SUPPORTING INFORMATION

On the annual variability of Antarctic aerosol size distributions at Halley research station

Thomas Lachlan-Cope[1], David Beddows[2], Neil Brough[1], Anna E. Jones[1], Roy M. Harrison[2,+], Angelo Lupi[3], Young Jun Yoon[4], Aki Virkkula[5,6] and Manuel Dall´Osto[7*]

[1]*British Antarctic Survey, NERC, High Cross, Madingley Rd, Cambridge, CB3 0ET, United Kingdom*

[2]*National Center for Atmospheric Sciences, University of Birmingham, Edgbaston, Birmingham, B15 2TT, United Kingdom*

[3]*Institute of Atmospheric Sciences and Climate (ISAC),National Research Council (CNR), via P. Gobetti 101, 40129, Bologna Italy*

[4]*Korea Polar Research Institute, 26, SongdoMirae-ro, Yeonsu-Gu, Incheon, KOREA 406-840*

[5]*Institute for Atmospheric and Earth System Research, University of Helsinki Helsinki, FI-00014, Finland*

[6]*Finnish Meteorological Institute, FI-00101 Helsinki, Finland*

[7]*Institute of Marine Sciences,* Passeig Marítim de la Barceloneta, 37-49. E-08003, Barcelona, Spain; corresponding author, email: dallosto@icm.csic.es

[+]Also at: Department of Environmental Sciences/Centre of Excellence in Environmental Studies, King Abdulaziz University, PO Box 80203, Jeddah, 21589, Saudi Arabia.

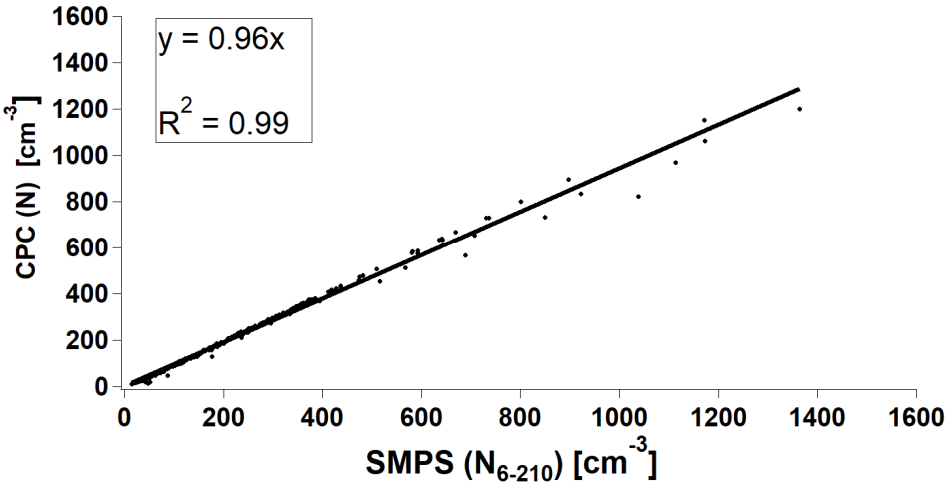


Figure SI 1 Intercomparison between CPC (TSI 3010) and SMPS (TSI 3082)

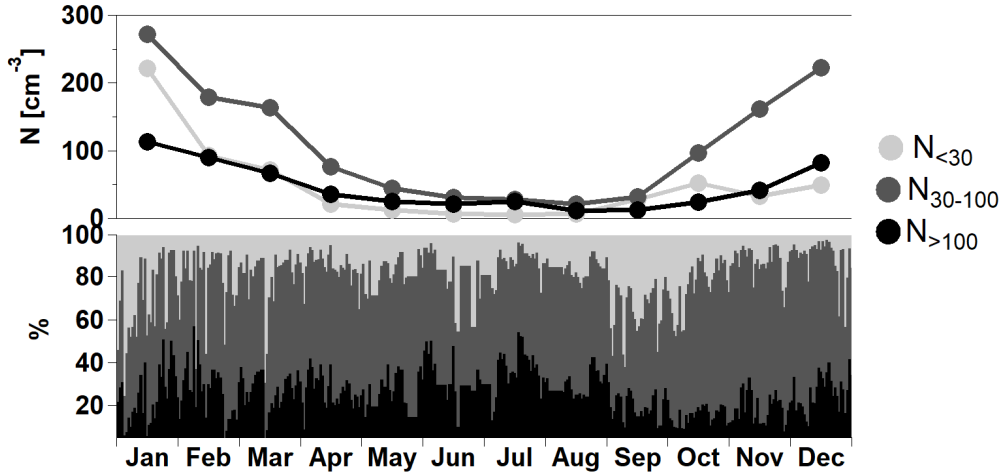
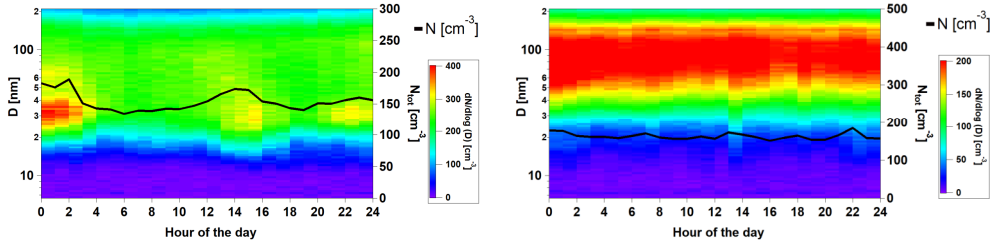
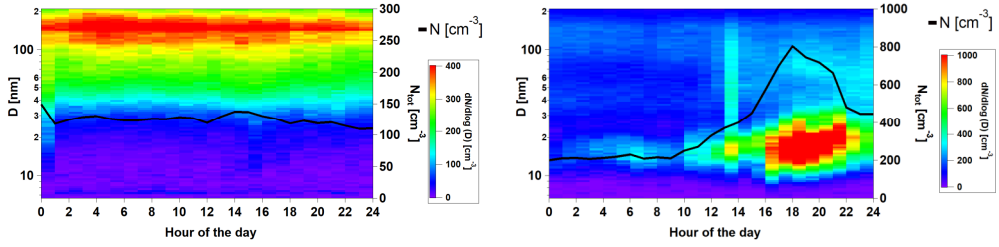


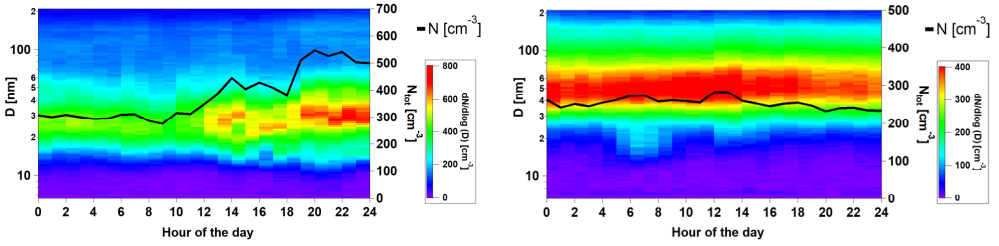
Figure SI 2 Temporal variation of different aerosol modes at Halley during the year 2015 for $N_{<30}$, N_{30-100} and $N_{>100}$ particle number concentrations (cm^{-3}).



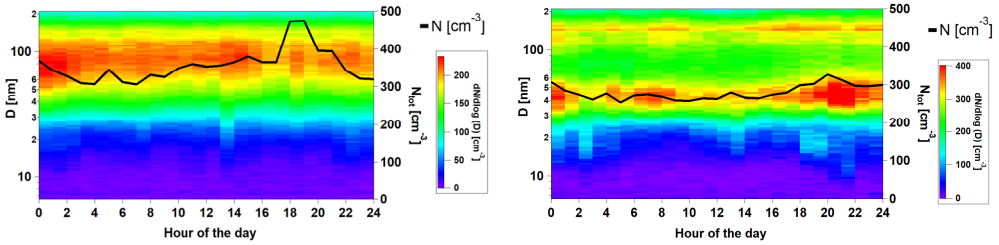
(a) Pristine_30 (b) Pristine_75



(c) Pristine_160 (d) Nucleation

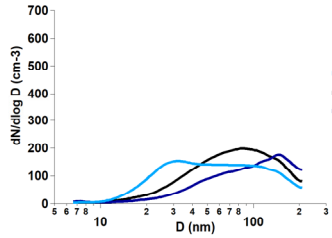


(e) Bursting (f) Nascent

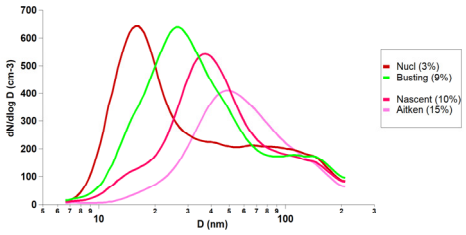


(g) Aiken (h) Bimodal

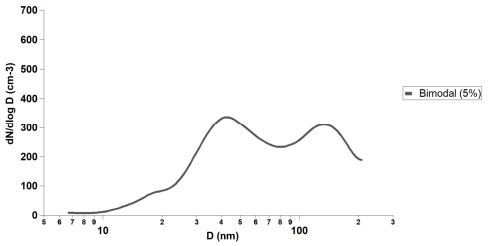
Figure SI 3 Diurnal profiles of aerosol size categories for the 8 K-means categories.



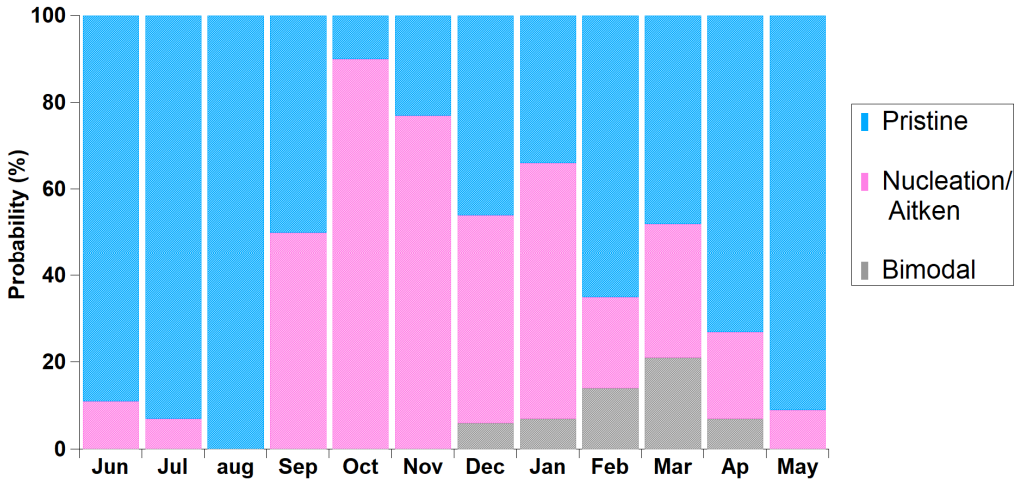
(a)



(b)



(c)



(d)

Figure SI 4 Average daily aerosol distributions grouped for different broad categories: (a) pristine, (b) nucleation-Aitken, (c) bimodal and (d) annual temporal trend expressed as monthly means.

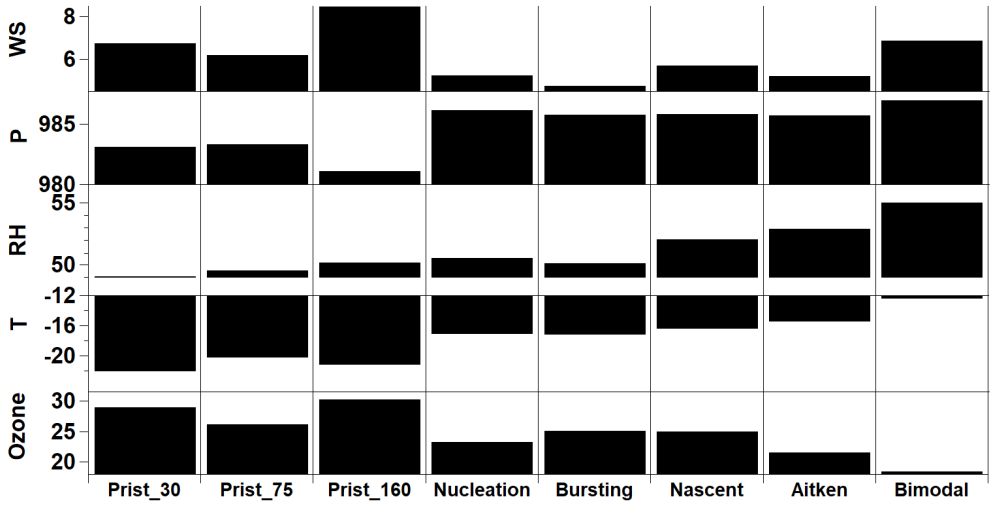
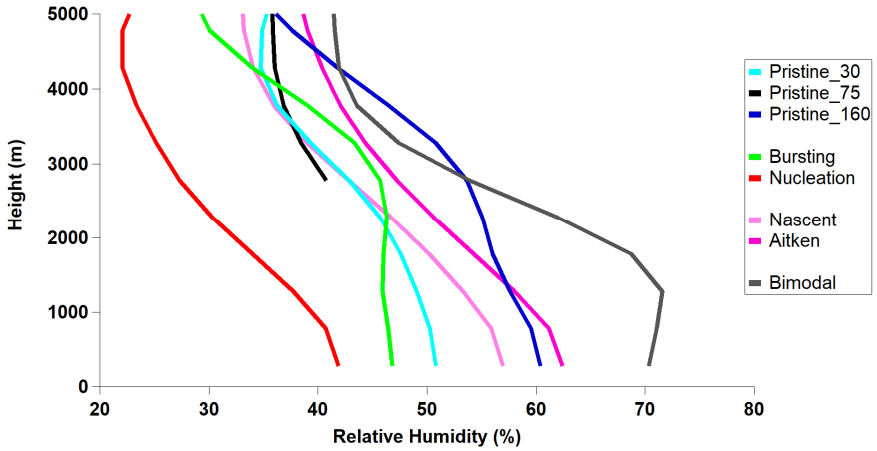
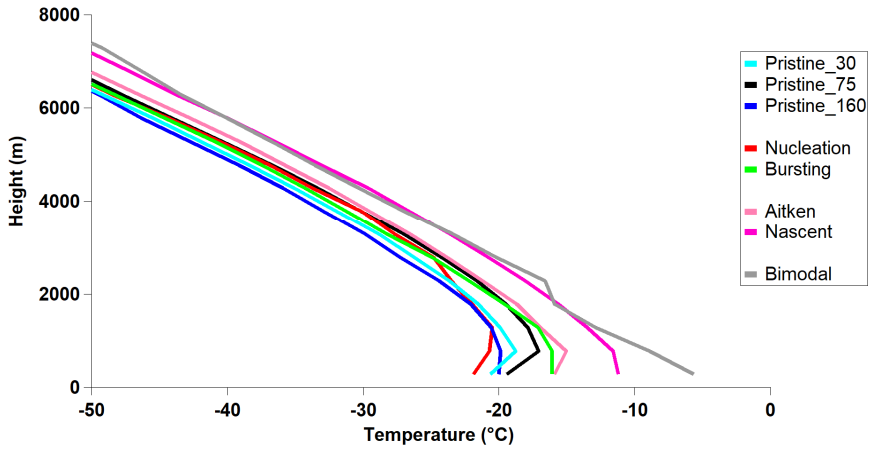


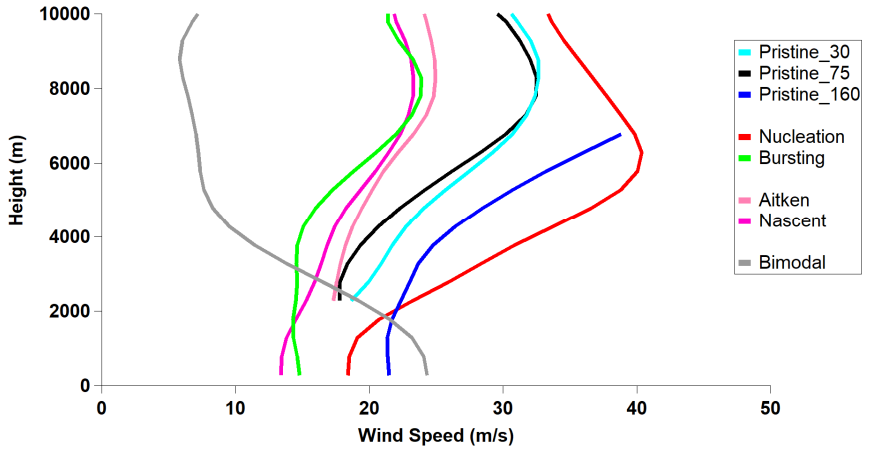
Figure SI 5 Average values of selected parameters (ozone, Temperature T, Relative Humidity RH, Pressure P, Wind Speed WS) for the 8 K-means categories.



(a)



(b)



(c)

Figure SI 6 Average vertical profiles of (a) Relative Humidity, (b) Temperature and (c) Wind speed for the 8 K-means aerosol categories

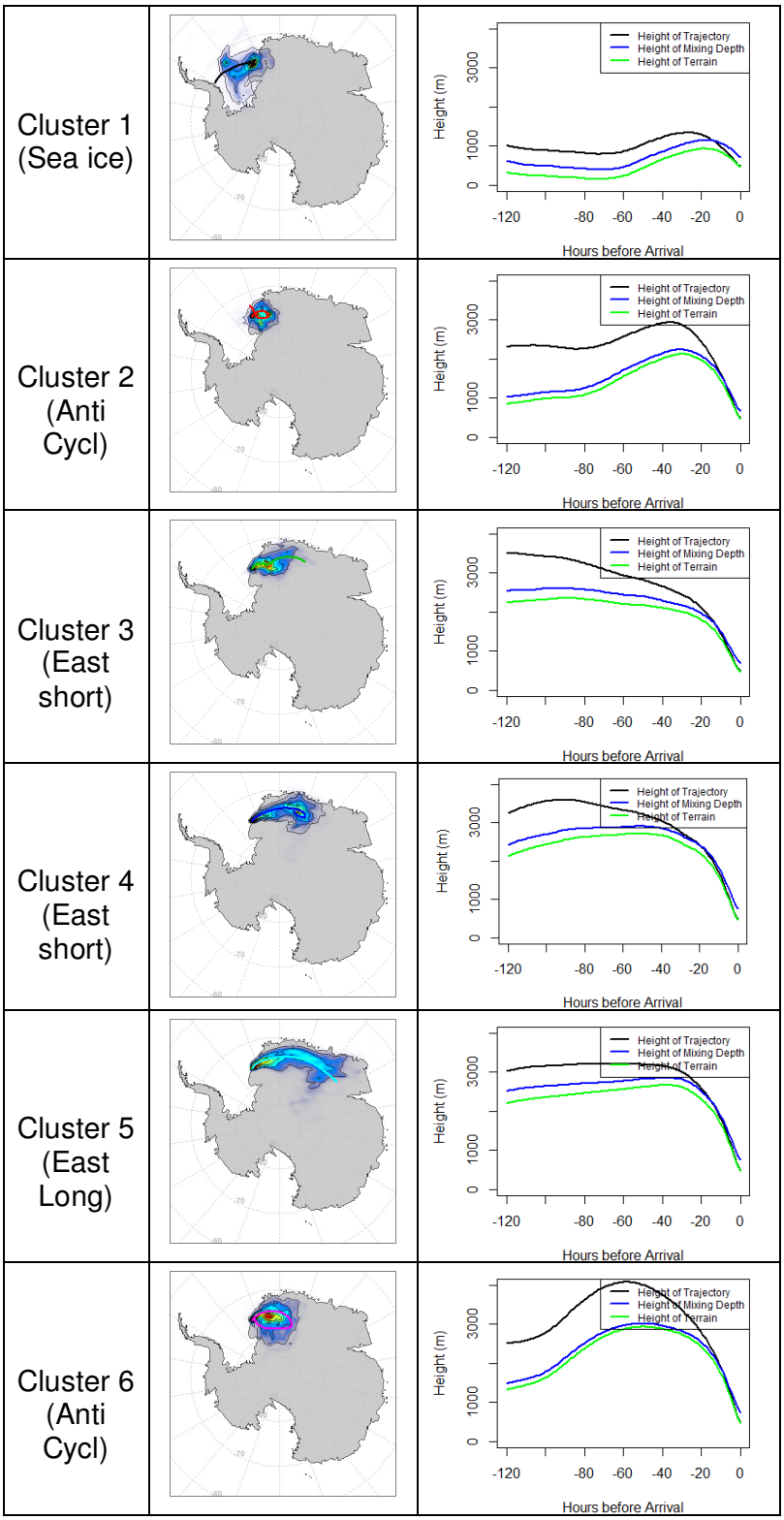


Figure SI 7 Heights of the air mass back trajectory clusters arriving at Halley station through 2015. Also shown are heights of the mixed layer depth and terrain height, all in meters above sea level.