Geophysical Research Abstracts
Vol. 18, EGU2016-13828, 2016
EGU General Assembly 2016

Characterizing interactions between aerosols and cloud droplets in marine boundary layer clouds

Hendrik Andersen and Jan Cermak
Department of Geography, Ruhr-Universität Bochum, Bochum, Germany (hendrik.andersen@rub.de)

This contribution presents a method to characterize the nonlinearities of interactions between aerosols and cloud droplets in marine boundary layer clouds based on global MODIS observations.

Clouds play a crucial role in the climate system as their radiative properties and precipitation patterns significantly impact the Earth's energy balance. Cloud properties are determined by environmental conditions, as cloud formation requires the availability of water vapour ("precipitable water") and condensation nuclei in sufficiently saturated conditions. The ways in which aerosols as condensation nuclei in particular influence the optical, micro- and macrophysical properties of clouds are one of the largest remaining uncertainties in climate-change research. In particular, cloud droplet size is believed to be impacted, and thereby cloud reflectivity, lifetime, and precipitation susceptibility. However, the connection between aerosols and cloud droplets is nonlinear, due to various factors and processes. The impact of aerosols on cloud properties is thought to be strongest with low aerosol loadings, whereas it saturates with high aerosol loadings. To gain understanding of the processes that govern low cloud water properties in order to increase accuracy of climate models and predictions of future changes in the climate system is thus of great importance.

In this study, global Terra MODIS L3 data sets are used to characterize the nonlinearities of the interactions between aerosols and cloud droplets in marine boundary layer clouds. MODIS observations are binned in classes of aerosol loading to identify at what loading aerosol impact on cloud droplets is the strongest and at which loading it saturates. Results are connected to ERA-Interim and MACC data sets to identify connections of detected patterns to meteorology and aerosol species.