences of this result are discussed. In particular, it is demonstrated that a better agreement between subjective and objective GWLs is obtained by including the 850 hPa geopotential height into the classification process for the summer season.

The procedure is applied to runs of the coupled AOGCMs ECHAM4/OPYC3 and ECHAM5/MPI-OM1. The GWL frequencies obtained from the control simulations of these models basically agree with those obtained from ERA40. In the greenhouse gas scenarios both models produce rising zonal and declining meridional GWL frequencies for winter.