Sea spray aerosol fluxes comparison: European Arctic vs. the Baltic Sea

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The results of studies of the vertical gradient of aerosol concentration measurements made during cruises of r/v "Oceania" between 2008 and 2016 are presented. The scientific cruises were conducted around the Baltic Sea and the European Arctic regions. Using the results from those experiments, sea spray emission fluxes were calculated for all particles of sizes in the range from 0.5 μm to 47 μm. Measurements were carried out using a gradient method Petelski (2003, 2014), Markuszewski (2014). For this method we used a Laser Particle Counter (PMS model CSASP-100_HV) placed on one of the masts of the r/v Oceania. Measurements were performed on five different levels above sea level: 8, 11, 14, 17 and 20 meters. The vertical aerosol concentration gradient was obtained from a minimum of 4 measurement series. Thus each result consists of a 1 hour series with the average sampling time at each elevation equaling 8 minutes.

Using the results from those experiments the sea spray emission fluxes have been calculated for all particles of sizes in range 0.5 μm to 8 μm, as well as for particles of sizes from fifteen channels of 0.5 μm width. Using these fluxes we calculated the Sea Salt Generation Function (SSGF) over the Baltic Sea, Petelski (2014). This function provides information on the emission of particles of different sizes, depending on environmental parameters. The emission of sea spray depends on the size of energy lost by the wind waves in the process of a collapse.

Gathered data and results

Processed data contains cruises over the years 2008 – 2016 in the Southern Baltic Sea region, and three measurements campaigns AREX (ARctic EXperiment) in the European Arctic region over the years 2013 – 2016. All the results presented were corrected to 80% relative humidity [Fitzgerald, 1975; Petelski, 2005]. Comparison and parameterisation between aerosol flux, size distribution and wind speed in range from 6 m/s to 17 m/s were made.
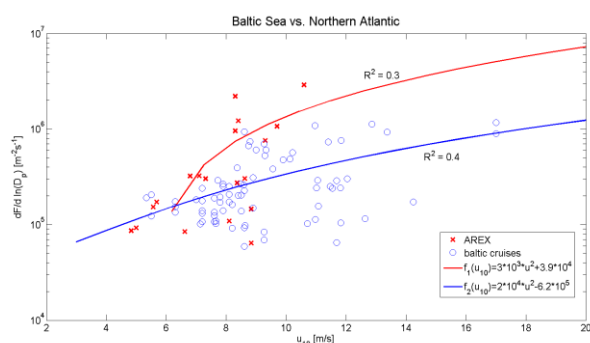

Figure 1. Gradient coarse aerosol fluxes gathered in years 2008 – 2015

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