

Supplementary Information:

S1 Sampling dates and times

Table S1. Sampling dates, times, locations and SHARK component information

Site	Date (dd/mm/yy)	Sampling periods	Impactors	Impactor 1 sampled volume, L (at 9 L min ⁻¹)	Impactor 2 sampled volume, L (at 9 L min ⁻¹)	Impactor 1 after-filter?	Windsond?	OPC?
Cardington, (UK)	15/05/2018	14:15-16:15	Impactor 1 and 2 installed, only Impactor 2 sampling	-	12000	No	No	Installed but not sampling
Hyytiälä, (Finland)	11/03/2018	10:45-16:00	Impactor 1 only	2835	-	No	No	No
Leeds, (UK)	07/06/2018	12:21-15:21	Both impactors	1620	18000	Yes	Yes	Yes
Longyearbyen, (Svalbard)	23/09/18-24/09/18	20:00-04:30	Both impactors	4590	51000	Yes	Yes	Yes

S2 Fraction frozen curves for all sites

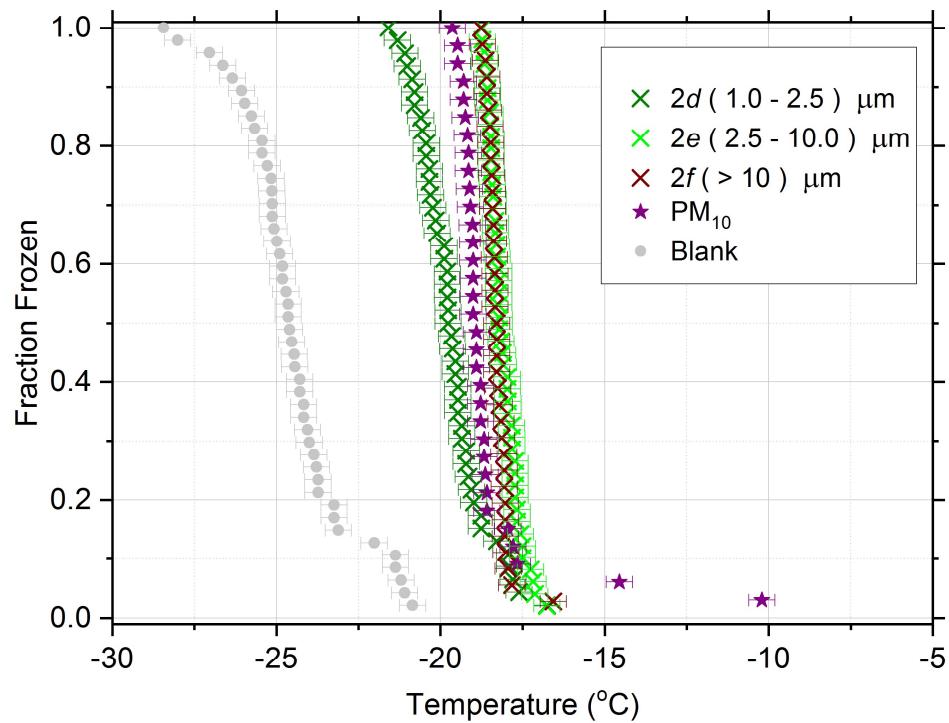


Figure S1. Fraction frozen curves for samples collected in Cardington, (UK)

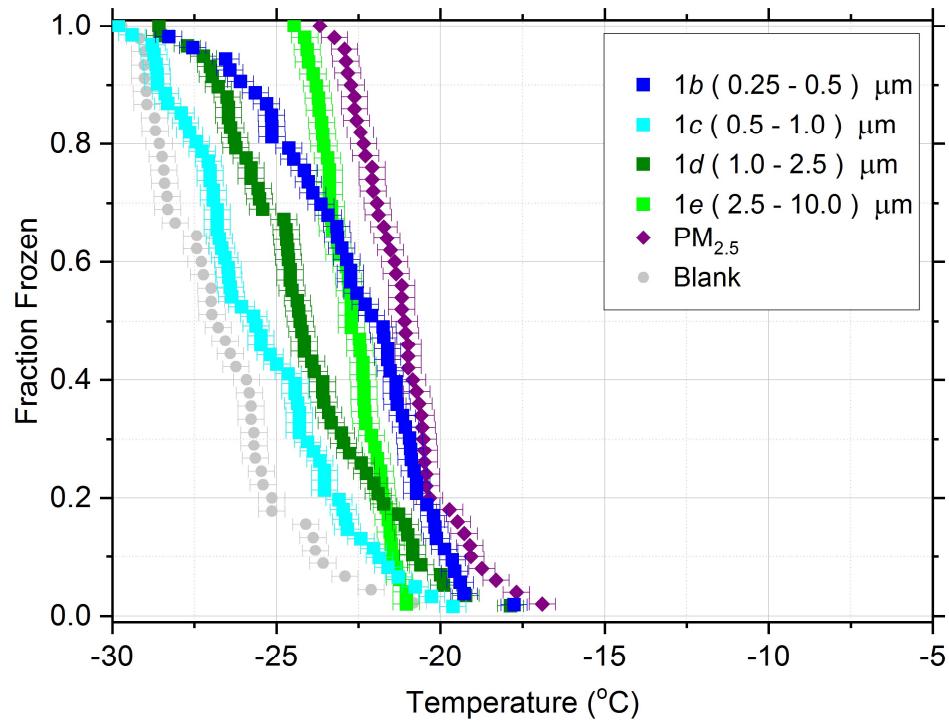


Figure S2. Fraction frozen curves for samples collected in Hyytiälä, (Finland)

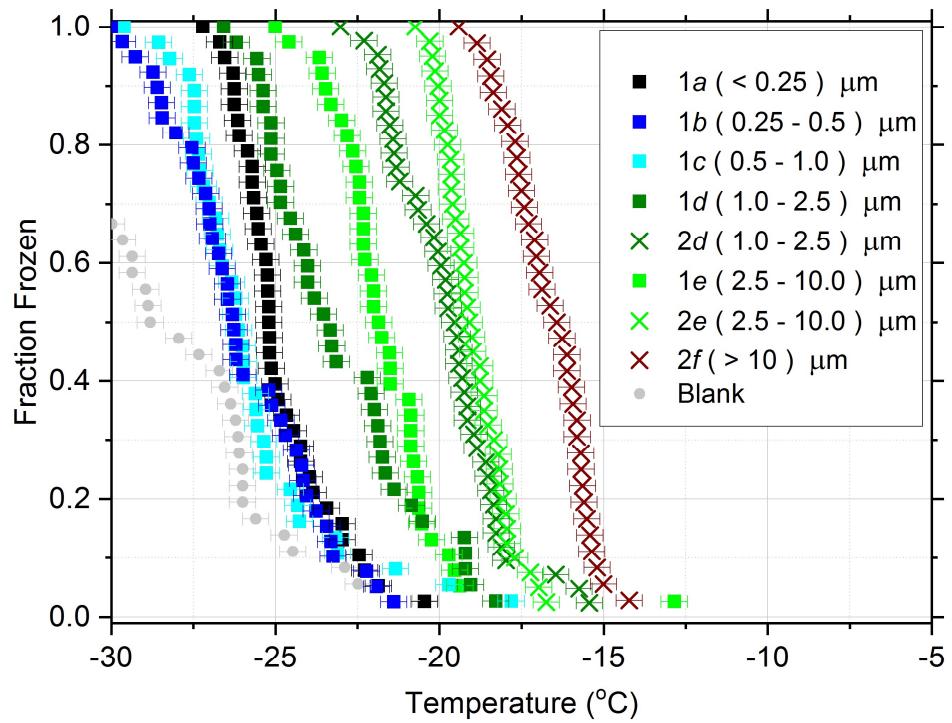


Figure S3. Fraction frozen curves for samples collected in Leeds, (UK)

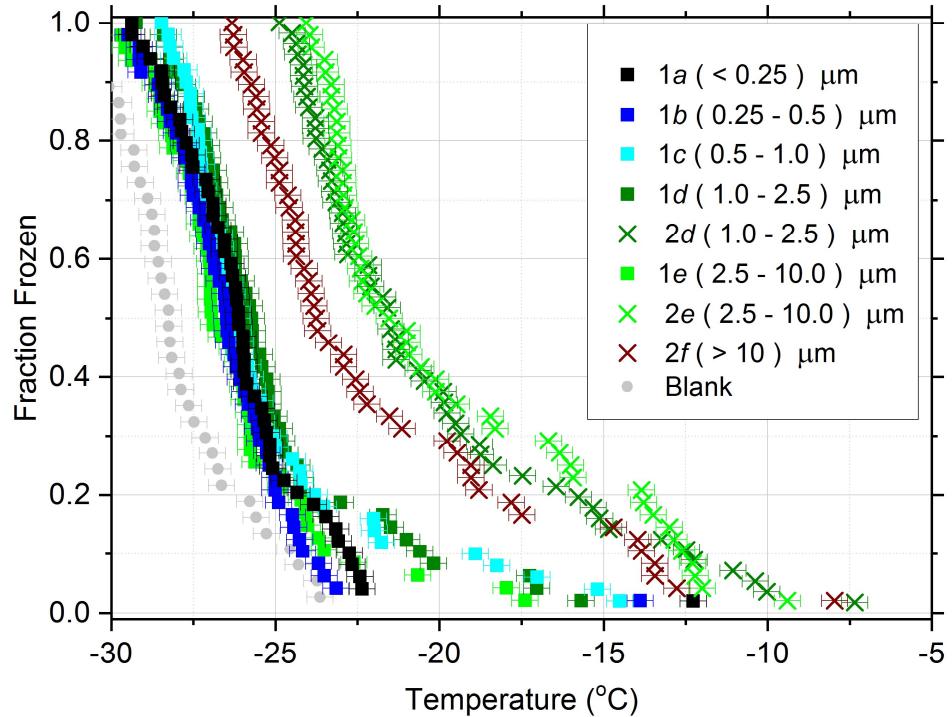


Figure S4. Fraction frozen curves for samples collected in Longyearbyen, (Svalbard)

S3 Aerosol data for Leeds and Longyearbyen

S3.1 Leeds, (UK)

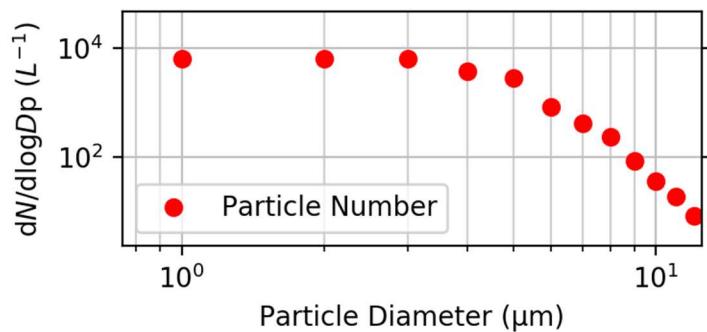


Figure S5. Particle number size distribution data for samples collected in Leeds, (UK)

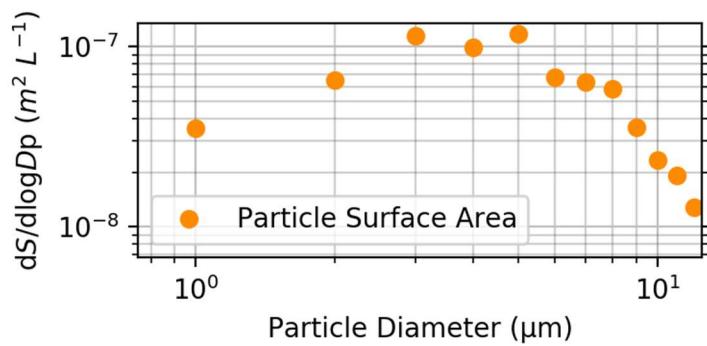


Figure S6. Particle surface area size distribution data for samples collected in Leeds, (UK)

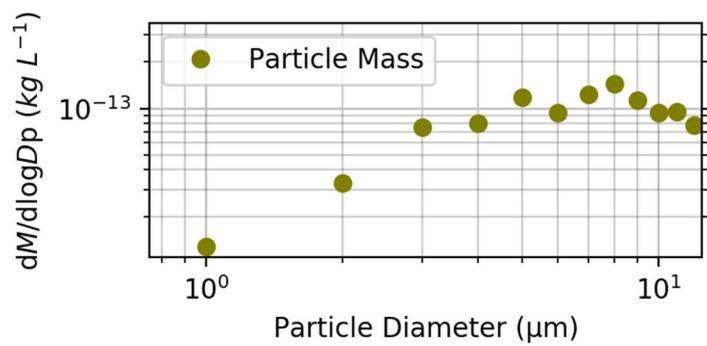


Figure S7. Particle mass size distribution data for samples collected in Leeds, (UK)

S3.2 Longyearbyen, (Svalbard)

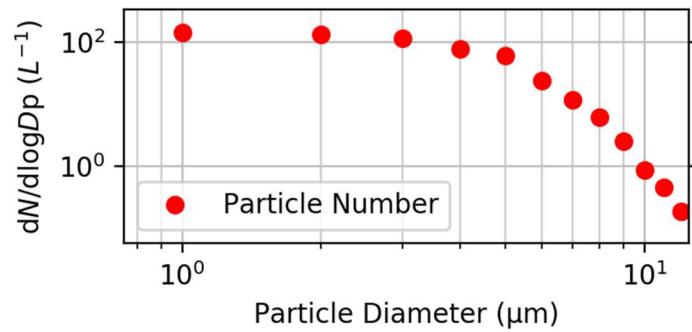


Figure S8. Particle number size distribution data for samples collected in Longyearbyen, (Svalbard)

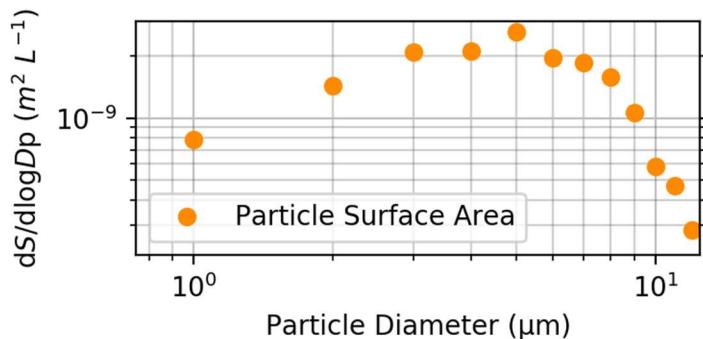


Figure S9. Particle surface area size distribution data for samples collected in Longyearbyen, (Svalbard)

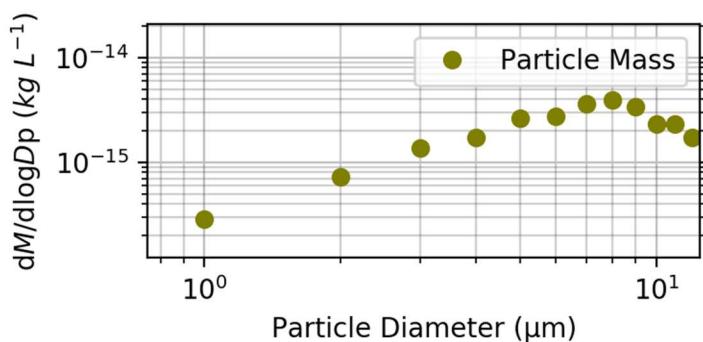


Figure S10. Particle mass size distribution data for samples collected in Longyearbyen, (Svalbard)