Organic Fraction of Laboratory Generated Primary Marine Aerosol

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Marine aerosols are an important source of aerosols in the Earth's climate system. Despite their importance, much remains unknown about the characteristics of these aerosols. The largest uncertainty remains in the submicron aerosol size range, where flux estimates span several orders of magnitude (de Leeuw *et al.* 2011). In addition to this, the organic fraction of these particles remains a large open question.

Building on previous work with a simulated sea spray aerosol tank at the University of Copenhagen (King *et al.* 2012), the organic fraction of laboratory produced aerosol is probed with the use of a thermo-denuder forming a Volatility-Tandem Differential Mobility Analyzer (VTDMA) operating at high temperatures (∼400°C). By selecting specific proxy sea water solutions with known organics and salts, the organic volume fraction volatilized from aerosols at specific mobility sizes can be determined, yielding the organic fraction of aerosols.

Several organic-salt systems were investigated, with results presented here from L-Serine, an amino acid found in the sea micro layer, with respect to varying concentrations of sodium chloride (NaCl) and an artificial sea salt, Tropic Marin Sea Salt (TMSS). A 1 g sample of organic in 10 L of Milli-Q (18MΩ) is bubbled using a vertical plunging jet producing bubble burst-aerosols characteristic of primary marine aerosols. Salt concentration is increased in the tank while the first DMA is set to several diameters with sufficient concentration for VTDMA study. Resulting modal diameters of the size distribution before and after the thermo-denuder are then used to calculate the volume fraction remaining (VFR). This results in the VFR plot shown in Figure 1.

Figure 1 shows that the volume fraction remaining, following passage of aerosols through the thrermodenude, decreases for all sample aerosols. For the TMSS:Serine system, the volume fraction remaining increases with increase in salt:organic ratio. A similar trend is seen for the NaCl:Serine system, however less pronounced.

A trend of volume fraction remaining with particle diameter is seen for TMSS:Serine ratios of 10:1 and 100:1, repectively, with a slight decrease in VFR near 100 nm. The low VFR for 20 nm particles implies a high organic fraction in the original particles and when considered relative to VFR of 60 nm particles, gives evidence for a size dependent organic fraction.

These results indicate a promising avenue with which to investigate the organic fraction of laboratory produced aerosols, which allows for the careful control of the precise organic and salt concentrations of a sea water proxy. Estimates of specific organics within the surface layer of the ocean can then be tied to aerosol production and organic mass flux over the ocean. Further work is to include more sample matrices and characterization of experimental error.

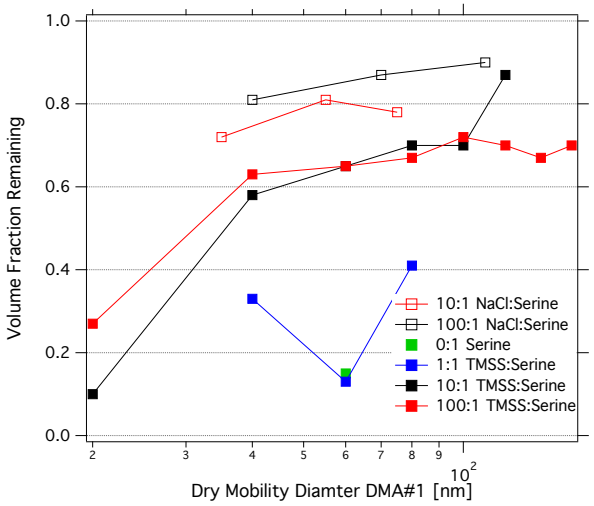

Figure 1: Volume Fraction Remaining for aerosols produced by plunging jet aerosol production in Salt:Organic sea water proxies

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