Sea Salt: 
To be, or not to be…
Sea salt detection by the AMS 
Sea salt quantification by the HR-ToF-AMS

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(53°20' N, 9°54' W)
The HR-ToF-AMS was calibrated using sea salt aerosol generated from artificial seawater using SIGMA sea salt dissolved in deionized water. The solution was nebulized with a TSI atomizer, and a DMA configured to generate a 300 nm monodisperse particle size distribution flow from the nebulized polydisperse flow, fed directly into the AMS inlet.

**Caution:** risk of overloading!
Max ambient ~5 µg m⁻³, saturation at >20 µg m⁻³
Two approaches:

(1)

adding up all sea salt ions to obtain a new high resolution sea salt “family”

\((^{23}\text{Na}, \text{Mg}, ^{25}\text{Mg}, ^{26}\text{Mg}, ^{35}\text{Cl}, ^{35}\text{HCl}, ^{37}\text{Cl}, ^{37}\text{HCl}, \text{K}, ^{41}\text{K}, \text{Mn}, \text{Fe}, \text{Na}^{35}\text{Cl}, ^{24}\text{Mg}^{35}\text{Cl}, \text{Na}^{37}\text{Cl}, ^{26}\text{Mg}^{35}\text{Cl}, ^{26}\text{Mg}^{37}\text{Cl}, ^{26}\text{Mg}^{37}\text{Cl}, ^{40}\text{Ca}^{35}\text{Cl}, ^{40}\text{Ca}^{37}\text{Cl}, \text{Br}, \text{Na}_2^{35}\text{Cl}, \text{Na}_2^{37}\text{Cl}, ^{24}\text{Mg}^{35}\text{Cl}_2, ^{25}\text{Mg}^{35}\text{Cl}_2, ^{26}\text{Mg}^{35}\text{Cl}_2, ^{24}\text{Mg}^{37}\text{Cl}_2, ^{26}\text{Mg}^{37}\text{Cl}_2)\)

Scaling factor equal to 2.5
centered on using only the $^{23}\text{Na}^{35}\text{Cl}^+$ ion fragment as the “fingerprint” of sea salt

Scaling factor equal to 51

Reference Cl isotope ratio
AMS measurements

Date

09/01/21 09/06/20 09/11/17 10/04/16 10/09/13

15th AMS Users Meeting
**Advantages:**

Sea salt family method

- Scaling factor equal to 2.5

**Drawbacks:**

- Very high background signal, long evaporation delays
- Other sources than the sea salt
- Sensitive to the tuning (Na surface ionization)
- Sensitive to the heater temperature

NaCl method

- Very low background signal
- Exclusively comes from the sea salt
- Not so sensitive to the tuning
- Not so sensitive to the heater temperature

- A large scaling factor of 51
Caution: upper cut-off

Atmospheric Physics and Chemistry. p. 416.
Ovadnevaite et al., 2012 JGR
Local wind speed measured at Mace Head was equal to 24.1 m s\(^{-1}\) (46.8 knots).
Ovadnevaite et al., 2012 JGR

Total fit: $F_{\text{total}} = 0.47 + 0.003U_{10}^{2.7}$

Decreasing wind fit: $F_{\text{dec}} = 0.47 + 0.01U_{10}^{2.3}$

Increasing wind fit: $F_{\text{inc}} = 0.47 + 0.0007U_{10}^{3.1}$
\[
\frac{dF}{d\log D} = \sum_{i=1}^{5} \frac{F_i(Re_{Hw})}{\sqrt{2\pi \ln \sigma_i}} \exp\left( -\frac{1}{2} \left( \frac{\ln \left( \frac{D}{CMD_i} \right)}{\ln \sigma_i} \right)^2 \right)
\]
Ovadnevaite et al., 2014 ACP