

1 *Supporting Information for:*

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3 **Characterization of aerosol growth events over Ellesmere Island during the**
4 **summers of 2015 and 2016**

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Table S1. List of all growth events observed near Eureka during the summers of 2015 and 2016 .

Event Number	Date and Time (UTC)				Average temp. change from 10 to 600 m (°C)
	Start		End		
GE 1	2015-07-27	18:00	2015-07-28	03:00	2.00
GE 3	2015-07-29	05:00	2015-07-30	11:00	1.10
GE 6	2015-08-02	04:00	2015-08-03	05:00	0.20
GE 9	2015-08-07	03:00	2015-08-08	05:00	0.00
GE 10	2015-08-07	21:00	2015-08-09	02:00	1.23
GE 15	2015-08-18	12:00	2015-08-19	04:00	1.28
GE 27	2016-06-15	00:00	2016-06-17	18:00	1.20
GE 28	2016-06-17	00:00	2016-06-18	13:00	2.25
GE 30	2016-06-25	20:00	2016-06-27	14:00	1.30
GE 32	2016-07-05	01:00	2016-07-08	09:00	2.91
GE 33	2016-07-08	07:00	2016-07-09	01:00	0.00
GE 34	2016-07-09	20:00	2016-07-13	18:00	4.89
GE 37	2016-07-20	18:00	2016-07-22	03:00	1.80
GE 38	2016-07-21	19:00	2016-07-25	17:00	5.77
GE 39	2016-07-27	02:00	2016-07-27	17:00	0.47
GE 43	2016-08-03	18:00	2016-08-04	14:00	0.07
GE 45	2016-08-05	03:00	2016-08-05	23:00	0.00
GE 46	2016-08-05	21:00	2016-08-06	17:00	0.00
GE 47	2016-08-13	19:00	2016-08-17	12:00	0.46
GE 48	2016-08-17	23:00	2016-08-19	20:00	0.00
GE 49	2016-08-20	23:00	2016-08-22	15:00	0.00
GE 51	2016-08-23	19:00	2016-08-25	15:00	0.18
GE 53	2016-08-26	19:00	2016-08-27	20:00	2.27
GE 54	2016-09-04	01:00	2016-09-05	09:00	1.45
GE 55	2016-09-05	09:00	2016-09-06	01:00	4.30
GE 56	2016-09-05	15:00	2016-09-08	01:00	0.56
GE 58	2016-09-10	12:00	2016-09-12	16:00	1.28
GE 59	2016-09-19	00:00	2016-09-20	06:00	0.15

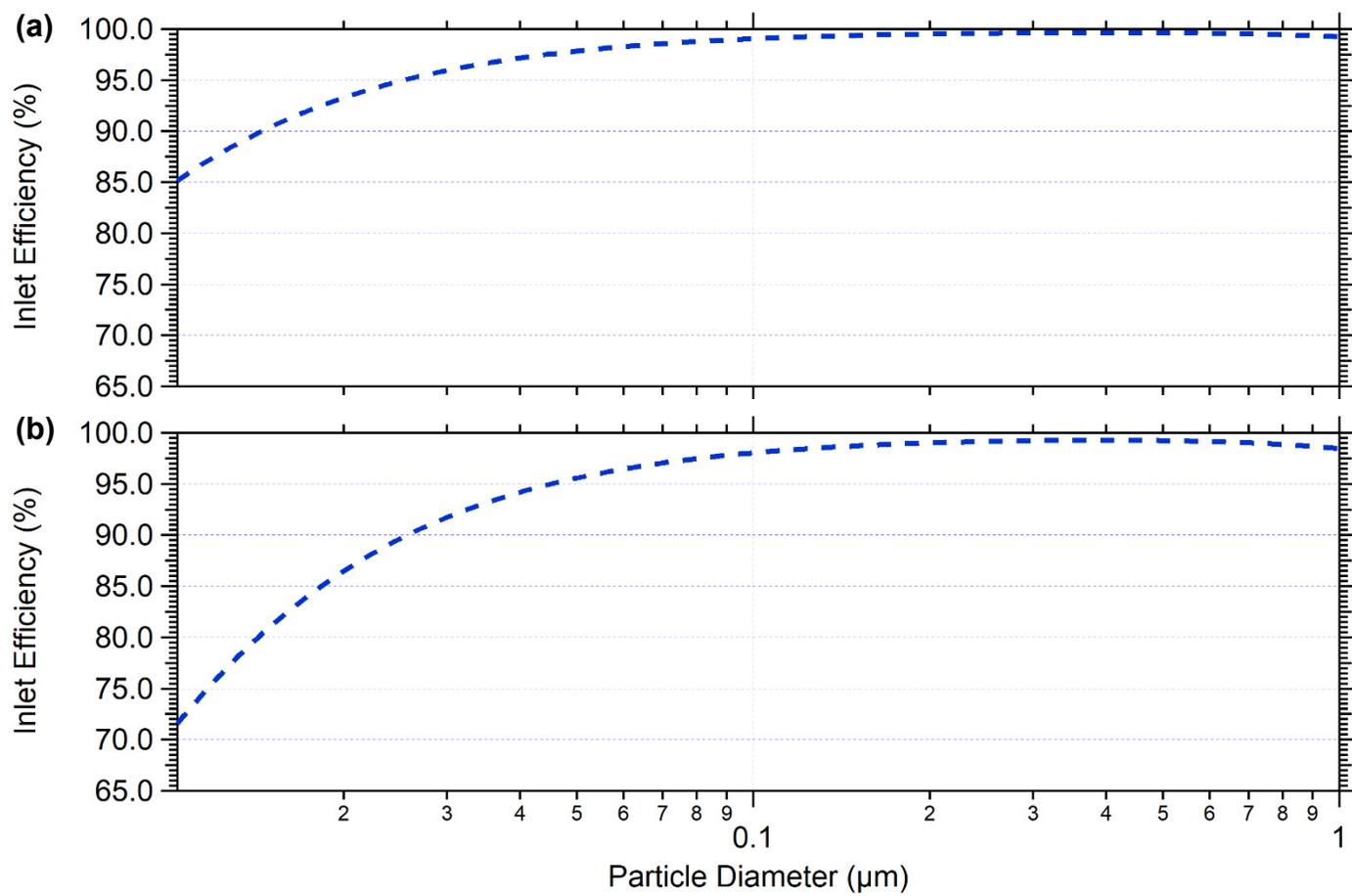


Figure S1. Inlet particle transmission efficiency for the AMS (a) and SMPS (b) at the PEARL RigdeLab.

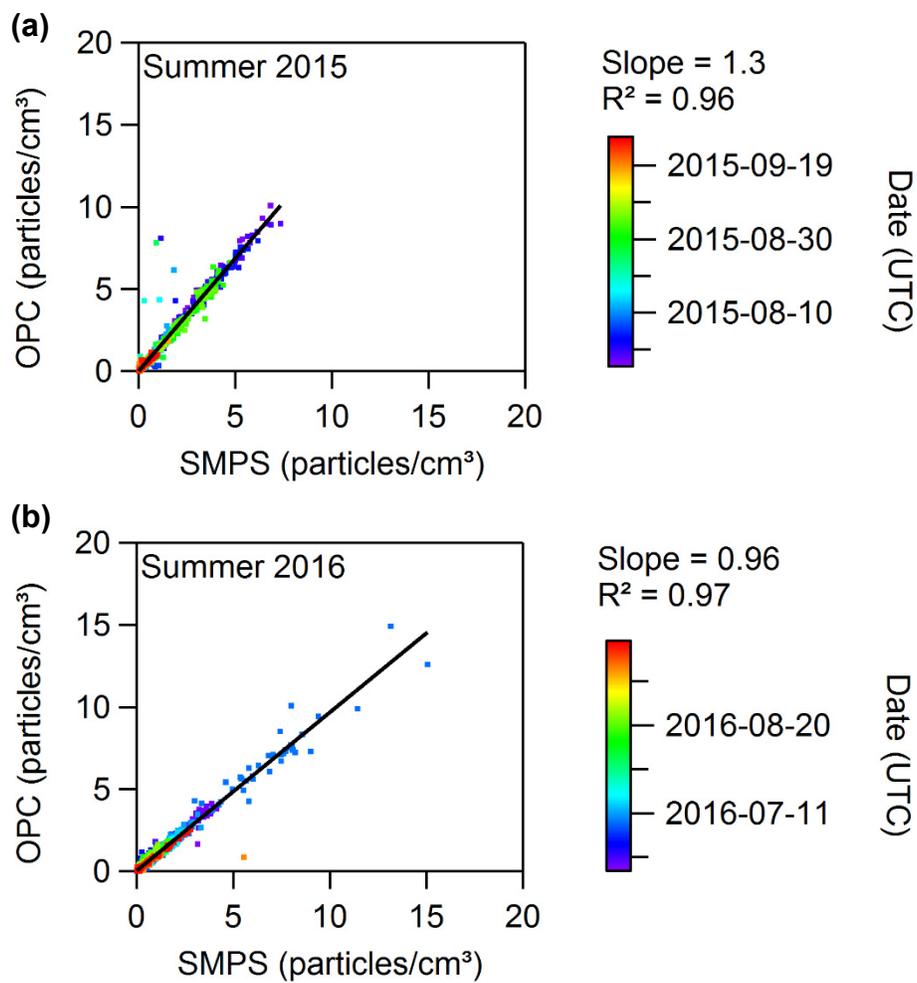


Figure S2. Scatter plots of the particle number concentrations measured by the SMPS (300 – 487 nm) and the OPC (300 – 500 nm) near Eureka for the summers of 2015 **(a)** and 2016 **(b)**.

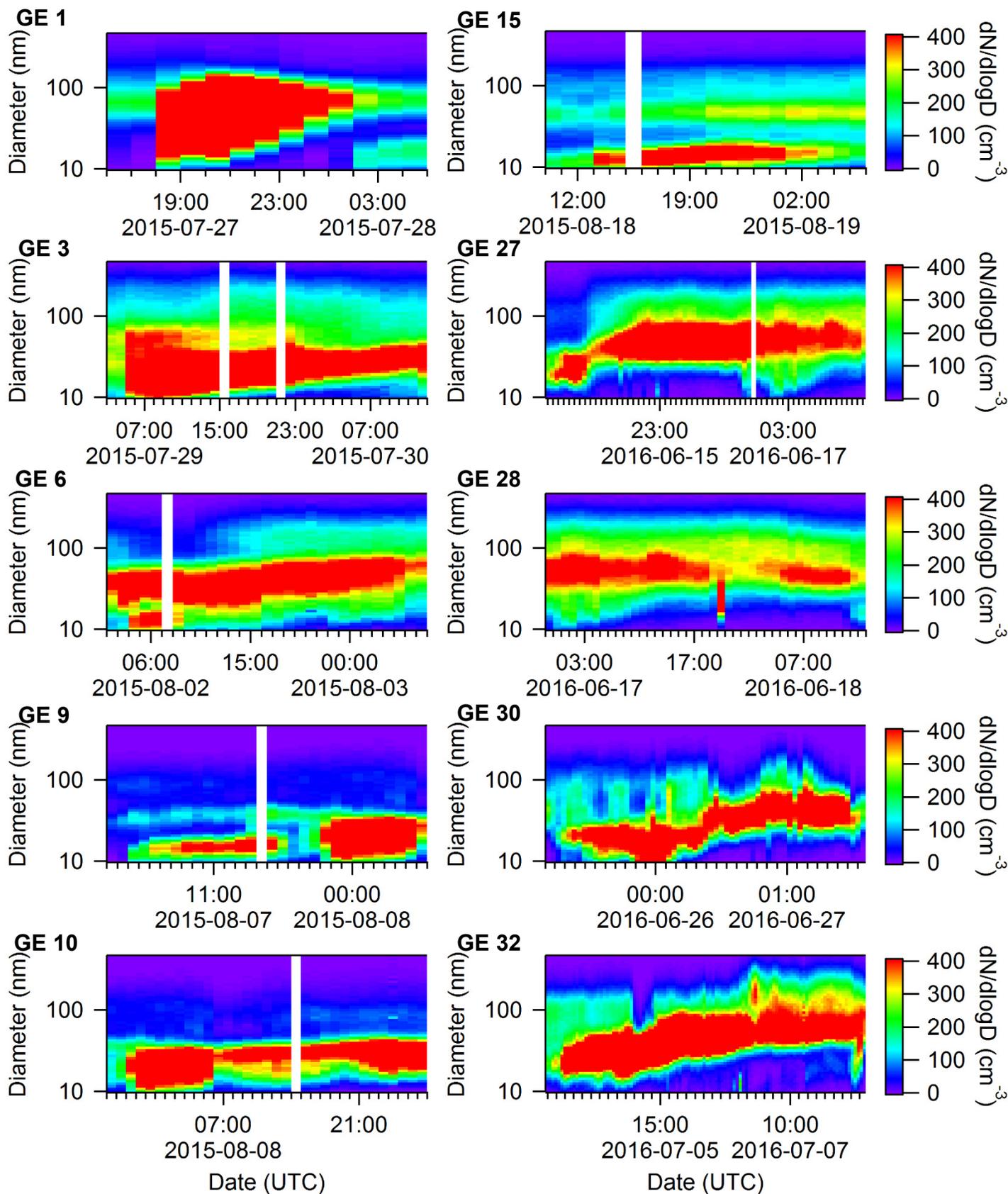


Figure S3. SMPS measurements of each growth event observed near Eureka during the summers of 2015 and 2016 as summarized in Table S1 and GE 3 at Alert.

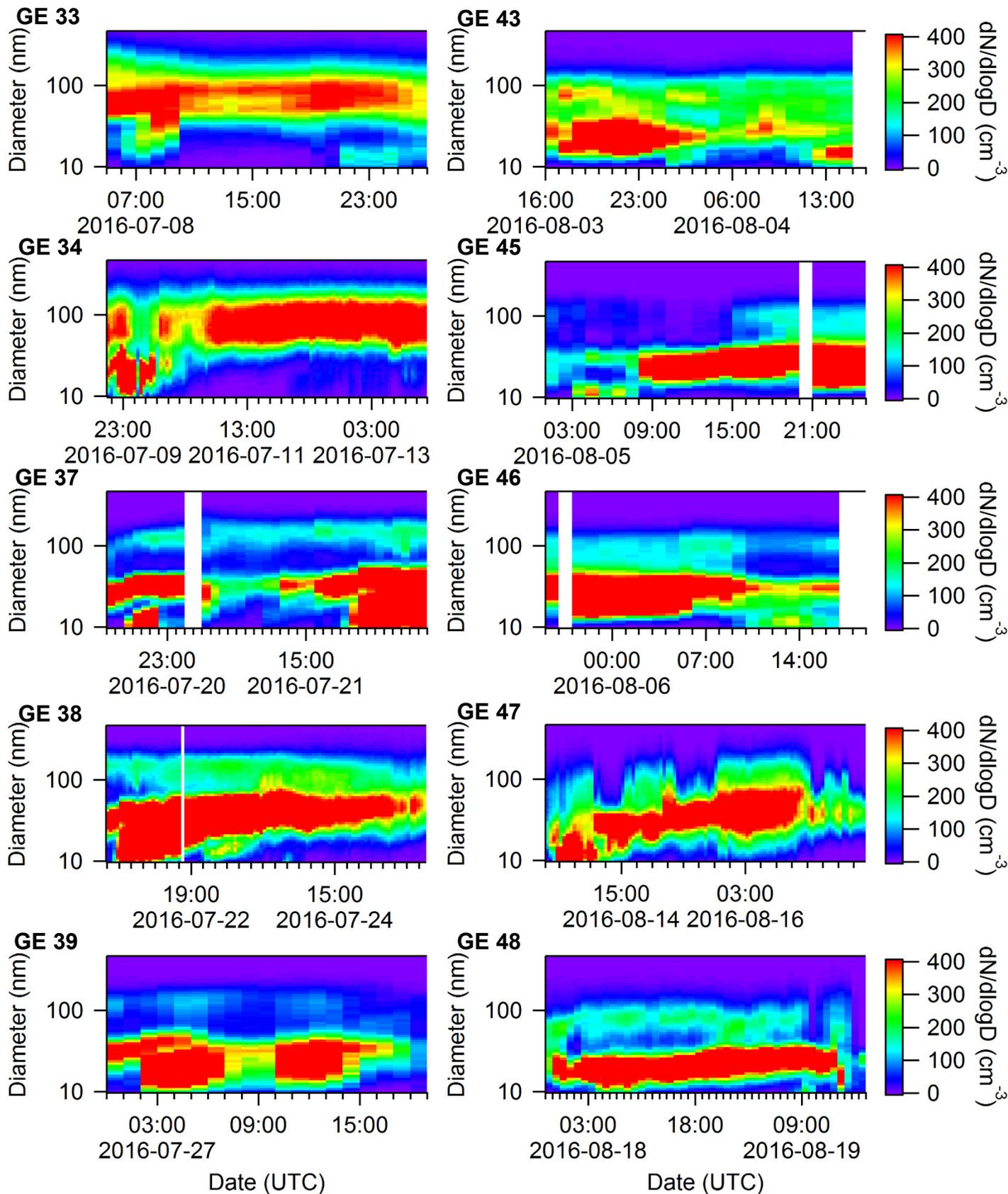


Figure S3. SMPS measurements of each growth event observed near Eureka during the summers of 2015 and 2016 as summarized in Table S1 and GE 3 at Alert (continued).

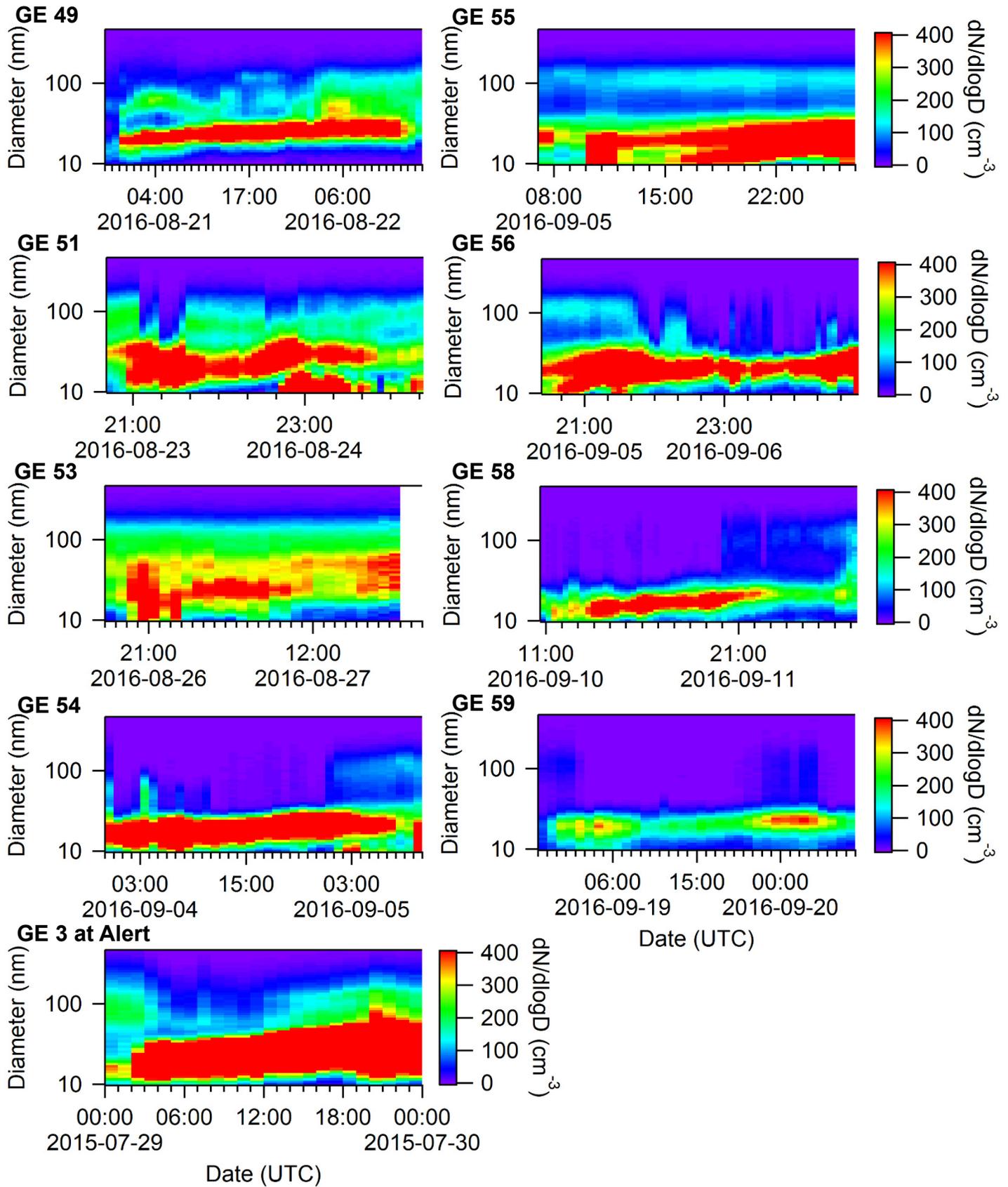
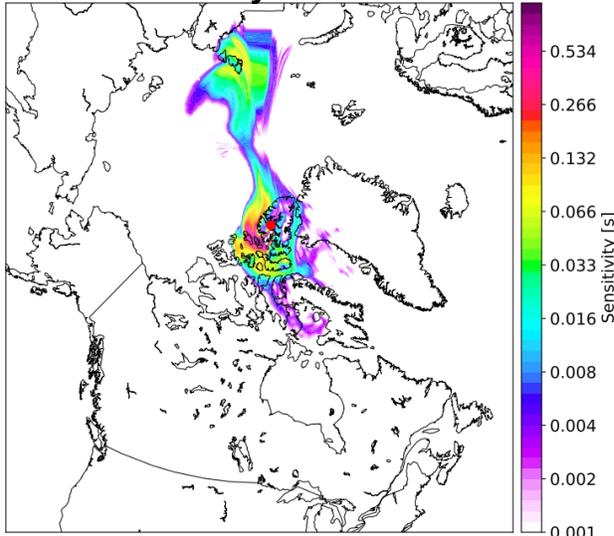
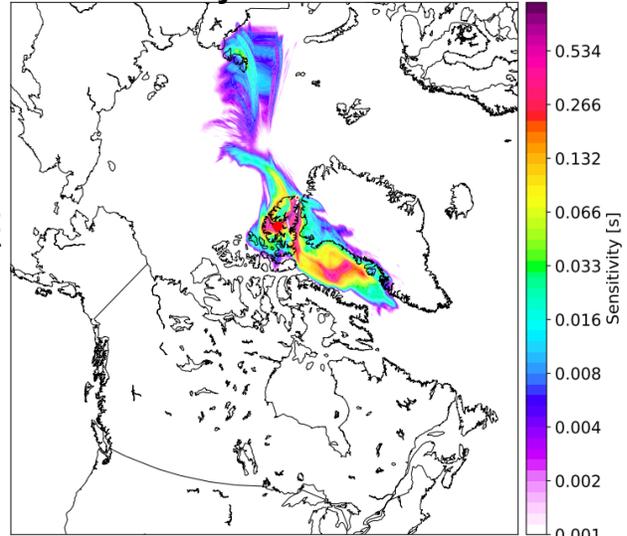


Figure S3. SMPS measurements of each growth event observed near Eureka during the summers of 2015 and 2016 as summarized in Table S1 and GE 3 at Alert (continued).

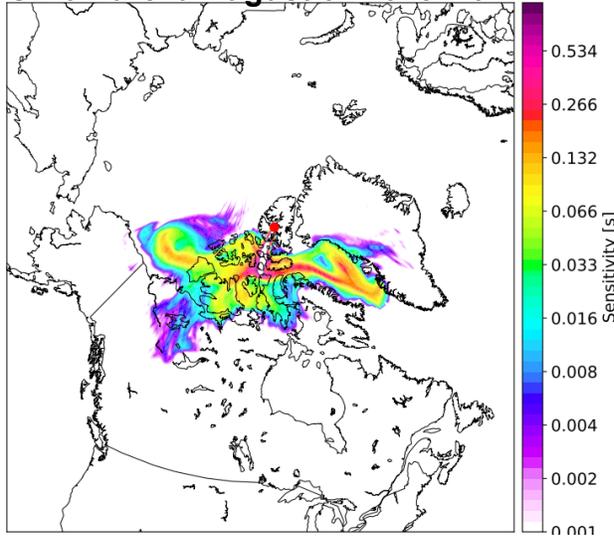
GE 3 Eureka July 29 2015 – 05h



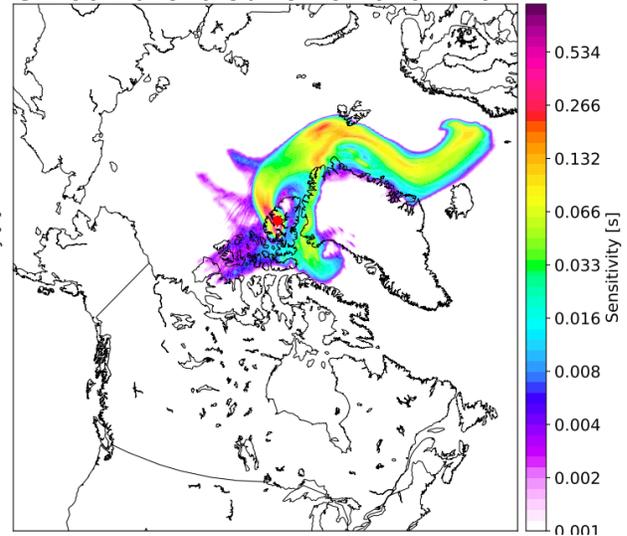
GE 3 Alert July 29 2015 – 03h



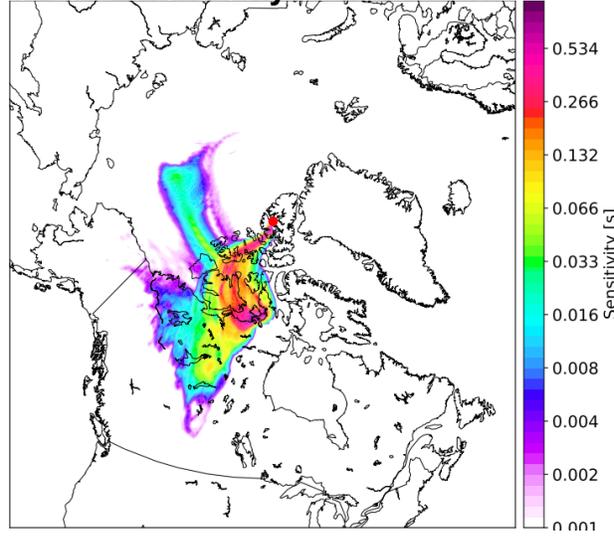
GE 6 Eureka August 02 2015 – 04h



GE 30 Eureka June 25 2016 – 20h



GE 32 Eureka July 05 2016 – 01h



GE 38 Eureka July 21 2016 – 19h

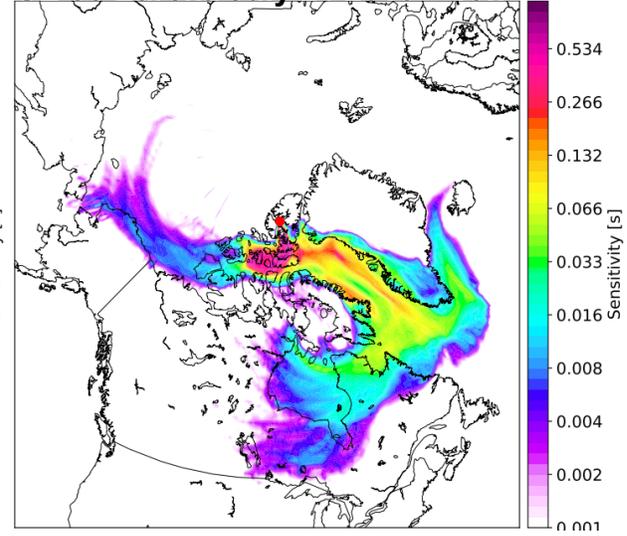


Figure S4. Evaluation of the air mass history during the six selected growth events summarized in Table 1 and shown in Figure 5 of the main text. The back-trajectory and potential emissions sensitivity are calculated using FLEXPART.

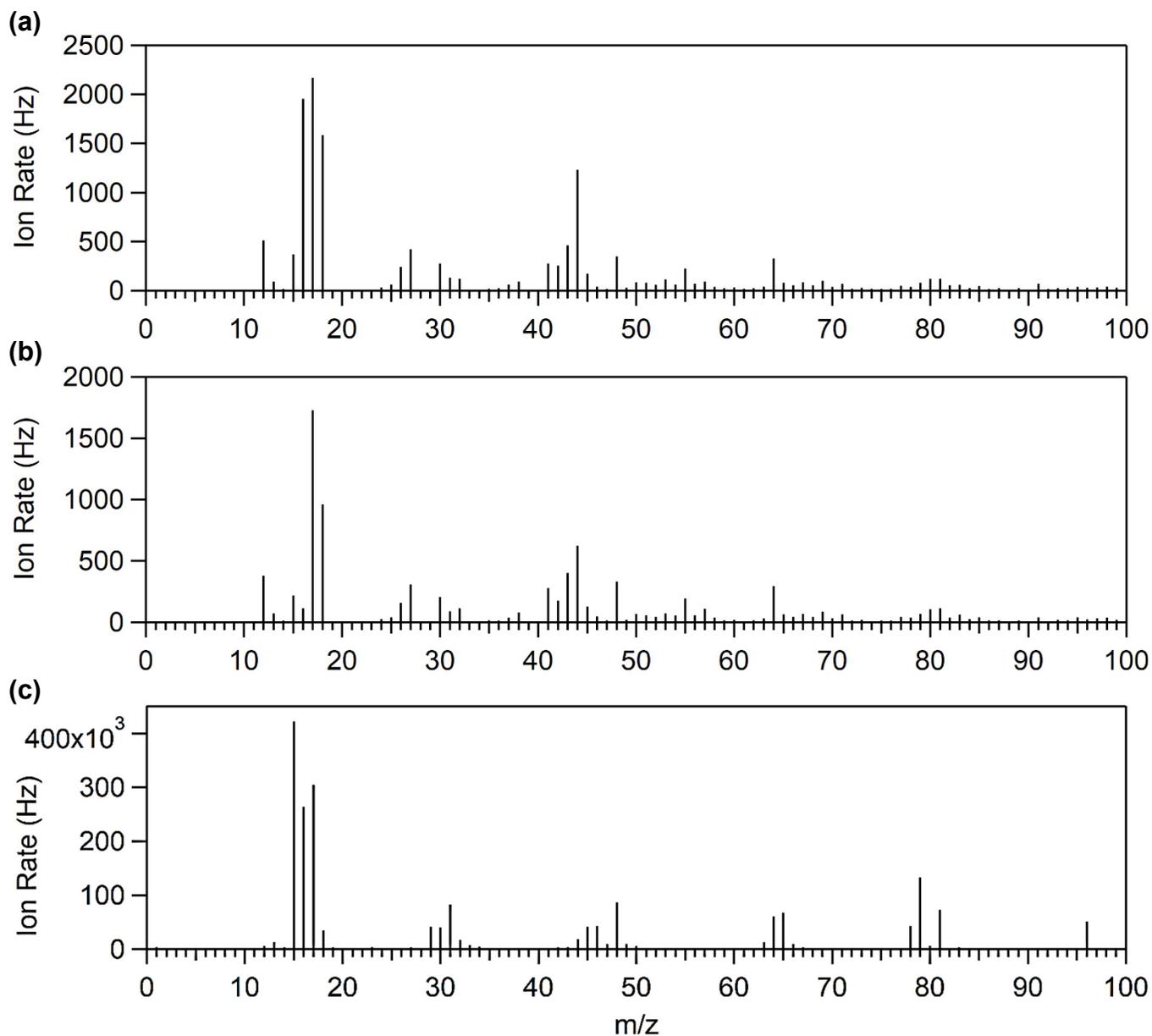


Figure S5. AMS average ambient aerosol mass spectrum of GE 3 (a) and GE 6 (b) compared with the mass spectrum of MSA (c).

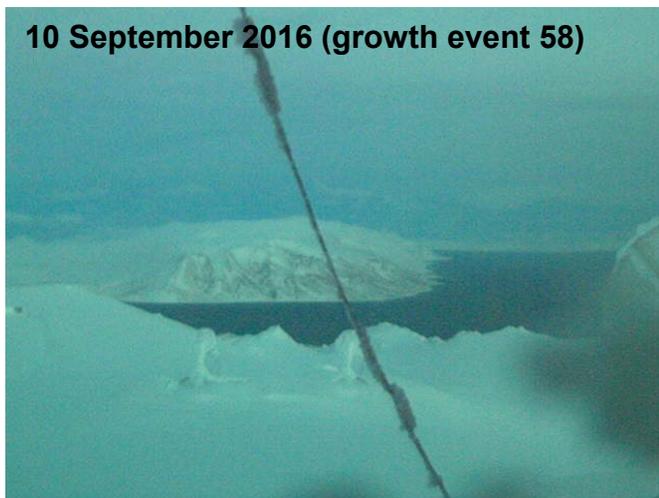
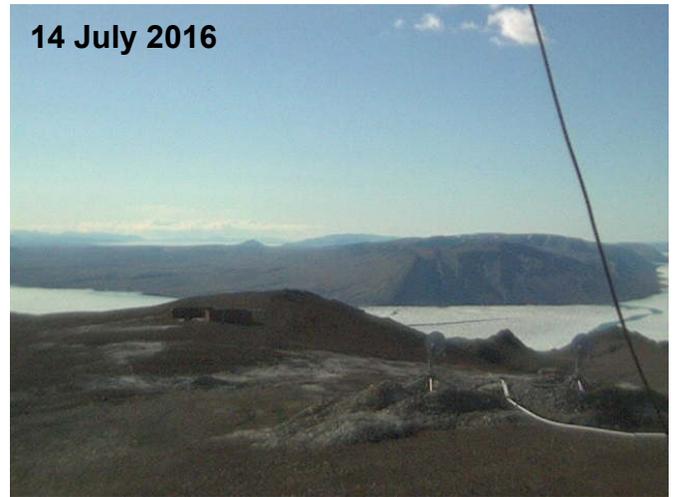
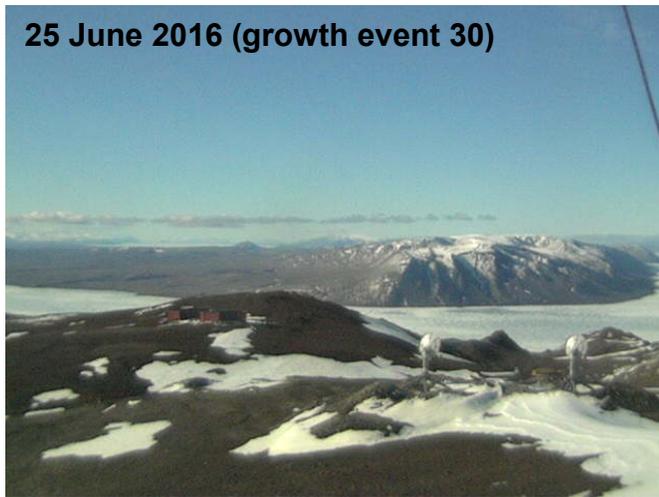


Figure S6. Photos from the PEARL RidgeLab, at 610 m above sea level. The images correspond to: the first observed growth event for 2016 (**25 June**), the first time open water is observed (**14 July**), the last observed growth event for 2016 (**10 September**), and the last image available for the year (**28 September**) due to poor visibility related to meteorological conditions as well as polar sunset.

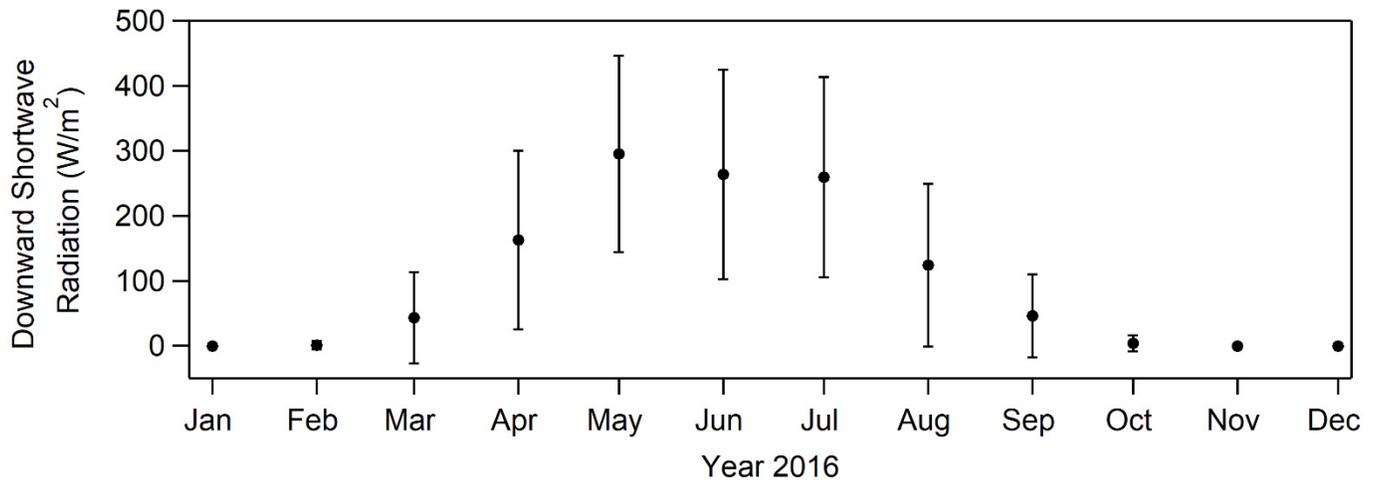


Figure S7. Average by month of the downwelling shortwave radiation for the year 2016 at Eureka, as measured at the SAFIRE facility at 85 m above sea level. The standard deviation of the one-minute average fluxes for each month is indicated along with the average.