

## Supplementary Information

### Uptake selectivity of Methanesulfonic Acid (MSA) on fine particles over polynya regions of Ross Sea, Antarctica

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#### Supplementary Material

Fig. S1. The cruise tracks of the observation in the Ross Sea (RS). Leg I was carried out during the early December (December 2 to 20, 2017). Leg II was carried out from middle January to February 14, 2018 in the RS, covering a large regions of 50°S to 78°S, 160°E to 185°E.

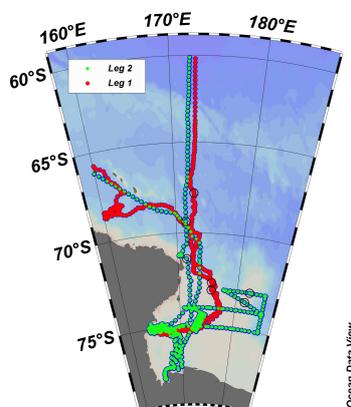


Fig. S2. Spatial distribution of sea ice and Chl-a concentrations. (a) Sea ice concentrations during December 2 to 20; (b) Sea ice concentrations during January 13 to February 14, 2018; (c) Mean Chl-a concentrations during Dec.4 to 14, 2017; (d) Mean Chl-a concentrations during Jan. 25 to Feb. 4, 2018.

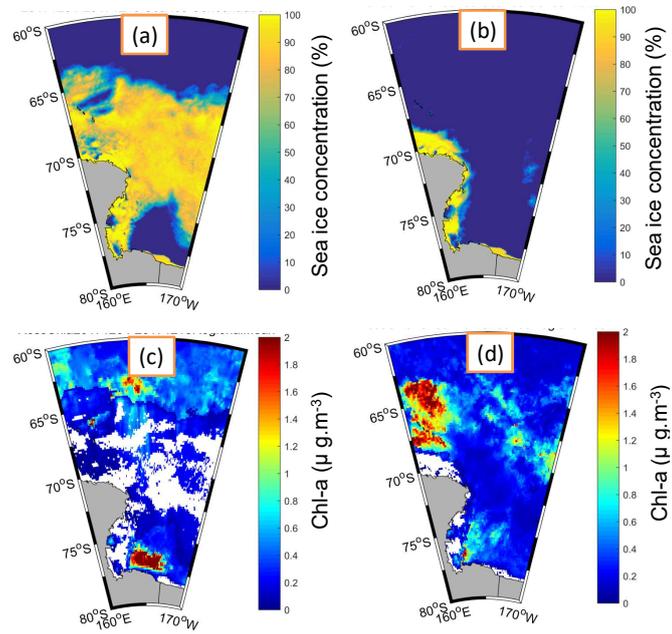


Fig. S3. Gases and aerosols monitoring system. An underway aerosols monitoring system were deployed on the R/V “Xuelong” to carried out the observation in the Southern Ocean (SO). An In-situ Gas and Aerosol Composition monitoring system was used to determine the gaseous and aerosol water soluble ions, A Single Particle Aerosol Mass Spectrometer were used to determine the particle size distribution and chemical compositions.

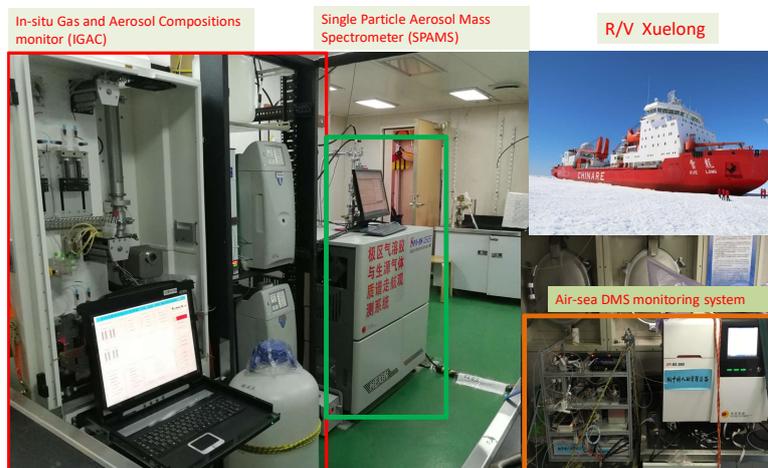


Fig. S4. Calibration curves of MSA, chloride, sulfate and sodium for IGAC monitoring system. (a) Six out of eight concentrations of standard solutions (0.1-1000 ug/L) were selected for MSA calibration ( $r^2=0.998$ ); (b) Six out of eight concentrations of standard solutions (0.1-2000 ug/L) were selected for Chloride calibration ( $r^2=0.997$ ); (c) Six out of eight concentrations of standard solutions (0.1-4000 ug/L) were selected for Sulfate calibration ( $r^2=0.997$ ); (d) Six out of eight concentrations of standard solutions (0.1-2000 ug/L) were selected for Sodium calibration ( $r^2=0.998$ ).

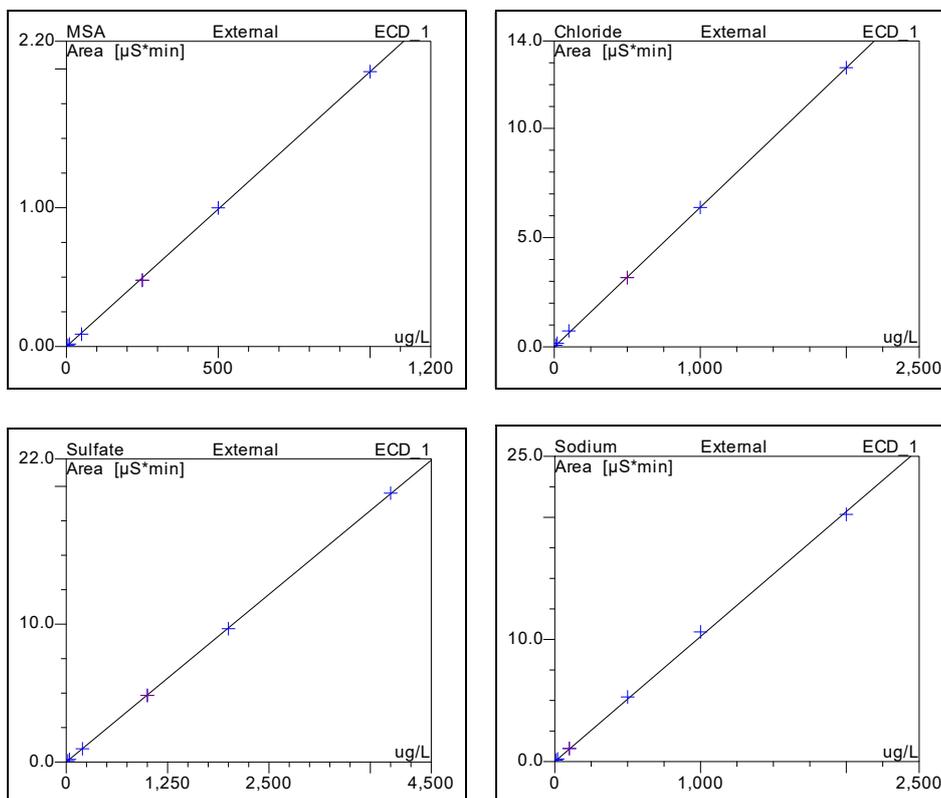


Fig. S5. Relationship between MSA population and MSA mass concentration. (a) Correlation between MSA mass concentrations and MSA particle population; (b) Correlation between MSA particle population and total particle population.

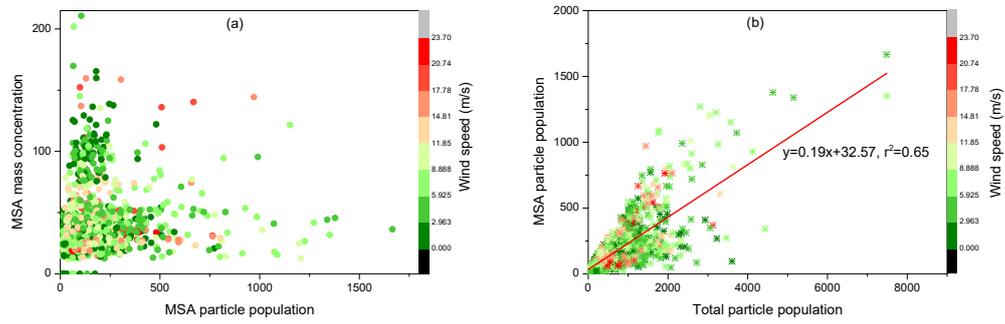




Fig. S7. Correlation between MSA-Na and MSA-Mg particle population.

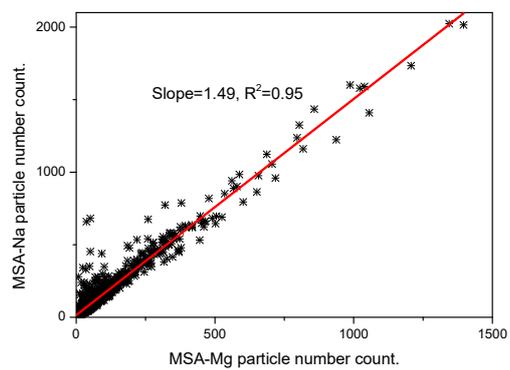


Fig. S8. Mean fraction of MSA sub-types to the total particle population during leg I and leg II.

