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The atmospheric aerosol - an important player in the global climate system

Aerosol particles are an important constituent of the global climate system. They not only affect the atmospheric radiation budget through scattering and absorption of solar radiation and through their role as cloud/ice nuclei but also impact air quality and human health. Both natural and human processes contribute to the global aerosol load. Whereas coarse-mode aerosol ($>1\ \mu\text{m}$ diameter) mainly originates from natural aerosol sources, fine mode aerosol is frequently associated with human activities.

Although substantial effort has been undertaken in the last decades to improve our knowledge about aerosols and their role in the global climate system, aerosol-cloud-radiation interactions still pose the largest uncertainty to estimates and interpretations of the Earth's changing energy budget (IPCC, 2013). In order to decrease these uncertainties, research is necessary. Thereby, research aircraft like the German Aerospace Center (DLR) Falcon and the NASA DC-8 provide unique platforms to study the horizontal and vertical distribution of aerosols and their microphysical, chemical and optical properties. In this talk, I will introduce aerosols in general, and discuss their effects on the atmosphere and climate. Furthermore, I will show selected results from airborne field experiments with the DLR research aircraft Falcon and the NASA research aircraft DC8 studying the long-range transport of mineral dust (SALTRACE project), the global distribution of coarse mode aerosols (ATom project), and aerosol mixtures in the Eastern Mediterranean (AEROC project).

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