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Supplementary Materials for

Freshening by glacial meltwater enhances melting of ice shelves and reduces formation of Antarctic Bottom Water

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This PDF file includes:

SUPPLEMENTARY MATERIALS

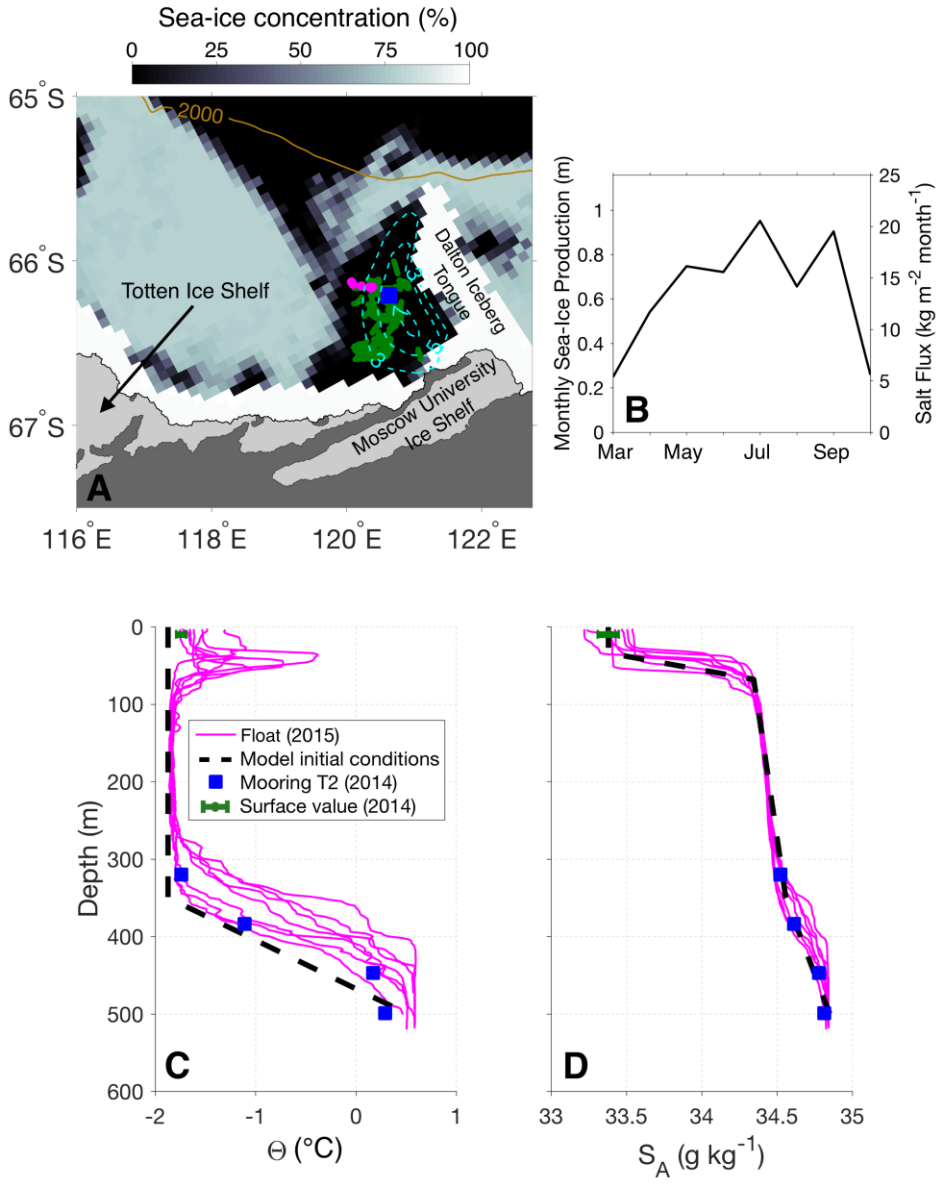

fig. S1. Dalton Polynya. (**A**) Map of sea-ice concentration on the Sabrina Coast on 25 February 2014 (*82*). The cyan dashed lines are contours of the 2014 annual sea-ice production (m) (*24*). The Dalton Polynya is characterized by low sea-ice concentration in summer and high sea-ice production in winter. (**B**) Monthly sea-ice production and associated salt flux in 2014 averaged over the area of the Dalton Polynya. (**C**) Magenta lines are vertical profiles of conservative temperature Θ measured between February and early March 2015 by the profiling float. Blue squares are from an average of data collected during the first two weeks of the deployment of mooring T2 (early March 2014). The green errorbar represents the mean (± 1 standard deviation) of the surface temperature values measured during the *Nathaniel B. Palmer* survey in late summer 2014. The location of the float profiles (magenta), mooring T2 (blue) and surface temperature measurements (green) are shown in panel (A). The black dashed line is the profile used as initial condition for the mixed-layer model. (**D**) as (C) but for absolute salinity S_A.

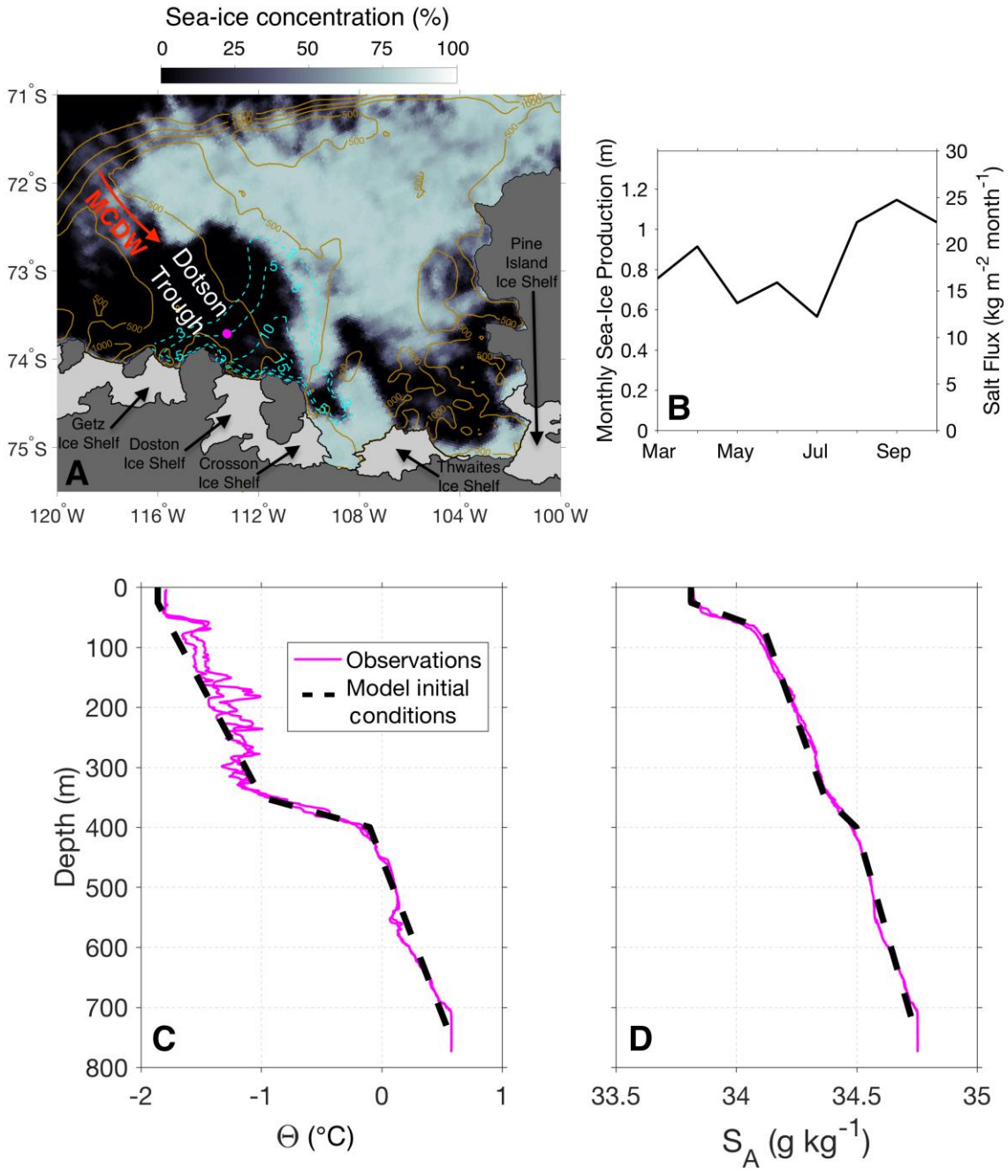

fig. S2. Amundsen Polynya. (**A**) Map of sea-ice concentration in the Amundsen Sea on 25 February 2007 (*82*). The cyan dashed lines are contours of the 2007 annual sea-ice production (m) (*24*). The Amundsen Polynya is characterized by low sea-ice concentration in summer and high sea-ice production in winter. Overlaid are the bathymetry and the coastline (*81*). (**B**) Monthly sea-ice production and associated salt flux in 2007 averaged over the area of the Amundsen Polynya. (**C**) Magenta lines are vertical profiles of conservative temperature Θ measured on 27 February 2007 in the Amundsen Polynya (see magenta dots in (A) for location). The black dashed line is the profile used as initial condition for the mixed-layer model. (**D**) as (C) but for absolute salinity S_A.

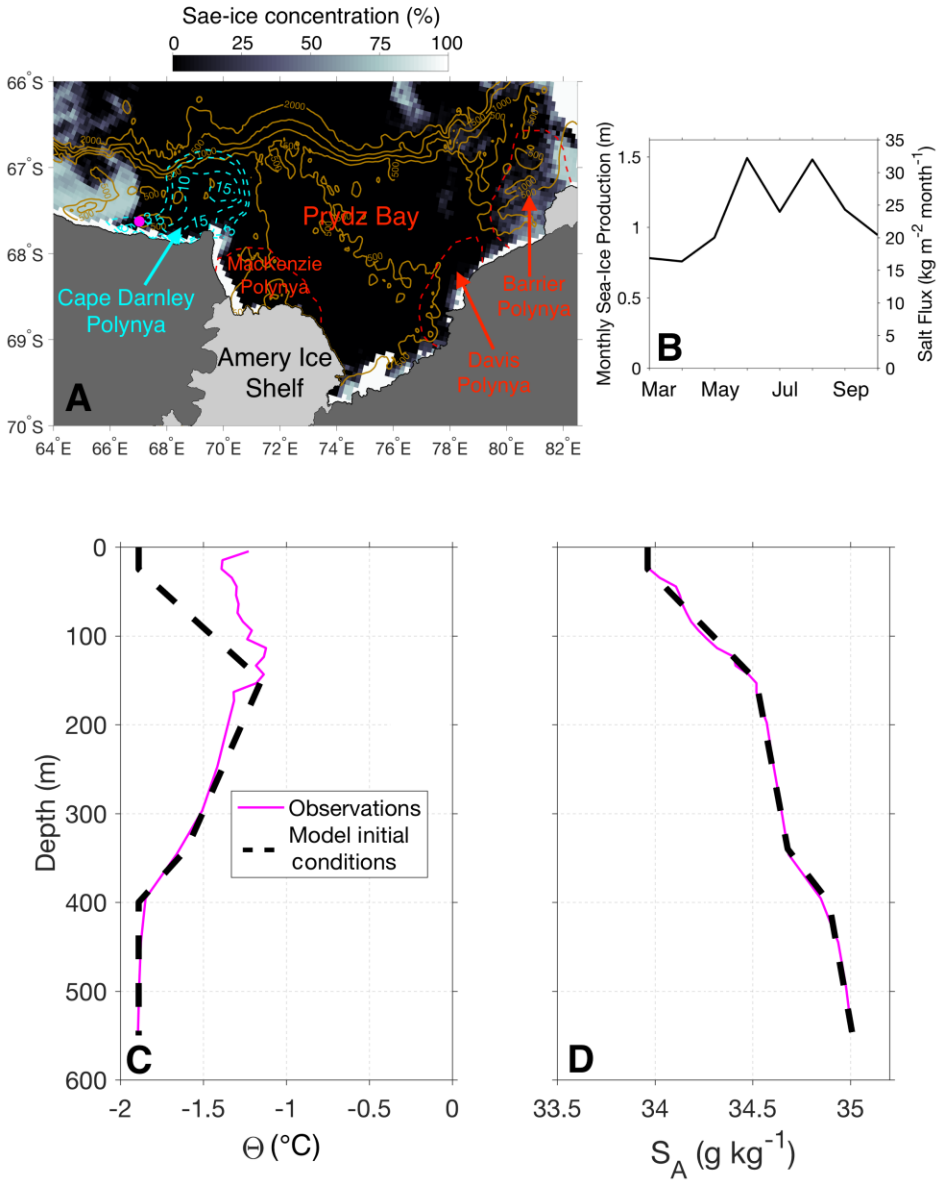

fig. S3. Cape Darnley Polynya. (**A**) Map of sea-ice concentration in the area of the Cape Darnley Polynya on 25 February 2011 (*82*). The cyan dashed lines are contours of the 2011 annual sea-ice production (m) (*24*). The Cape Darnley Polynya is characterized by low sea-ice concentration in summer and high sea-ice production in winter. In red are the boundaries (3-m contours of annual sea-ice production) of the polynyas formed in Prydz Bay. Overlaid are the bathymetry and the coastline (*81*). (**B**) Monthly sea-ice production and associated salt flux in 2011 averaged over the area of the Cape Darnley Polynya. (**C**) Magenta line is a vertical profile of conservative temperature Θ measured on 22 February 2011 in the Cape Darnley Polynya (see magenta dot in (A) for location). The black dashed line is the profile used as initial condition for the mixed-layer model. For this we assume that the surface temperature is at the surface freezing point when sea ice starts to grow in March and we linearly interpolate between the surface layer and ~150 m, the base of the seasonal pycnocline. Stratification at high latitudes is dominated by salinity and therefore the choice of the temperature profile used to fill the near surface data does not influence the model results. (**D**) as (C) but for absolute salinity S_A.

table S1. Moorings on the Sabrina Coast.

Mooring	**Latitude** (°S)	**Longitude** (°E)	**Deployment Period** (dd/mm/yy)	**Ocean Depth** (m)	**Instrument**	**Measurements**	**Recording Interval** (minutes)	**Instrument Depth** (m)
T1	66°32.558'	119°12.685'	18/02/2014 to 03/01/2015	708	SBE37 Microcat	Temperature Salinity Pressure	10	326
					SBE37 Microcat	Temperature Salinity Pressure	10	488
					SBE37ODO Microcat	Temperature Salinity Pressure	60	651
					SBE37 Microcat	Temperature Salinity	10	705
T2	66°12.628'	120°37.638'	22/02/2014 to 26/12/2014	501	SBE37 Microcat	Temperature Salinity Pressure	10	320
					SBE37 Microcat	Temperature Salinity Pressure	10	384
					SBE37 Microcat	Temperature Salinity Pressure	10	447
					SBE37 Microcat	Temperature Salinity	10	499
T3	66°30.082'	120°27.398'	05/03/2014 to 25/12/2014	550	SBE37 Microcat	Temperature Salinity Pressure	10	320
					SBE37 Microcat	Temperature Salinity Pressure	10	406
					SBE37 Microcat	Temperature Salinity	10	548