DKT-11-22, 2018
11. Deutsche Klimatagung

Analysis of spatial patterns and drivers of aerosol-cloud interactions based on satellite products

J. Fuchs (1), J. Cermak (1), H. Andersen (1), R. Hollmann (2), and K. Schwarz (3)

(1) Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany (julia.fuchs@kit.edu), (2) Deutscher Wetterdienst (DWD), Offenbach, Germany, (3) Department of Geography, Ruhr-Universität Bochum, Bochum, Germany

The study's focus is the investigation of spatial patterns of aerosol-cloud interactions and their drivers in the South-East Atlantic based on satellite remote sensing.
Observing aerosol-cloud interactions based on satellite products is an important method for advancing our understanding of the climate system. It is a challenging task, as most aerosol and cloud retrievals are not detected at the same time. Further, aerosols and clouds are influenced by the same atmospheric conditions making it difficult to separate the sole aerosol effect from the influence of meteorological parameters on cloud properties. The first goal of the study is to map the global occurrence frequency of potential aerosol-cloud interactions using CALIPSO's Cloud-Aerosol-Discrimination Score of the Level-2 Layer products. Results point to the South-East Atlantic region, which is marked by a semi-permanent stratocumlus cloud cover frequently overlaid by biomass-burning aerosols. The second goal is to analyze this thermodynamically stable region considering the influence of air-mass type on cloud properties using the HYSPLIT-model and the CMSAF CLAAS product. As a third goal the role of drivers for cloud properties is investigated based on a machine learning technique, gradient boosting regression trees, using a combination of MODIS data and ERA-Interim reanalysis data.
Results show that the application of different satellite products combined with reanalysis data sets is capable to analyze various aspects of the aerosol-cloud-meteorology system.