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What controls volatility of sea spray aerosol? Results from laboratory studies using artificial and real seawater samples

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Keywords

Volatility, seawater, hydrates, thermodenuder, sea spray, atmospheric aerosol

Abstract

Seawater samples were collected in the Bay of Aarhus, Denmark, from April 9 to June 1, 2015, and laboratory generated sea spray aerosol (SSA) were characterized with regards to volatility, particle size distributions and cloud condensation nuclei (CCN) activity. The volatile fraction of SSA generated in a sea spray tank from real and artificial seawater was determined using a thermodenuder at temperatures up to 400 °C. SSA generated from artificial seawater consisting of a mixture of inorganic salts show a larger volatile fraction than SSA from the real seawater samples. Measurements of different artificial saltwater solutions revealed that the volatile fraction of dried artificial SSA is likely due to evaporation of water in the thermodenuder. Thermal decomposition of hydrates in the thermodenuder, in particular magnesium chloride hydrates can explain the observed behavior. The presented results suggests that the inorganic salt composition may influence and even dominate the volatility of SSA generated from artificial and real seawater samples.

1 Introduction

Sea spray aerosol (SSA) constitutes a major source of atmospheric particulate matter (Andreae & Rosenfeld, 2008) and is considered an important component of the climate system influencing cloud formation and precipitation patterns (Clarke et al., 2006). SSA is generated from bursting