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Laboratory measurements of sea salt aerosol refractive index

R. Irshad (1), D. M. Peters (1), R. G. Grainger (1), K. M. Smith (2), R. A. McPheat (2) and R. G. Williams (2)

(1) Atmospheric, Oceanic and Planetary Physics, Clarendon Laboratory, University of Oxford, OX1 3PU, UK, (2) Space Science and Technology Department, Rutherford Appleton Laboratory, Didcot, OX11 0QX, UK

Aerosols play a crucial role in atmospheric chemical reactions and radiative transfer. It is important to understand their properties and behaviour in order to better understand the behaviour of the Earth's atmosphere. Sea salt aerosols provide a significant contribution to the aerosol environment due to the large source area of the ocean, which covers approximately 70% of the Earth's surface.

The optical properties of aerosols are particularly important as they can be used to calculate their direct radiative forcing contribution. Currently, the most commonly used refractive indices of sea salt aerosol are calculated using mixing rules to combine the values for salt and water. This is necessary as the composition of sea salt aerosol is determined by the relative humidity which is spatially and temporally variable.

We have measured laboratory generated sea salt aerosols extinction spectra from 1 μm to 20 μm using a Bruker 66v/S FTIR spectrometer. Concomitant measurements included temperature, pressure, relative humidity and the aerosol size distribution. The refractive indices of the sea salt have been determined using a SHO band model (Thomas, 2004) for aerosol with compositions between 0.1 % to 100% sea salt. The resulting refractive index spectra, while in general agreement with previous measurements, show significant discrepancies when compared to existing sea salt refractive indices.

References:

G. E. Thomas, S. F. Bass, R. G. Grainger, and A. Lambert, "Retrieval of aerosol refrac-

tive index from extinction spectra with a damped harmonic-oscillator band model," Appl. Opt. 44, 1332-1341 (2005)