

CIRCULATION MODES AND CLIMATE CHANGE: A SUPERENSEMBLE INTERCOMPARISON STUDY

Heiko Paeth and Andreas Hense

Meteorologisches Institut, Universität Bonn, 53347 Bonn, Germany.

hpaeth@uni-bonn.de/Fax: 49+228+735188

An EOF analysis of northern hemisphere (NH) mean sea level pressure (SLP) north of 20°N has been performed in order to define the leading NH circulation mode and its response to an imposed greenhouse forcing as predicted by ensembles of three coupled general circulation models. All simulations are subject to an external forcing by increasing greenhouse gas concentrations and sulphate aerosols respectively. The leading EOF is almost identical within each ensemble and rather similar when comparing the models with each other. This pattern is currently associated with the Arctic Oscillation (AO) indicating a zonal circulation mode spanning the whole NH. The corresponding time series of the leading principal component (PC) indicate a positive trend as time-dependent response of the AO circulation mode to the greenhouse forcing implying a zonalisation over the whole NH and enhancing e.g. the zonal gradient over the midlatitude continents. The leading EOF patterns are also naturally occurring. Thus, it seems that the AO as a natural circulation mode is effected by the global greenhouse forcing leading to regionally differentiated climate change over the NH at least in the model runs. The comparison to the NCEP reanalysis data leads to an astonishing agreement between the first and partly the second EOFs, and the observed PC is also subject to a strong positive trend from the eighties onward.