



Modifications of cloud properties due to ship emissions - quantitative analysis of changes in solar irradiance and backscattered light

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Emissions of ships into the marine boundary layer can result in significant changes of the environment. One important aspect is the modification of clouds, resulting in a change of the solar irradiance below the cloud, known as the first indirect aerosol effect. Under certain meteorological conditions emitted aerosols from ships can change cloud formation by altering cloud properties and lifetimes, thus affecting the energy budget. These so-called ship tracks can be detected with the help of remote sensing techniques and are defined as line-shaped bright features in a near-infrared imagery that are spatially coincident with the effluent plume of a ship.

Using remote sensing data, the changes in micro- and macro-physical cloud parameters due to ship emissions into maritime stratiform clouds have been derived. By dividing the cloud-pixel into clean and polluted pixels, the resulting changes were used to estimate the change in solar irradiance at the surface and also the backscattered light at top of atmosphere. Comparison of the mean values shows a change of 34% in solar irradiance and 12% in the backscattered light.