Supplement of The Cryosphere, 17, 3269–3289, 2023
https://doi.org/10.5194/tc-17-3269-2023-supplement

The Cryosphere Open Access EGU

Supplement of

A long-term proxy for sea ice thickness in the Canadian Arctic: 1996–2020

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Supplementary Materials

Table S1. Canadian Ice Service ice chart availability for November-April

	Western Arctic	Eastern Arctic
1996	Nov: weekly Dec: biweekly Jan-Apr: monthly	Nov: weekly Dec: biweekly Jan-Apr: monthly
1997-2000	Nov: weekly Dec: biweekly Jan-Apr: monthly	Nov: weekly Dec: biweekly Jan-Apr: monthly
2001-2005	Nov: weekly Dec: biweekly Jan-Apr: monthly	Nov: weekly Dec: biweekly Jan-Apr: monthly
2006	Nov-Dec: weekly Jan-Feb: monthly Mar-Apr: biweekly	Nov-Dec: weekly Jan-Feb: monthly Mar-Apr: biweekly
2007	Nov-Dec: weekly Jan-Mar: biweekly Apr: weekly	Nov-Dec: weekly Jan-Mar: biweekly Apr: weekly
2008-2010	Nov-Apr: weekly	Nov-Apr: weekly
2011-present	Nov-Apr: weekly	Nov-Apr: weekly

Table S2. List of used predictor features

Partial concentration New Ice	Partial concentration pancake ice
Partial concentration Nilas	Partial concentration small ice cake
Partial concentration Young Ice	Partial concentration ice cake
Partial concentration Grey Ice	Partial concentration small floe
Partial concentration Grey White Ice	Partial concentration medium floe
Partial concentration FYI	Partial concentration big floe
Partial concentration thin FYI	Partial concentration vast floe
Partial concentration first stage thin FYI	Partial concentration giant floe
Partial concentration second stage thin FYI	Partial concentration fast ice
Partial concentration medium FYI	Scatterometer backscatter
Partial concentration thick FYI	
Partial concentration Old Ice	
Partial concentration second-year ice	
Partial concentration MYI	

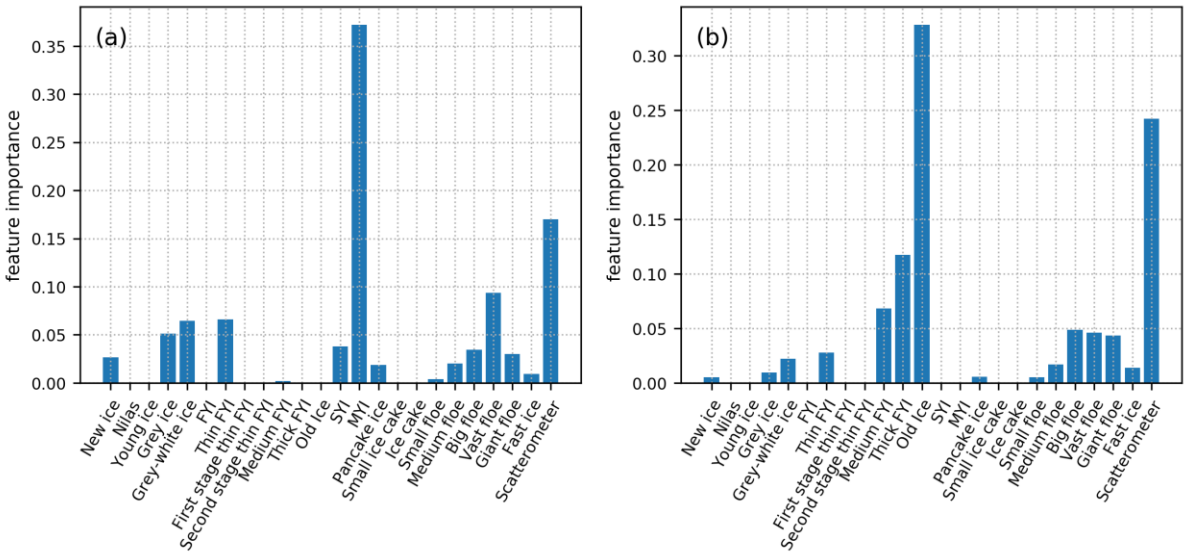

Figure S1. Feature importance in the Random Forest Regression model for (a) November C-band and (b) April C-band.

Table S3. Number of datapoints Random Forest Regression models are trained on.

	C-band	Ku-band
November	21935	14642
December	29326	23529
January	28829	25873
February	27225	20378
March	29135	20643
April	30601	25004

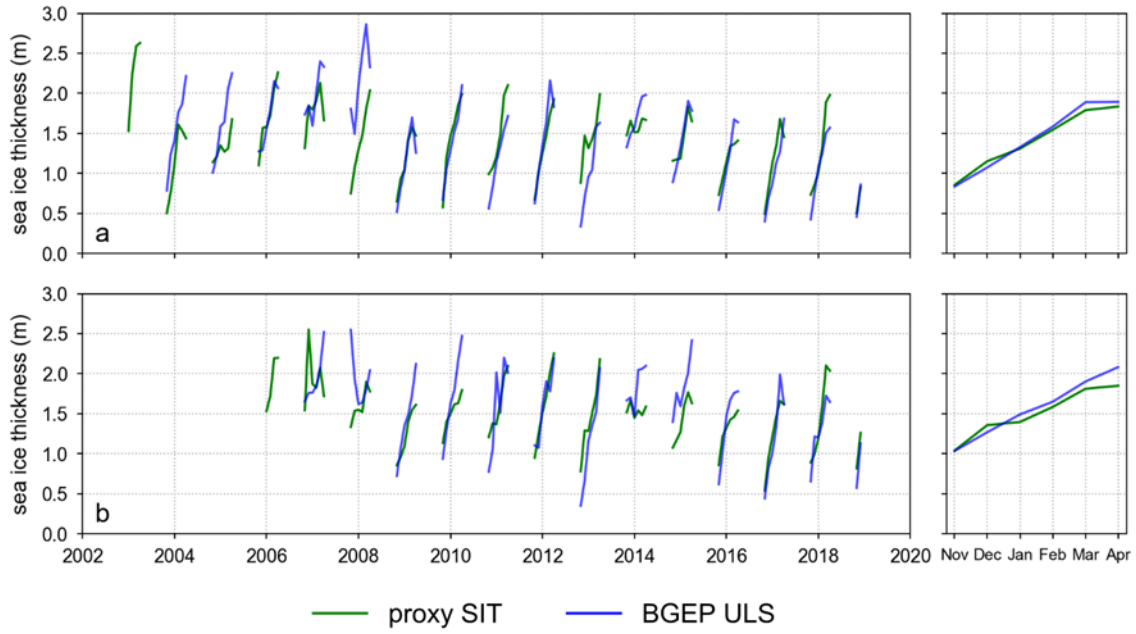

Figure S2. BGEP ULS moorings (a) location A and (b) location D (for locations see Fig 1) and the proxy_corr sea ice thickness product. Graphs on right-hand side show mean seasonal cycle for both locations.

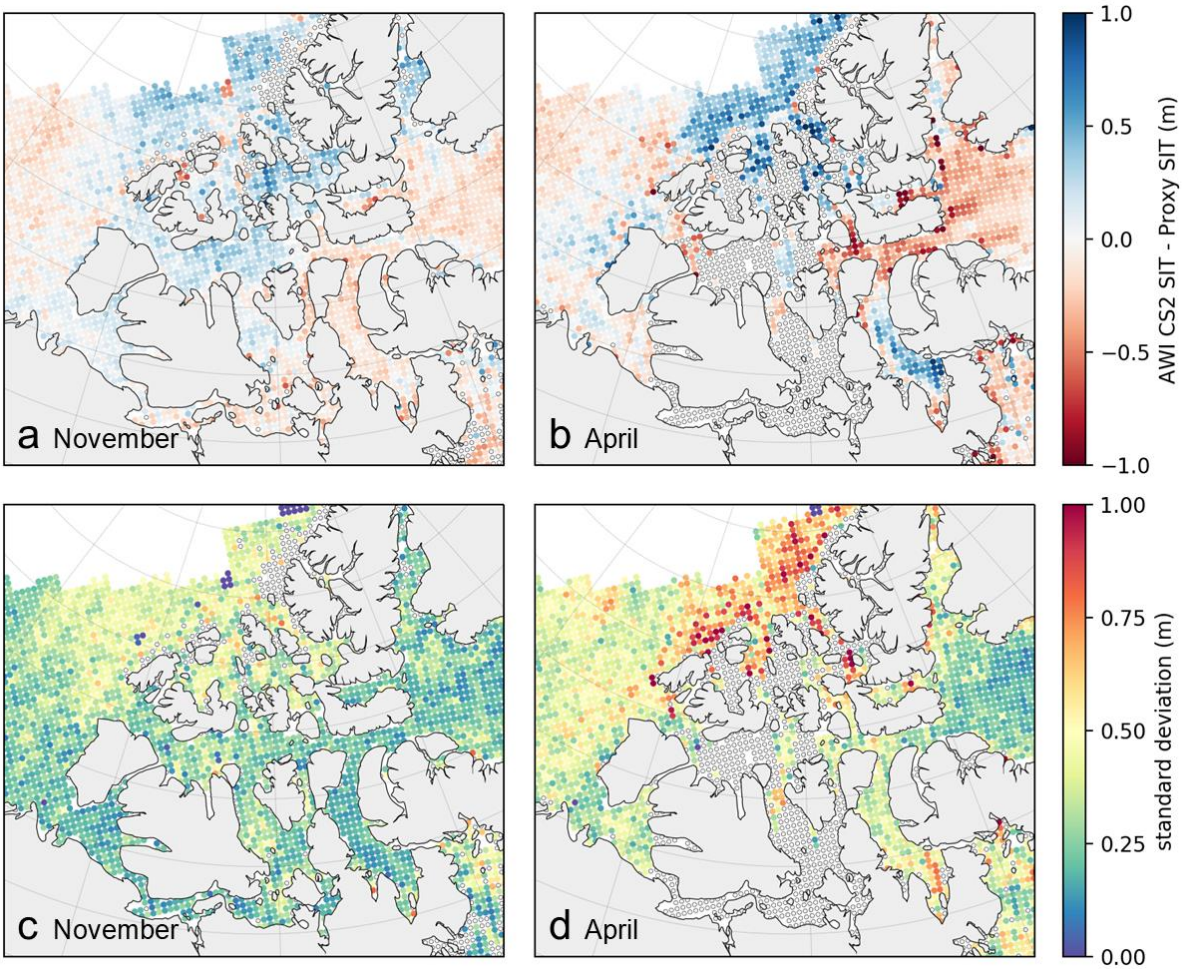

Figure S3. Comparison between AWI CS2 SIT (Hendricks and Paul, 2022) and the proxy_corr SIT product. (a,b) The mean difference between the two products for 2010-2020 for November (a) and April (b). (c,d) The standard deviation in the difference between the two products. The top 5 percentile SIT uncertainty was removed from the AWI CS2 SIT, resulting in SIT observations with an uncertainty higher than 0.55 m in November and higher than 0.90 m in April being removed. No value is given where more than half the years are missing in the AWI CS2 SIT product (either no observations or top 5 percentile uncertainty).

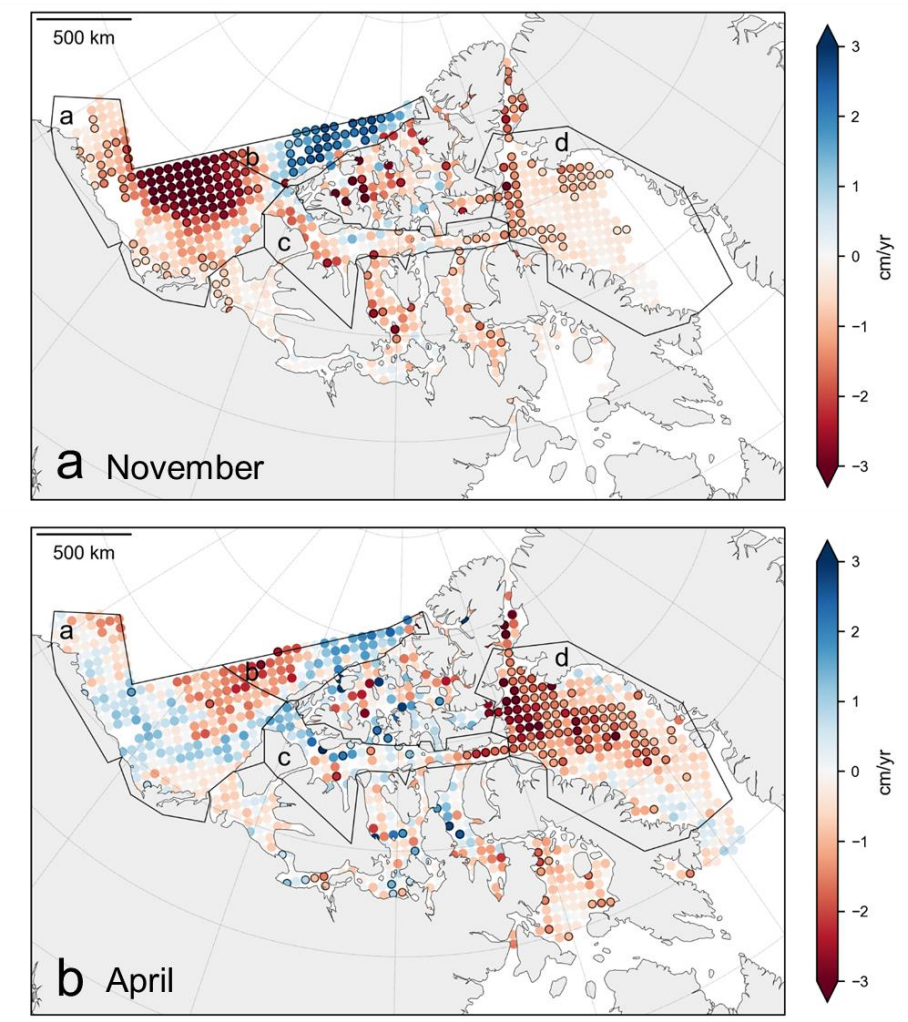

Figure S4. Sea ice thickness trends from the proxy_nocorr SIT product for (a) November and (b) April 1996-2020. Solid outline circles where statistically significant ($p<0.05$).

Stefan Hendricks, & Stephan Paul. (2022). Product User Guide & Algorithm Specification: AWI CryoSat-2 Sea Ice Thickness (version 2.5) (2.5). Zenodo. https://doi.org/10.5281/zenodo.7416200