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Latitudinal aerosol size distribution variation in the Eastern Atlantic Ocean measured aboard the FS-Polarstern

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Abstract. Aerosol size distribution measurements from 0.03 μm to 25 μm diameter were taken at ambient humidity aboard the German research vessel, FS-Polarstern, during a transect from Bremerhaven in northern Germany, to Cape Town in South Africa across latitudes 53°32' N to 33°55' S, denoted cruise number ANT XXI/1. The data were segregated according to air mass history, wind speed and latitude. Under clean marine conditions, the averaged size distributions were generally in good agreement with those reported previously for diameters less than 0.5 μm and can be approximated by two log-normal modes, with significant variation in the mean modal diameters. Two short periods of tri-modal behaviour were observed. Above 0.5 μm , there is indication of a limit to the mechanical generation of marine aerosol over the range of wind speeds observed ($\sim 1.7\text{--}14.7 \text{ m s}^{-1}$). A new technique to determine the errors associated with aerosol size distribution measurements using Poisson statistics has been applied to the dataset, providing a tool to determine the necessary sample or averaging times for correct interpretation of such data. Finally, the data were also used to investigate the loss rate of condensing gases with potentially important consequences for heterogeneous marine photochemical cycles.

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