Supplement to Aerosol composition and

sources in the Central Arctic Ocean during

ASCOS

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S1 Solutions from positive matrix factorisa-1

tion2

For this study, a four factor solution was determined to best represent the3

measured aerosol. A two factor solution separates the Ship Emissions factor4

from the ambient background aerosol, while a three factor solution includes5

the Organic factor. It is only with four factors that the Marine Biogenic6

factor is separated from the Continental factor. Additional factors either7

identify instrumental noise, or split the existing factors. Figure S1 shows8

the decrease in Q/Qexp as additional factors are included, where Qexp is9

the expected Q. We see that including a 5th

factor decreases Q/Qexp by10

identifying instrumental noise, while additional factors only serve to capture11

episodic events, often coinciding with ship emissions. Even though Q/Qexp12

decreased slightly from 3.36 for four factors down to 3.06 for 10 factors,13

including more factors did not contribute additional information about the14

measured aerosol. As such, the four factor solution was deemed to give the15

most information about the measured ambient aerosol.16

The robustness of the solution can be explored by either varying the initial17

seed, which changes the set of pseudorandom values used for the initial point18

(Paatero, 1997), or by using bootstrapping analysis, in which the rows of X19

are randomly sampled and PMF is executed on the new dataset (as described20

by Reﬀ et al., 2007). Both of these methods were used and the four factor21

solution at fPeak = -0.75 was found to be robust: 100 values for the initial22

seed parameter in the PMF2 program resulted in 90 of the cases giving the23

solution presented here, while 100 iterations of the bootstrapping analysis24

S1

2500

2000

1500

1000

500

0

11/08/2008 21/08/2008 31/08/2008

Date (UTC)

15

10

5

0

4

2

0

8

4

0

-4

-2

0

2

4

∆Q/Qexp

-10

-5

0

5

10

-4

-2

0

2

4

8

4

0

-4

-10

-5

0

5

10

250245240235230225220

DOY

1 to 2

2 to 3

3 to 4

4 to 5

5 to 6

6 to 7

7 to 8

8 to 9

9 to 10

Figure S1: The decrease in Q/Qexp as additional factors are included in the

PMF solution.

resulted in deviations of < 0.01 (fraction of signal) in the mass spectra and1

< 0.015 µg m−3

in the time series.2

Although the solution at fPeak = -0.75 is robust, a range of fPeak =3

-1.5 to 0 provide physically reasonable solutions. The degree to which the4

composition and F44 are dependent on the solution can be seen in Figs. S25

and S3.6

Analyses were also performed on a data matrix calculated by adding7

together the mass spectra of the species of interest (i.e. nitrate, sulphate,8

organic and MSA) in nitrate equivalent mass with a corresponding error9

matrix calculated from the individual errors added in quadrature. However,10

results from the initial runs were similar enough to those calculated from the11

method described in the main text that only the latter method was pursued.12

S2