



Classification of extreme hydrometeorological events by frontal and convective predictors

M. Nonnenmacher (1) and J. Jacobeit (2)

(1) Institute of Geography, University of Wuerzburg, Germany, (2) Institute of Geography, University of Augsburg, Germany (matthias.nonnenmacher@mail.uni-wuerzburg.de, jucundus.jacobeit@geo.uni-augsburg.de)

Principal aims of the analysis are i) the characterisation of recent atmospheric conditions which have contributed to extreme hydrometeorological events, ii) the assessment of frequencies and fluctuations of such conditions for future decades. Study areas are Central Europe (6-16°E, 46.5-53°N) and the Northeastern United States (71-86°W, 36-45°N). Coupled hydrometeorological events of heavy precipitation and high discharge, as well as of dry periods and low discharge are defined with daily resolution based on observational data for the period 1950 to 1999 (real-time climate). NCEP/NCAR reanalyses provide data for the real-time atmosphere 1950 to 1999. Control climates (1950-1999) and SRES scenario A2 and B2 climates (2000-2100) are represented by three Global Climate Models (CGCM2, GFDLCM2, HADCM3). For several hydrometeorological extreme criteria, subsets of multivariate atmospheric pattern combinations are established: Frontal atmospheric predictors are based on 1) inter-diurnal and 2) spatial gradients of 18 variables related to temperature, humidity and pressure at different tropospheric levels; additionally, 12 convective indices describe the degree of vertical instability. Patterns are generated by coupled t-mode Principal Component Analysis (PCA). Selection of frontal and convective pattern combinations typical for hydrometeorological extremes is done by comparing extreme-related pattern combinations with non-extreme ones. Stationarity of NCEP pattern combinations is checked by conducting cross-validation for verification and calibration data subsets. Bias estimation reveals systematic differences between reanalysis pattern combinations and those from control run models. Finally, time series analyses related to

control run patterns and corresponding SRES-patterns (21st century) provide information about possible future characteristics of extreme hydrometeorological events. Frequency and variability estimations include statistical comparisons between the two study areas mentioned above.