## **Supplementary Information**

Caixin Wang<sup>1, 2</sup>, Robert M. Graham<sup>2</sup>, Keguang Wang<sup>1</sup>, Sebastian Gerland<sup>2</sup>, Mats A. Granskog<sup>2</sup>

<sup>1</sup>Norwegian Meteorological Institute, 9293 Tromsø, Norway

<sup>2</sup>Norwegian Polar Institute, Fram Centre, P.O.Box 6606 Langnes, 9296 Tromsø, Norway

Correspondence to: Caixin Wang (caixin.wang@npolar.no)

The supplementary Information includes 7 figures. Figure captions are:

Figure S1. Variation of 2 m air temperature (T2M) in ERA5, ERA-I and the buoys and the difference of T2M between ERA5 and ERA-I for buoys (a) 2010A, (b) 2012C, (c) 2013B, (d) 2014E, and (e) 2015D.

Figure S2. Same as Figure S1, but for buoys (a) 2012I, (b) 2012J, (c) s16, (d) s20, and (e) s29. Note there is no buoy data in Figure (b) for buoy 2012J.

Figure S3. Variation of T2M differences between ERA5/ERA-I and buoys for buoys (a) 2010A, (b) 2012C, (c) 2012I, (d) 2013B, (e) 2014E, (f) 2015D, (g) s16, (h) s20, and (i) s29.

Figure S4. Cumulative total precipitation (prec.) and snowfall (snow) for ERA5 and ERA-I and snow depth for buoys (a) 2010A, (b) 2012C, (c) 2013B, (d) 2014E, and (e) 2015D. Accumulation starts from 15 August. Note that Buoy\_2012C does not have snow depth.

Figure S5. Same as Figure S4, but for buoys (a) 2012I, (b) 2012J, (c) s16, (d) s20, and (e) s29, and accumulation starts on 1 October.

Figure S6. Cumulative FDD and estimated ice growth using cumulative FDD model along the trajectories of (a) buoy 2011M, (b) buoy 2012H, (c) buoy 2012L, and (d) buoy 2012J for freeze-up from 1 October.

Figure S7. Forcing data of wind speed (V), relatively humidity (Rh), total cloud (CN) and ocean heat flux (fw) used in the model.



Figure S1. Variation of 2 m air temperature (T2M) in ERA5, ERA-I and the buoys and the difference of T2M between ERA5 and ERA-I for buoys (a) 2010A, (b) 2012C, (c) 2013B, (d) 2014E, and (e) 2015D.



Figure S2. Same as Figure S1, but for buoys (a) 2012I, (b) 2012J, (c) s16, (d) s20, and (e) s29. Note there is no buoy data in Figure (b) for buoy 2012J.



Figure S3. Variation of T2M differences between ERA5/ERA-I and buoys for buoys (a) 2010A, (b) 2012C, (c) 2012I, (d) 2013B, (e) 2014E, (f) 2015D, (g) s16, (h) s20, and (i) s29.



Figure S4. Cumulative total precipitation (prec.) and snowfall (snow) for ERA5 and ERA-I and snow depth for buoys (a) 2010A, (b) 2012C, (c) 2013B, (d) 2014E, and (e) 2015D. Accumulation starts from 15 August. Note that Buoy\_2012C does not have snow depth.



Figure S5. Same as Figure S4, but for buoys (a) 2012I, (b) 2012J, (c) s16, (d) s20, and (e) s29, and accumulation starts on 1 October.



Figure S6. Cumulative FDD and estimated ice growth using cumulative FDD model along the trajectories of (a) buoy 2011M, (b) buoy 2012H, (c) buoy 2012L, and (d) buoy 2012J for freeze-up from 1 October.



Figure S7. Forcing data of wind speed (V), relatively humidity (Rh), total cloud (CN) and ocean heat flux (fw) used in the model.