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Aerosol carbon isotope composition over Baltic Sea

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Particulate carbonaceous matter is significant contributor to ambient particulate matter originating from intervening sources which contribution is difficult to quantify due to source diversity, chemical complexity and processes during atmospheric transport. Carbon isotope analysis can be extremely useful in source apportionment of organic matter due to the unique isotopic signatures associated with anthropocentric (fossil fuel), continental (terrestrial plants) and marine sources, and is particularly effective when these sources are mixed (Ceburnis et al., 2011;Ceburnis et al., 2016).
We will present the isotope ratio measurement results of aerosol collected during the cruise in the Baltic Sea. Sampling campaign of PM10 and size segregated aerosol particles was performed on the R/V “Oceania” in October 2015. Air mass back trajectories were prevailing both from the continental and marine areas during the sampling period. The total carbon concentration varied from 1 μg/m3 to 8 μg/m3. Two end members (δ13C = -25‰ and δ13C = -28 ‰) were established from the total stable carbon isotope analysis in PM10 fraction. δ13C analysis in size segregated aerosol particles revealed δ13C values being highest in the 1 - 2.5 μm range (δ13C = -24.9 ‰) during continental transport, while lowest TC δ13C values (δ13C $\approx$ -27 ‰) were detected in the size range D50 <1 μm during stormy weather when air mass trajectory prevailed from the western direction. These measurements revealed that simplified isotope mixing model can not be applied for the aerosol source apportionment (Masalaite et al., 2015) in the perturbed marine environment. Additionally, concentration of bacteria and fungi were measured in size segregated and PM10 aerosol fraction. We were able to relate aerosol source δ13C end members with the abundance of bacteria and fungi over Baltic Sea combining air mass trajectories, stable isotope data, fungi and bacteria concentrations.

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