Supplementary Information to

Upper ocean warming and sea ice reduction in the East Greenland Current from 2003 to 2019.

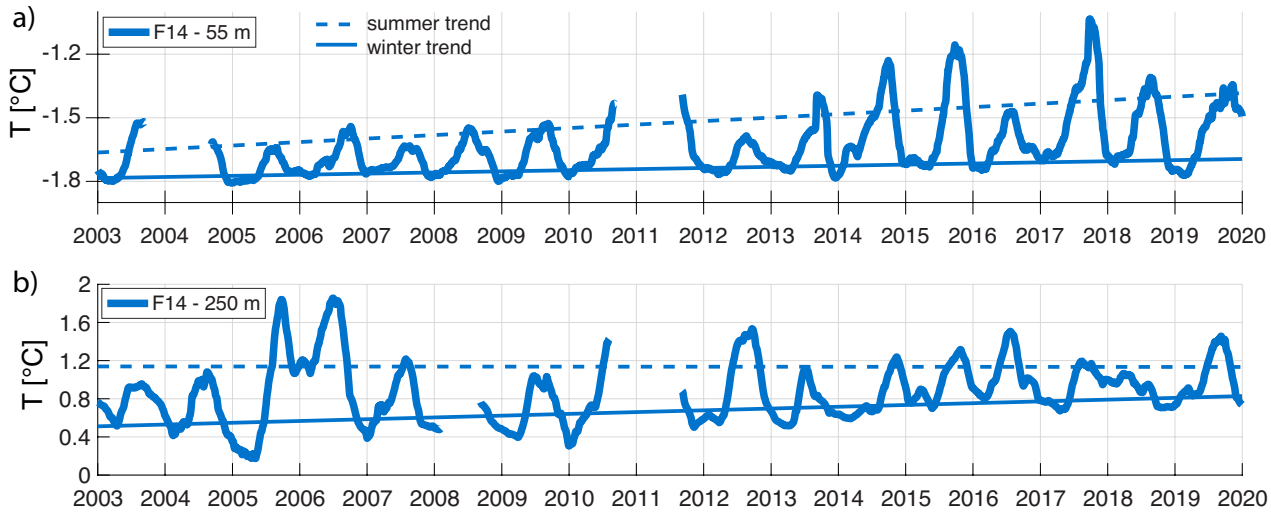
L. de Steur[1*], H. Sumata[1], D.V. Divine[1], M.A. Granskog[1], O. Pavlova[1]

1. Norwegian Polar Institute, Tromsø, Norway

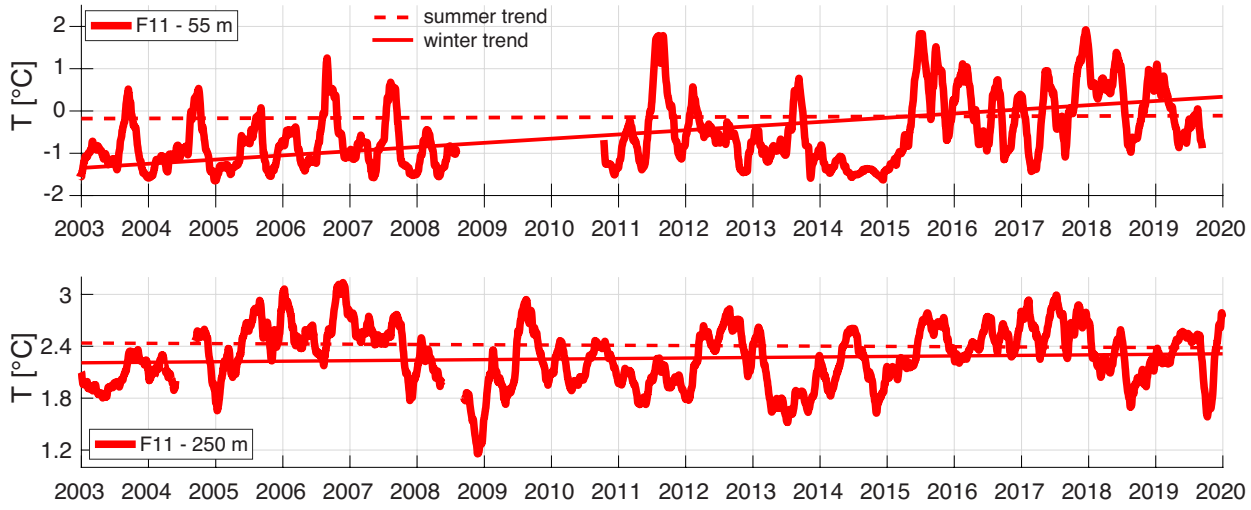
*Corresponding author: Laura.de.Steur@npolar.no

Supplementary Table S1: Linear ocean temperature trends in the East Greenland Current (EGC) on the shelf (mooring F14) and eastern EGC (mooring F11) for summer (JAS) and winter (JFM) at 55 m and at 250 m based on daily averages between January 2003 - December 2019. For the eastern EGC at 3°W (F11), numbers are given separately for Polar Water (PW, T<0°C) and Atlantic Water (AW, T>0°C) and not as one mean temperature trend at that location.

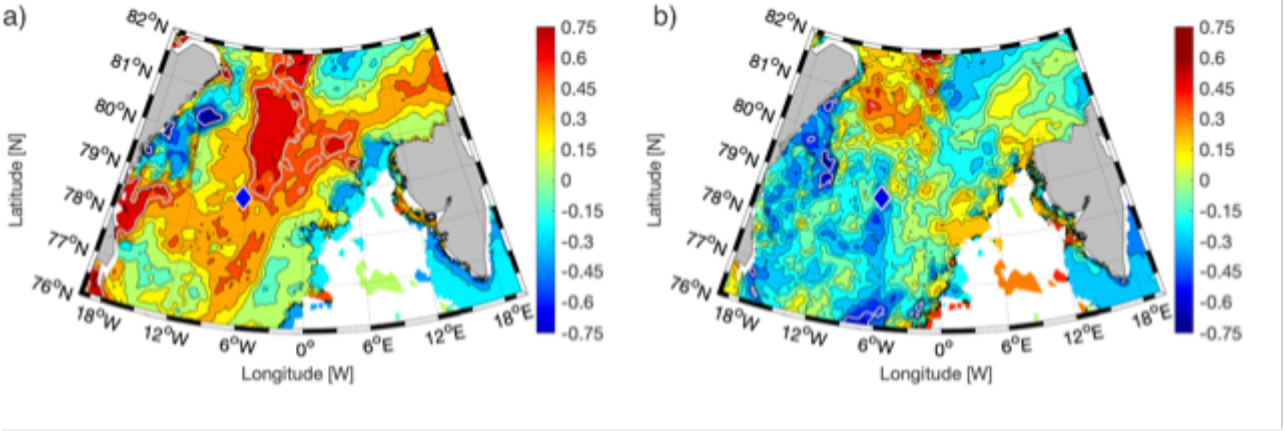
Location:	Shelf 6.5°W (F14)		Eastern EGC 3°W (F11)	
Depth:	summer (JSA)	winter (DJF)	summer (JAS)	winter (DJF)
55 m (PW, T<0°C)	+0.19°C/decade	+0.07°C/decade	+0.18°C/decade	+0.16°C/decade
55 m (AW, T>0°C)	No AW at F14	No AW at F14	-0.57°C/decade	+0.61°C/decade
250 m (AW)	-0.07°C/decade	+0.18°C/decade	-0.05°C/decade	+0.09°C/decade



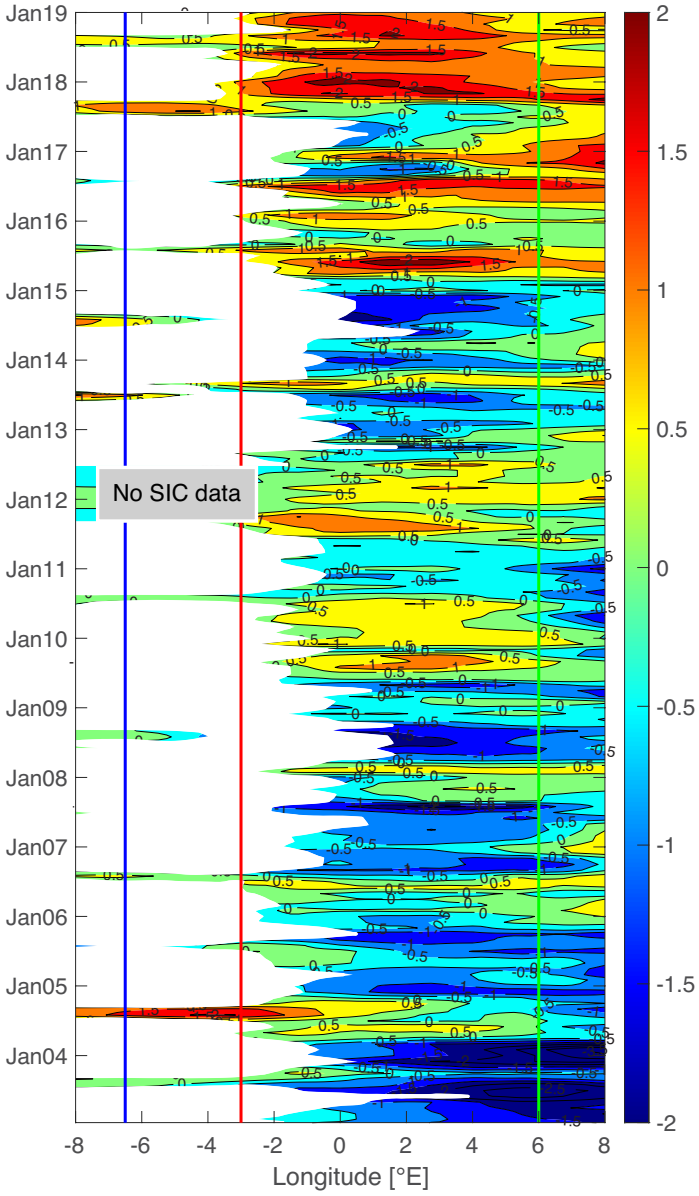
Supplementary Figure S1: Ocean temperature at target depths of a) 55 m (PW layer), and b) 250 m (AW layer) on the Greenland shelf (F14). Dashed straight lines mark the linear trend in summer (JAS) and solid straight lines mark the trend in winter (JFM). Values of these trends are given in Supplementary Table S1.



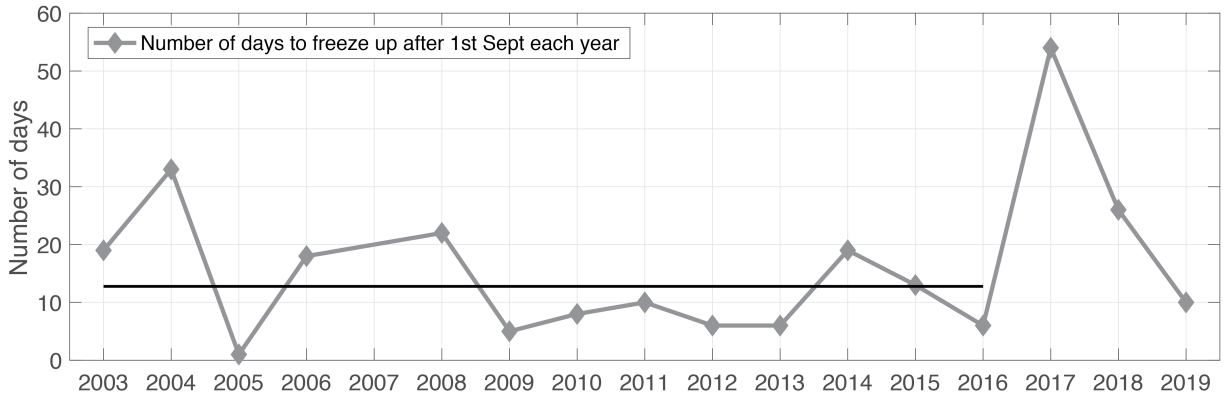
Supplementary Figure S2: Ocean temperature at target depths of a) 55 m (PW/AW layer), and b) 250 m (AW layer) in the eastern EGC (F11). Dashed straight lines mark the linear trend in summer (JAS) and solid straight lines mark the trend in winter (JFM). Values of these trends are given in Supplementary Table S1.



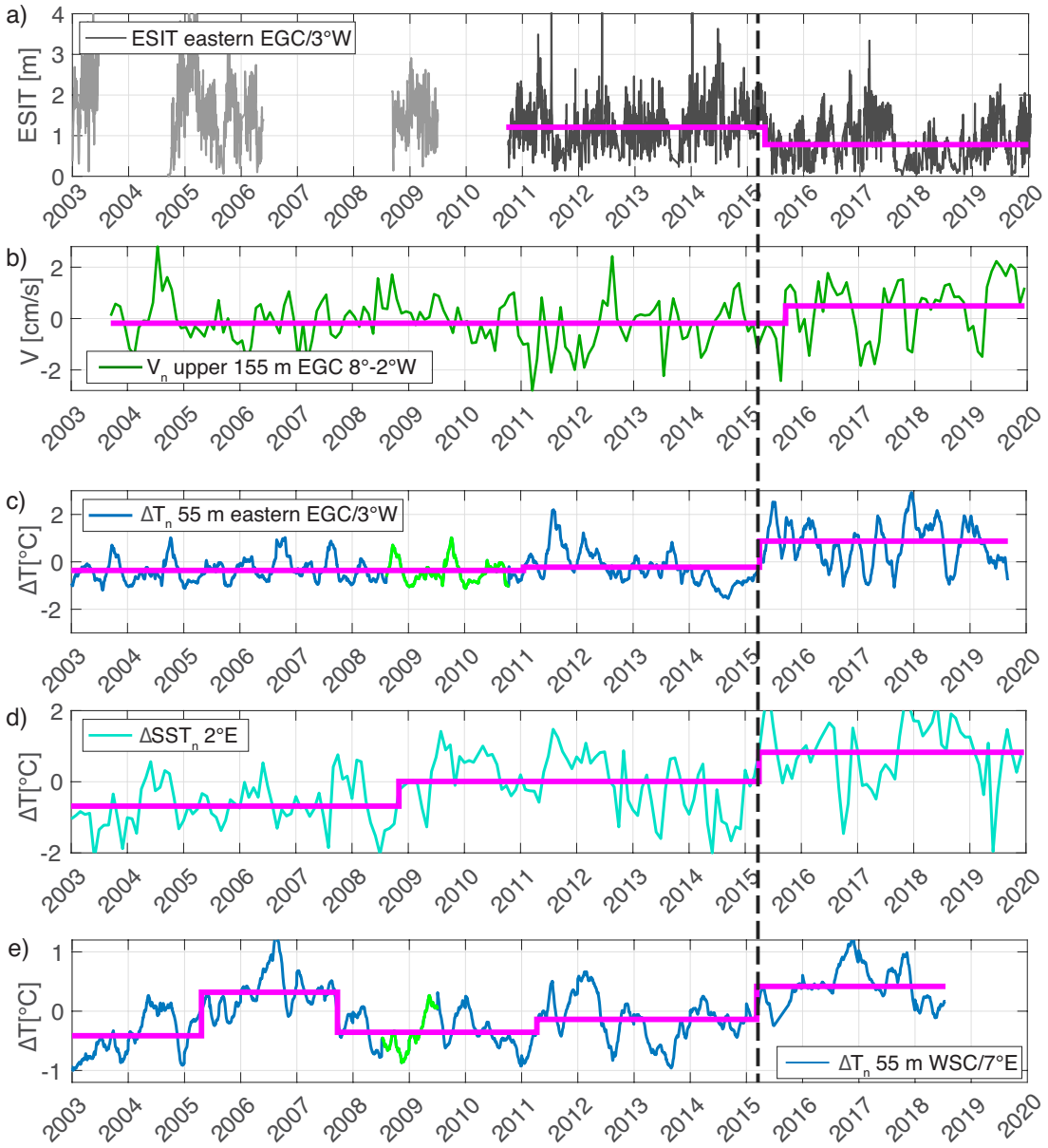
Supplementary Figure S3: Correlation maps of Open Water Fraction (OWF) with ocean temperature (T) at 55 m from the mooring on the shelf (F14) for summer months (JAS) when T > mean seasonal T and with ocean temperature at 55 m lagging OWF by one month for the two cases: when monthly mean practical salinity from the mooring at 55 m was a) S_p<33, and b) S_p>33. Thin gray line marks a p-value of 0.05.



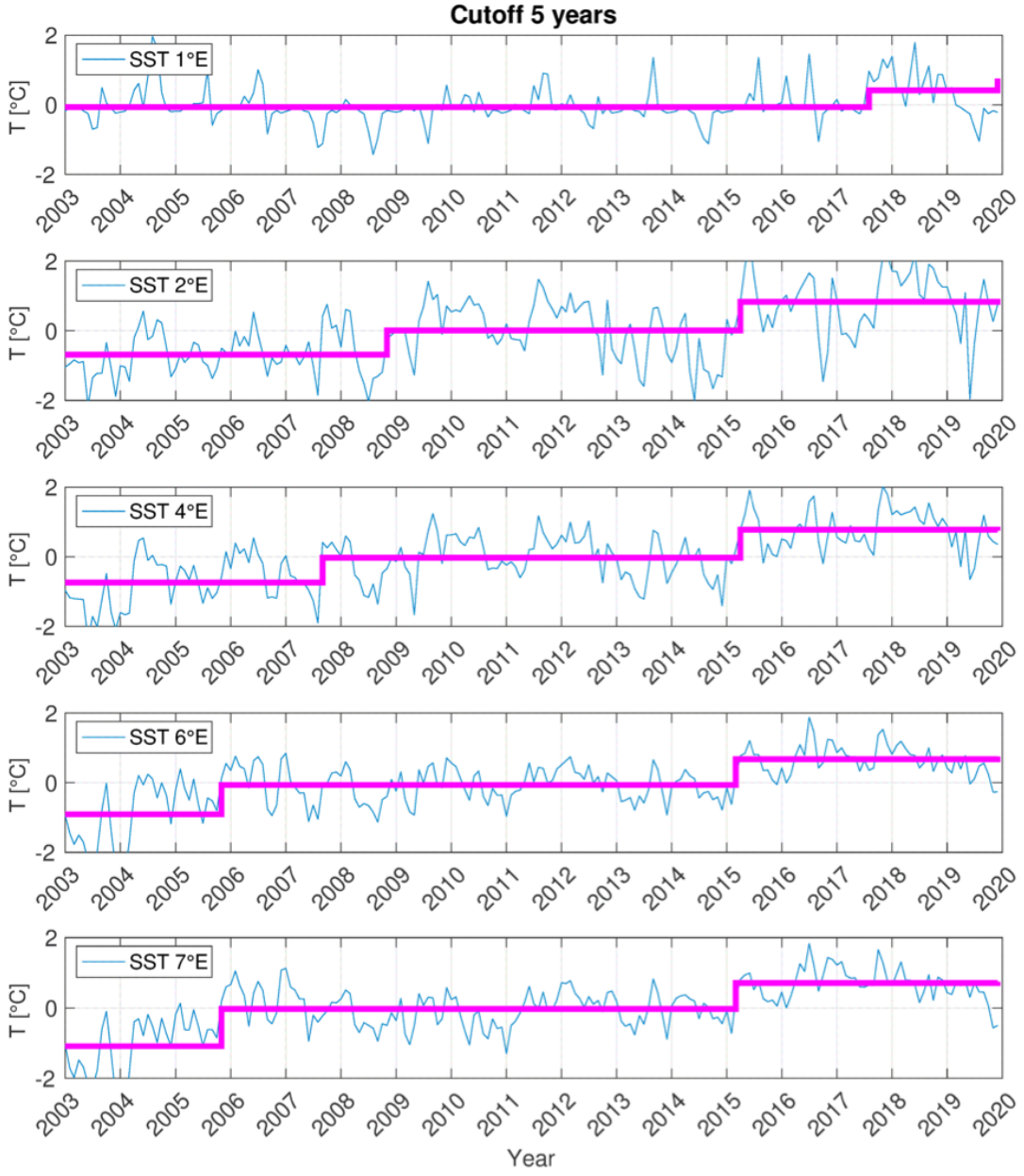
Supplementary Figure S4: Hovmuller diagram of monthly mean ERA-5 Sea-Surface Temperature (SST) anomaly in the Fram Strait at 79°N between 8°W and 8°E. The white filled contoured area marks the area with Sea Ice Concentration SIC>0.5. Vertical lines mark the mooring locations F14 (blue), F11 (red), and F4 (green).



Supplementary Figure S5: Number of days after September 1st when the ocean surface starts to freeze on the shelf (F14) from the 1-D convective model initialized with observed vertical ocean temperature and salinity profiles. The horizontal bar marks the average number of days to freeze up after Sept 1st between 2003-2016.



Supplementary Figure S6: Regime shift detection analysis. a) Daily Effective Sea Ice Thickness (ESIT) at 3°W (F11), b) monthly mean normalised ocean velocity averaged over the upper 155 m in the EGC between 8°-2°W (southward velocity is negative), c) monthly mean normalised ocean temperature anomaly at 55 m in the eastern EGC at 3°W (mooring F11), d) monthly mean normalised Sea-Surface Temperature (SST) anomaly at 2°E, and e) monthly mean normalised ocean temperature anomaly at 55-75 m in the West Spitsbergen Current at 7°E (mooring F4). The magenta lines in each panel marks when shifts are detected (See Methods). The green segments in panel b) and e) mark periods when there were no data and these data gaps were filled with data from 2003-2005. The black vertical dashed line marks the shift identified in all parameters in 2015. Time series in panels c), d) and e) were deseasoned and normalized.



Supplementary Figure S7: Regime shift detection analysis for Sea-Surface Temperature (SST) at five locations in the eastern Fram Strait. SST has been deseasoned and normalized.