Supplement Material for the manuscript:

Causes and Evolution of Winter Polynyas over North of Greenland

5 Younjoo J. Lee¹, Wieslaw Maslowski¹, John J. Cassano^{2,3}, Jaclyn Clement Kinney¹, Anthony P. Craig⁴, Samy Kamal⁵, Robert Osinski⁶, Mark W. Seefeldt^{2,3}, Julienne Stroeve^{2,7}, Hailong Wang⁸

¹Naval Postgraduate School, Monterey, California, USA ²National Snow and Ice Data Center, Boulder, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado, USA

- ³Department of Atmospheric and Oceanic Sciences, University of Colorado, Boulder, Colorado, USA
 ⁴Independent Researcher
 ⁵RedLine Performance Solutions, College Park, Maryland, USA
 ⁶Institute of Oceanology of the Polish Academy of Sciences, Sopot, Poland
 ⁷University of Manitoba, Winnipeg, Manitoba, Canada
- 15 ⁸Pacific Northwest National Laboratory, Richland, Washington, USA

Correspondence to: Younjoo J. Lee (ylee1@nps.edu)

Table S1. The 3-hourly weather data (mean air temperature, mean wind direction, and mean wind

20 speed) at Station 04312 (Station Nord) in February 2009. If any data are missing, they are not shown or indicated as (-).

Date	Time (local)	Air temperature (°C)	Mean wind direction (wind blowing from)	Mean wind speed (m/s)
6-Feb	0	-16.6	-	-
	3	-12.2	-	-
	6	-12.3	-	-
	9	-12.7	-	-
	12	-12.6	-	-
	15	-12.9	-	-
	18	-11.7	south-southwest	15
	21	-12.7	south-west	11
7-Feb	0	-13.0	south-southwest	16
	3	-13.1	south-west	14
	6	-13.0	south-west	15
	9	-12.6	south-west	16
	12	-13.7	south-southwest	19
	15	-18.0	west	4
	18	-17.2	west-northwest	2
	21	-13.6	south-west	11
8-Feb	0	-18.5	south-west	8
	3	-14.6	south-west	11
	6	-16.0	south-west	15
	9	-21.9	west	7
	12	-27.7	west-northwest	4
	15	-23.8	west	3
	18	-25.8	east-northeast	2
	21	-32.0	north-northwest	3
9-Feb	0	-32.4	south-west	5
	3	-33.5	south-west	4
	6	-31.0	south-west	3
	9	-29.8	south-west	3
10-Feb	3	-25.3	north-east	1
	6	-25.2	east	1
	9	-24.3	south-southwest	1
	12	-24.4	north-east	1
	15	-24.2	north	1
	18	-25.5	north-east	2
	21	-26.2	north	1
11-Feb	0	-28.5	south-west	2
	3	-29.6	south-west	4
12-Feb	6	-25.3	west-southwest	1
	9	-25.1	east-northeast	2
	12	-25.1	east	1
	15	-25.3	north-east	1
	18	-28.6	-	-
27-Feb	12	-29.5	south-west	2







Figure S1. Monthly mean sea ice thickness (SIT; m) of the RASM hindcast in (a) November 1985, (b) November 2015, and (c) its difference between (a) and (b) over the polynya region (black line), and of PIOMAS in (d) November 1985, (e) November 2015, and (f) its difference between (d) and (e).



35 Figure S2. 6-hourly near-surface (at 10 m) wind fields (m/s) from ERA-Interim atmospheric reanalysis at 00:00 on (a) 9 February 2018, (b) 18 February 2018, and (c) 24 February 2018



40 Figure S3. (a)-(p) Satellite-derived (NASA team algorithm) daily mean sea ice concentration (SIC, μ; black) for the northern Greenland region (see Fig. 5a) during January-March from 1979 to 1994. The grey shading depicts one standard deviation (σ; gray) from the mean.



Figure S4. (a)-(p) Same as Fig. S3, but from 1995 to 2010.