EMS Annual Meeting Abstracts
Vol. 10, EMS2013-127, 2013
13th EMS / 11th ECAM

Characterizing the connection between large-scale atmospheric conditions and local PM10 concentrations in Bavaria by means of circulation and weather type classification

C. Weitnauer, C. Beck, and J. Jacobeit

Institute of Geography, University of Augsburg, Universitaetsstrasse 10, Augsburg, Germany
(claudia.weitnauer@geo.uni-augsburg.de)

High emission episodes and adverse weather conditions foster air pollution. With climate changing rapidly, these connections need to be better understood in order to provide estimates of consequences for air quality management purposes. Amongst other air pollutants local concentrations of particulate matter with an aerodynamic diameter < 10 μm (PM10) are affecting public health. They are influenced by local meteorological and large scale atmospheric terms.
In order to quantify the link between large-scale atmospheric conditions and local PM10 concentrations different approaches have been utilized for varying locations. Up to now only few systematic attempts have been made to modify existing or to develop new weather- and circulation type classifications in order to improve their ability to resolve local PM10 concentrations.
The aim of this study is to optimize existing weather- and circulation type classifications with regard to their discriminative power for local PM10 concentrations at 46 Bavarian measurement sites for the period 1980 to 2011. In a first step two representative classification approaches, a cluster analysis and a threshold based method, were performed on 2.5 x 2.5 gridded daily mean sea level pressure fields of the NCEP/NCAR reanalysis data set for the period 1980-2011. The classifications have been run with varying spatial and temporal settings as well as modified numbers of classes and have been evaluated using several skill scores. Taking into account the outcome further attempts towards the optimization of circulation type classifications are made. Varying meteorological input parameters (e.g. geopotential height, zonal and meridional wind, specific humidity, temperature) on several pressure levels (1000, 850 and 500 hPa) and combinations of these variables applying different weighting schemes are therefore used. All classification variants are again evaluated.
Based on these analyses it is further intended to develop robust downscaling models for estimating possible future – climate change induced – variations in local PM10 concentrations in Bavaria from scenario runs of global climate models.