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Local PM10 concentrations in Augsburg (Germany) and their connection to large scale circulation types

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Local concentrations of PM10 are affected on the one hand by the extent of natural and anthropogenic emissions of these air pollutants and as well by the level of precursor emissions. On the other hand local meteorological conditions and large scale circulation dynamics are important additional influencing factors.
Whereas the general relationship between local PM10 and large-scale circulation dynamics – as for example reflected by weather- or circulation types - has been proven in several studies so far only few systematic attempts have been made to optimize weather- and circulation type classifications concerning their relationship to local PM10 concentrations.
The goal of this contribution is to test varying circulation type classifications with respect to their relevance for local PM10 concentrations in order to detect those approaches that are best suited for the use in planned subsequent studies (e.g. estimation of potential PM10 variations due to future climate change).
To this end different approaches for the classification of weather- and circulation types are applied to gridded daily NCEP/NCAR reanalysis data for the period 1979 – 2010 and resulting circulation types are evaluated concerning their discriminatory power for local PM10 concentrations in Augsburg, Germany. The set of approaches that are evaluated and compared comprises varying classification methods (e.g. cluster analysis, principal component analysis), varying sets of classified variables (e.g. sea level pressure, wind components) and combinations of variables, varying sizes of the spatial domain and varying lengths of the classified period (single days or sequences of days).