Determinants of Cloud Properties - A Statistical Study

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This contribution presents a statistical analysis of the relationship of cloud properties with corresponding aerosol and meteorological conditions, using satellite-based observations.

The indirect aerosol effects are believed to contribute significantly to the optical and microphysical proper-ties of clouds. In recent years, various studies of this relationship have been performed based on numerical models and observations, mostly from the satellite perspective. While the former frequently suffer from an inadequate observational basis, the latter often rely on small data sets and very basic statistical methods. In this study, machine learning techniques are employed to relate aerosol and meteorological conditions to patterns of cloud properties, focusing on selected cloud regimes and regions. A 30-year time series of AVHRR data is used, as well as MODIS products and ECMWF re-analysis data. In this extensive data set, the sensitivities of cloud optical depth and droplet effective radius to variations in each of the meteorological and aerosol parameters are investi-gated numerically. The relative contribution of the aerosol indirect effect is quantified on a region and regime basis.