Forty-Seven Years of MSA Concentrations in the Finnish Arctic

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Keywords: MSA, SST anomalies, PSCF.
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In the northern hemisphere 7.5% of total sulfur emissions are from oceanic sources and for arctic regions (65° to 80°N) oceanic sulfur emissions constitute 42% of total emissions (Bates, 1992). MSA (Methane Sulfonate) is a unique sulfate that can be used as a marker for these biogenic oceanic sources. Marine planktonic algae excrete DMS (dimethylsulfide) which is transported to the air and oxidized to MSA (methane sulfonate) as well as nss-sulfate (Bates, 1992).

Week-long historical filter samples collected at Kevo, Finland from 1964-2010 have been analyzed for methane sulfonate (MSA) as well as various other species.

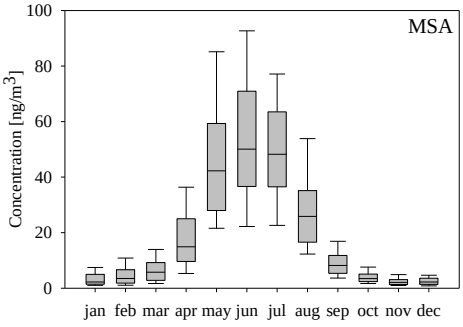

Figure 1. Seasonality of MSA concentrations.

MSA has a distinct summer maximum during the months of May, June and July associated with warmer waters and increased primary productivity in the surrounding oceans (Figure 1).

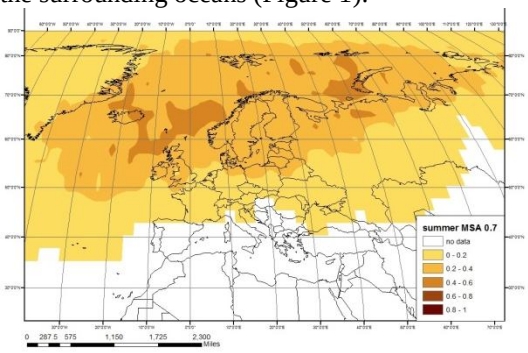

Figure 2. PSCF plot for MSA during summer months.

PSCF (potential source contribution function) results using HYSPLIT 5-day back-trajectories show for MSA in the summer show source areas primarily in the Norwegian and Barents Seas (Figure 2). Sea surface temperatures in the northern hemisphere have risen since the early 1970s, most dramatically in the North Atlantic (Thompson, 2010). Using the HadSST2 Dataset (Rayner, 2006), a significant correlation was found between average yearly MSA concentrations for the months of peak concentration (May, June, and July) and yearly SST anomalies in the region from 30W to 80E and 40N to 90N (Figure 3).

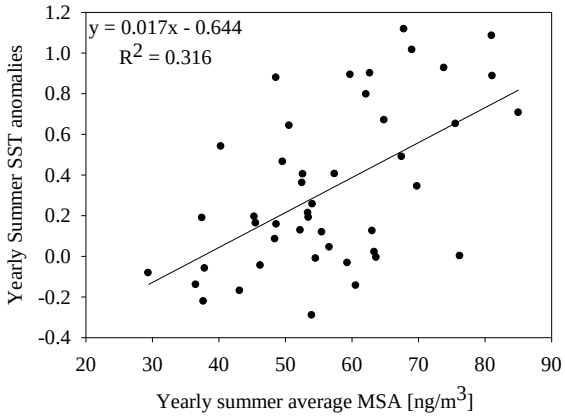

Figure 3. Yearly average summer (may, june, july) MSA concentrations and sea surface temperature anomalies.

This work was supported by the National Science Foundation under grant ATM 1007329.

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