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Measurements of NaCl in ambient air with a capture vaporizer-ToF-ACSM

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Supplemental Information

S1 Data selection calibration experiment

Figure S1 shows the time series of the fragment signals at m/z 23, m/z 58 and m/z 60 collected during the laboratory calibration experiment. After each change in NaCl aerosol concentration, the signal was allowed to stabilize before inclusion in the analysis. Aerosol concentrations ranged from 4.6 µg m^{-3} and 26.3 µg m^{-3}, with three concentrations applied for each particle diameter (150, 200, and 250 nm) in a random sequence to minimize potential memory effects.

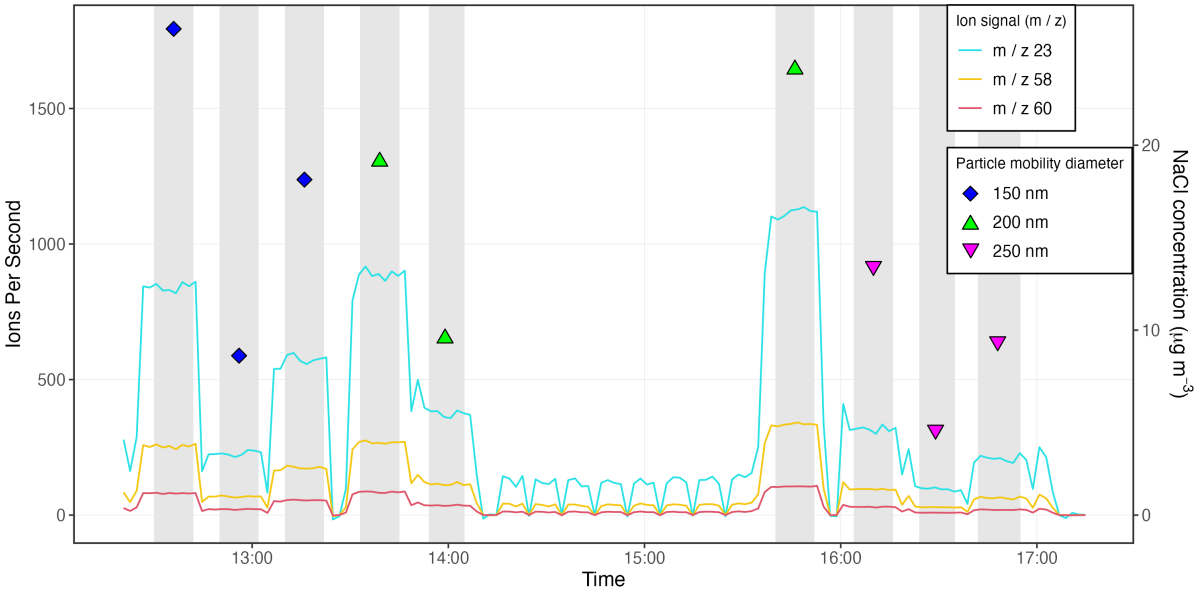


Figure S1: Time series of the fragment signals at m/z 23, 58 and 60 recorded during the laboratory experiment. The grey rectangles indicate the time period during which data was analyzed. The diamonds indicate the NaCl aerosol mass concentration and particle mobility diameter for each measurement.

S2 Ambient measurements Lutjewad

Figure S2 shows the time series of the ACSM fragment signals at m/z 23, 58, and 60 during a measurement period in 2023 at the Lutjewad measurement station. Periods of enhanced sea salt concentrations can be identified by a simultaneous increase in all three fragment signals. However, m/z 58 also shows several periods of elevated signal

intensity without a corresponding increase in m/z 23 and m/z 60. This indicates that m/z 58 is not exclusively associated with sea salt and can also originate from other aerosol components or sources.

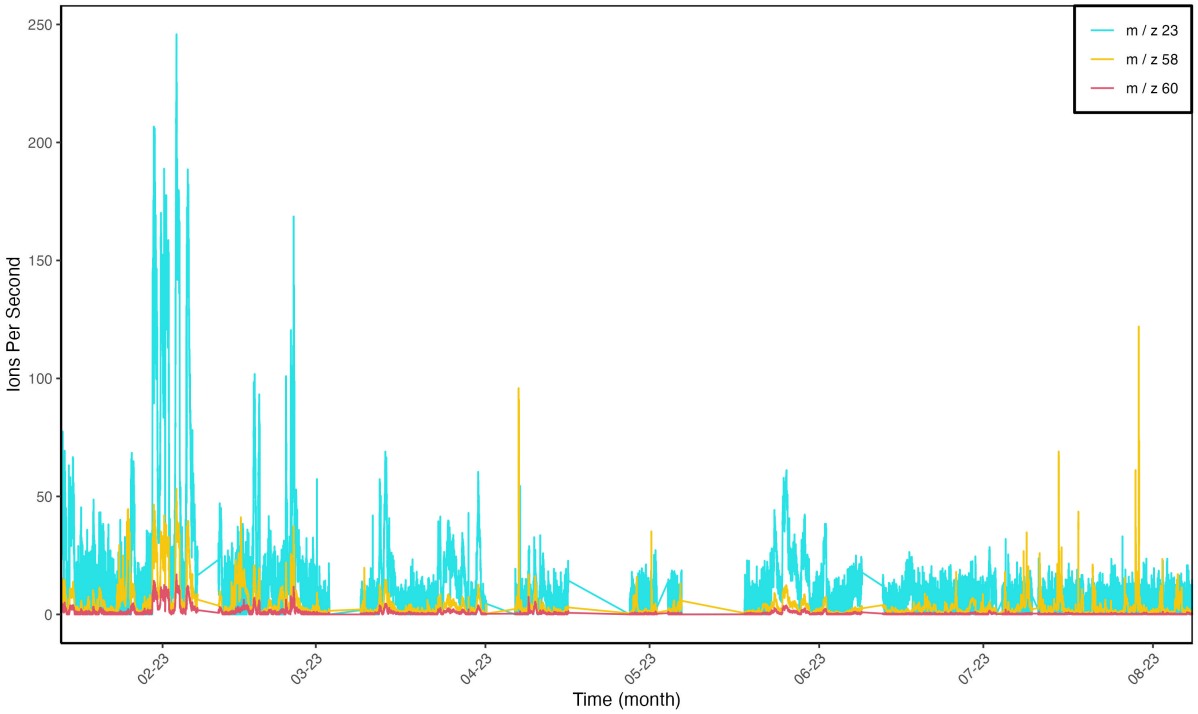


Figure S2: Time series of the ACSM fragment signals at m/z 23, 58, and 60 measured during the measurement period at the Lutjewad measurement station.

The mass spectrum measured during the high sea-salt episode on 3 February 2023 (Fig. S3) shows a characteristic enhancement of several signals associated with sea salt aerosol. The spectrum is dominated by m/z 23, which represents the strongest signal, followed by m/z 58. Additional pronounced signals are observed at m/z 16-18, 28,

30, 35-38, 44, 48 and 64. It should be noted that the signal at m/z 23 is not included in the default fragmentation table of the CV-ToF-ACSM.

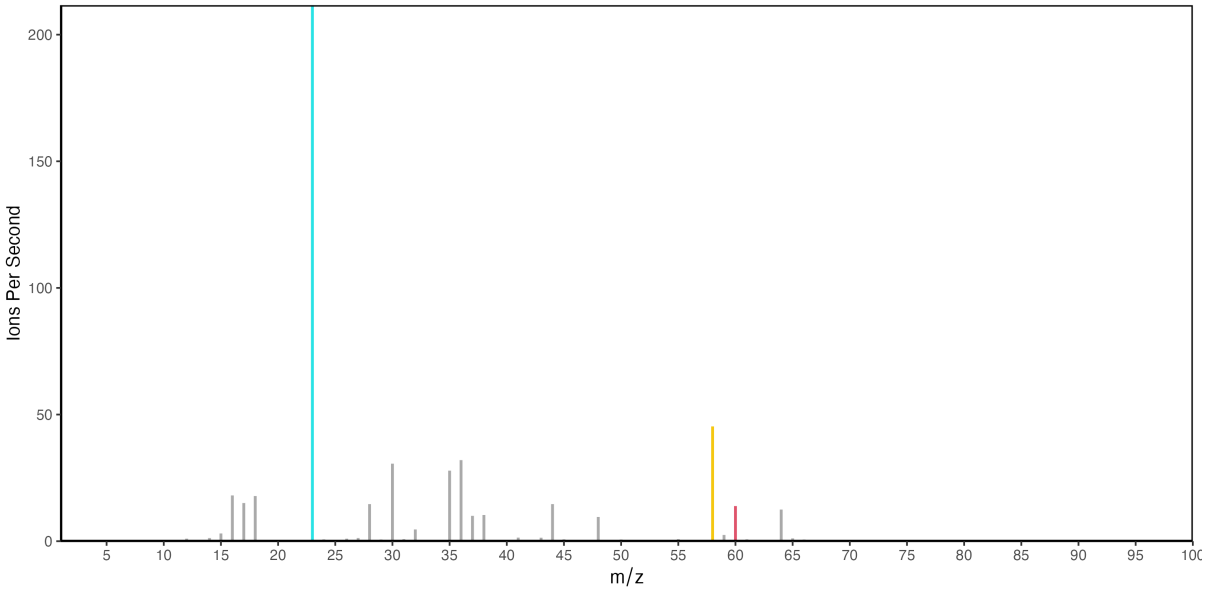


Figure S3: Mass spectrum of a high sea salt episode at the Lutjewad measurement station on 3 February 2023. The ion signal at m/z 23 is marked in blue, the ion signal at m/z 58 in yellow and the ion signal at m/z 60 is marked in red.

S3 AIDA chamber experiment 19 January 2024

Figure S4 depicts the time series of the fragments at m/z 23, m/z 58 and m/z 60, and the OA signal calculated using the default fragmentation table for the ToF-ACSM during the AIDA chamber experiment conducted on 19 January 2024. The RH in the AIDA chamber was remained between 90 and 95% during this experiment. Under these high relative humidity conditions complex chemical and physical processes take place in the gas phase as well as in the aqueous phase, however, as can be observed from figure S2 the three NaCl fragment signals held stable under these conditions.

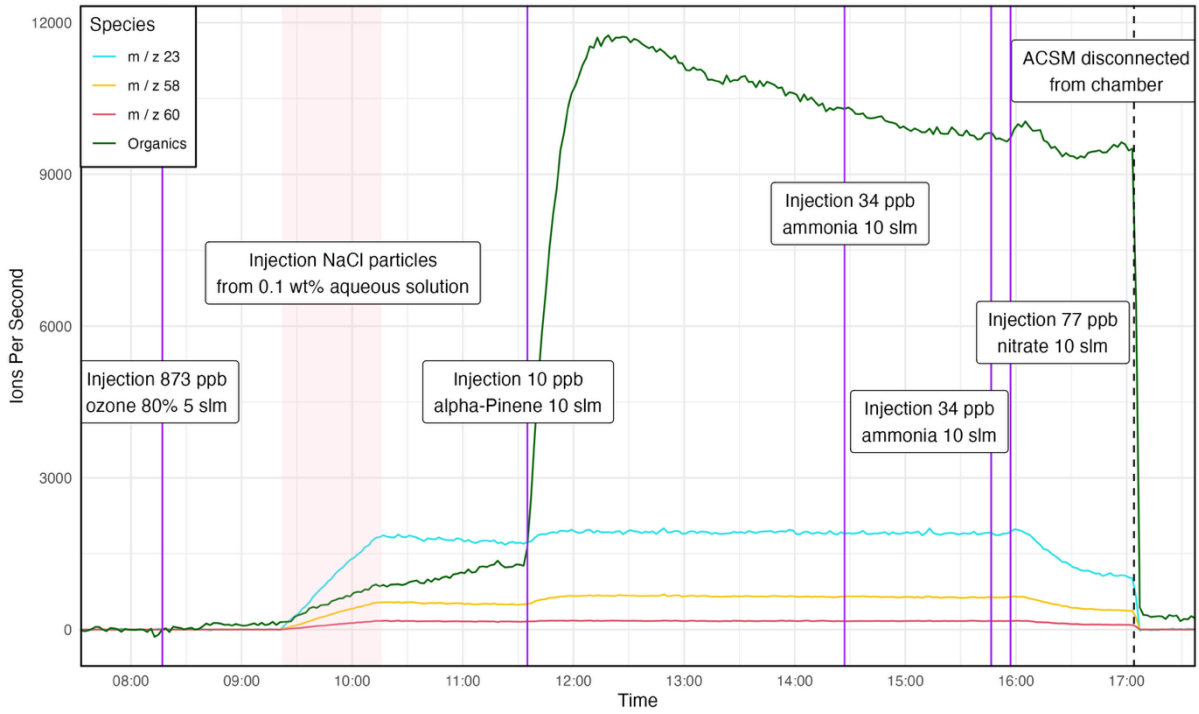


Figure S4: Time series of the fragment signals at m/z 23, 58 and 60 (light blue, yellow, and red, respectively), and the organics signal as assigned by default in the fragmentation table of the TOF-ACSM, during the AIDA chamber experiment on 19 January 2024. The pink shaded area represents the injection of NaCl particles from a 0.1 wt% aqueous solution. The polydisperse aerosol had an average number mode diameter of ±223 nm as derived from the measurements with the two SMPS instruments. The purple lines represent the injection of 783 ppb ozone, the injection of 10 ppb alpha-Pinene, the injection of 34 ppb ammonia, a second injection of 34 ppb ammonia, and the injection of 77 ppb NO_2, respectively.