

Project title: Investigation of the influence of air pollution on DMS and its role in the Earth's climate

Abstract

The interaction of the ocean with the atmosphere is of particular importance for the Earth's climate. Oceans are the source of sea spray aerosol and affect the tropospheric budgets of important trace gases such as CO₂ and dimethyl sulfide (DMS). DMS is the main natural source of non-sea salt sulfate aerosols (nss-SO₄²⁻) that significantly influence the direct and indirect radiative forcing. The effect of DMS on radiation is determined by its oxidation products. The conversion rates into nss-SO₄²⁻ strongly depend on the oxidant and the oxidation medium (gas or aqueous phase). Recent studies indicate that the tropospheric aqueous-phase chemistry has a significant impact on the DMS conversion (Hoffmann et al., 2016). The effect of multiphase DMS oxidation on regional and global climate can be very distinct, as the product yields in polluted and pristine regions are different: Under polluted conditions as in continental outflow and coastal regions, the DMS oxidation is dominated by the NO₃ radical (Breider et al., 2010) enhancing the DMS to SO₂ conversion and consequently increases the nss-SO₄²⁻ concentration. Under more pristine conditions, the DMS to SO₂ conversion is reduced, which will favour the growth of existing particles. Hence, the direct and cloud-mediated radiative forcing of climate due to marine aerosol will differ between the two environmental regimes. Studies on the effect of this complex system on Earth's climate are missing. Therefore, in this project the effect of multiphase DMS chemistry will be investigated by using the global aerosol-chemistry-climate model ECHAM6-HAMMOZ.