Geophysical Research Abstracts
Vol. 15, EGU2013-4043, 2013
EGU General Assembly 2013

Variability of CCN Activation Behaviour of Aerosol Particles in the Marine Boundary Layer of the Northern and Southern Atlantic Ocean

Silvia Henning, Katrin Dieckmann, Susan Hartmann, Michael Schäfer, Zhijun Wu, Maik Merkel, Alfred Wiedensohler, and Frank Stratmann

Insitute for Tropospheric Research, Leipzig, Germany (silvia.henning@tropos.de)

The variability of cloud condensation nucleus (CCN) activation behaviour and total CCN number concentrations was investigated during three ship cruises. Measurements were performed in a mobile laboratory on the German research vessel FS Polarstern cruising between Cape Town and Bremerhaven (April / May and October / November 2011) as well as between Punta Arenas and Bremerhaven (April / May 2012). CCN size distributions were measured for supersaturations between 0.1% and 0.4% using a Cloud Condensation Nucleus Counter (DMT, USA). Aerosol particle and CCN total number concentrations as well as the hygroscopicity parameter κ (Petters and Kreidenweis, 2007) were determined. Furthermore, size distribution data were collected.
The hygroscopicity parameter κ featured a high variability during the cruises, with a median κ-value of 0.52 $\pm$ 0.26. The κ-values are depended on air mass origin; and are as expected mainly dominated by marine influences, but also long range transport of aerosol particles was detected. In the Celtic Sea, κ was found to be lower than that of clean marine aerosol particles (0.72 $\pm$ 0.24; Pringle et al., 2010) with κ-values $\sim$0.2, possibly influenced by anthropogenic emissions from Europe. Close to the West African coast particle hygroscopicity was found to be influenced by the Saharan dust plume, resulting in low κ-values $\sim$0.25.

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