Influence of large-scale circulation patterns on mineral dust loads over Central Europe and the Mediterranean Area

M. Demuzere (1), M. Werner (2,3), N. P.M. Van Lipzig (1)

(1) Physical and Regional Geography Research Group, Universiteit Leuven, Belgium, (Matthias.Demuzere@geo.kuleuven.be / Fax: +32 16322980 / Phone : +32 16326424)

(2) Max Planck institute for Biogeochemistry, Jena, Germany, (3) Leibniz-Gemeinschaft, Referat Evaluierung, Bonn, Germany

It is becoming more and more evident that mineral dust particles act as a major climate modifier. Dust particles absorb and backscatter solar and terrestrial radiation increasing solar heating of the atmosphere and influencing the atmospheres thermal structure. Furthermore, dust enhances the formation of cloud droplets in a cloudy environment, thereby influencing drop size, thus changing cloud potential to form droplets. In this study, large-scale synoptic situations over the larger Mediterranean area during July 1981-2000 are investigated. Thereby, the automated classification method of Jenkinson-Collison is used to classify all days within the above-mentioned period. Mean sea level pressure (MSLP) fields of the transient future climate simulation with the most recent version of the Max Planck Institute for Meteorology Earth System Model, ECHAM5/MPI-OM1 serve as an input for the classification method, whereby ECMWF-ERA40 reanalysis data is used to validate the obtained results. Subsequently, monthly (July) averaged mineral dust fields simulated by the atmospheric aerosol module HAM, which has been coupled to the ECHAM5/MPI-OM1 model, are analyzed with respect to the obtained circulation types. Using observational data from the Total Ozone Mapping Spectrometer Aerosol Index (TOMS-AI) and differences in simulated and observed circulation types, one can investigate whether these large-scale synoptic circulations are a driving factor in the mobilization of mineral dust. This understanding of the synoptic large scale circulation role on mineral dust loads may help to improve the mineral dust parameterization in atmospheric models and numerical weather forecasts.