

Supplementary material of  
**Important role of the mid-tropospheric atmospheric circulation in the recent surface melt increase over the Greenland ice sheet**  
*Fettweis et al., 2012*

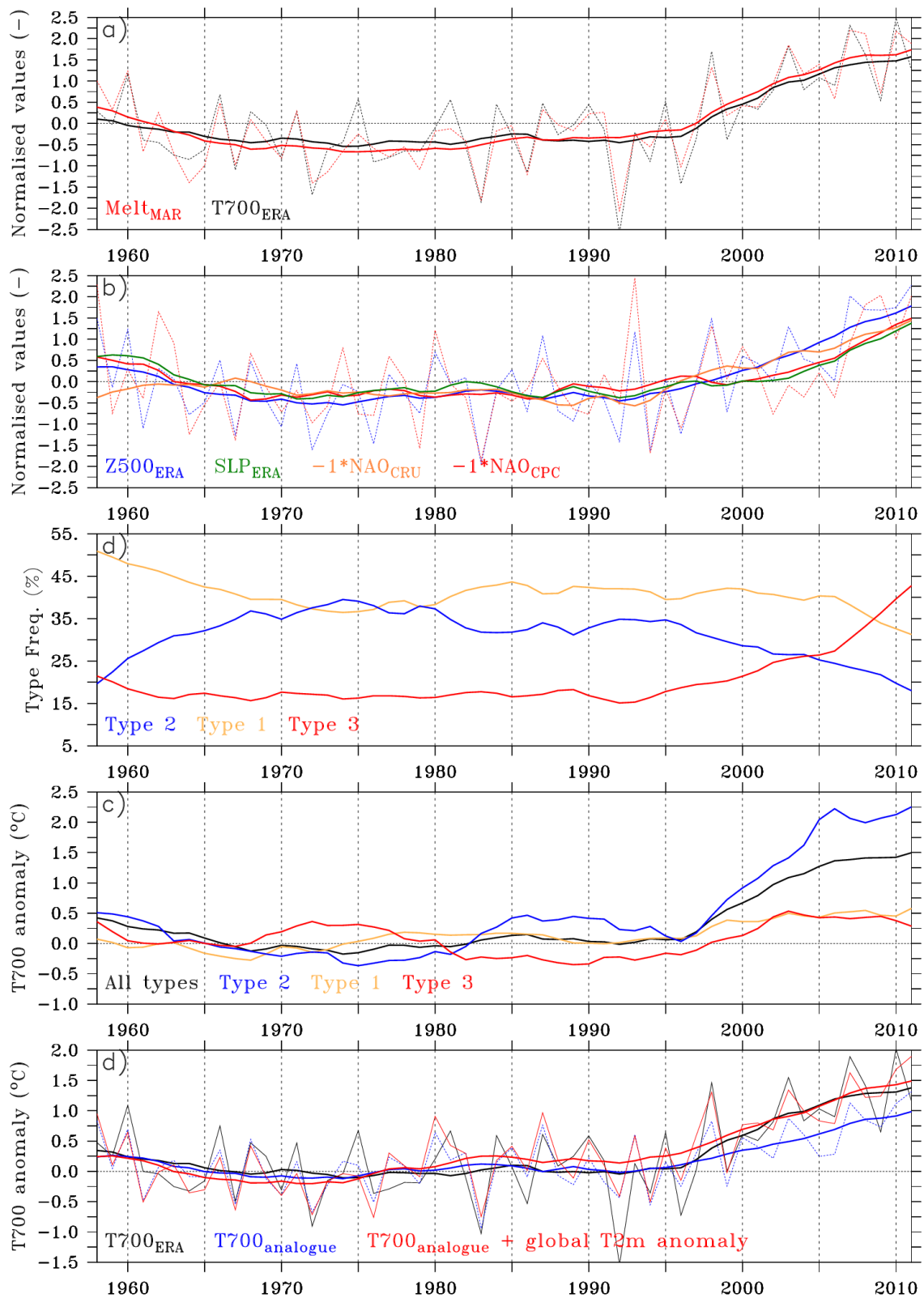


Fig. S1: The same as Fig. 1 but by using the ECMWF reanalysis.

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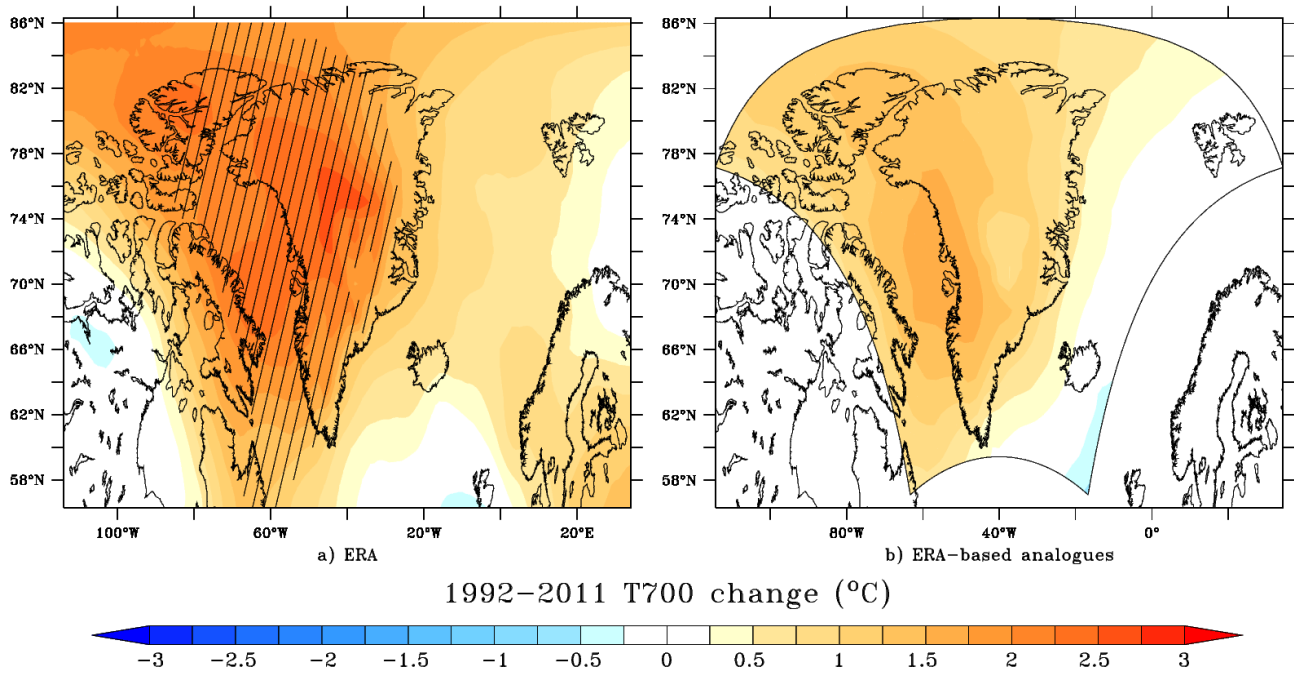


Fig. S2: The as Fig. 2 but by using the ERA-INTERIM reanalysis.

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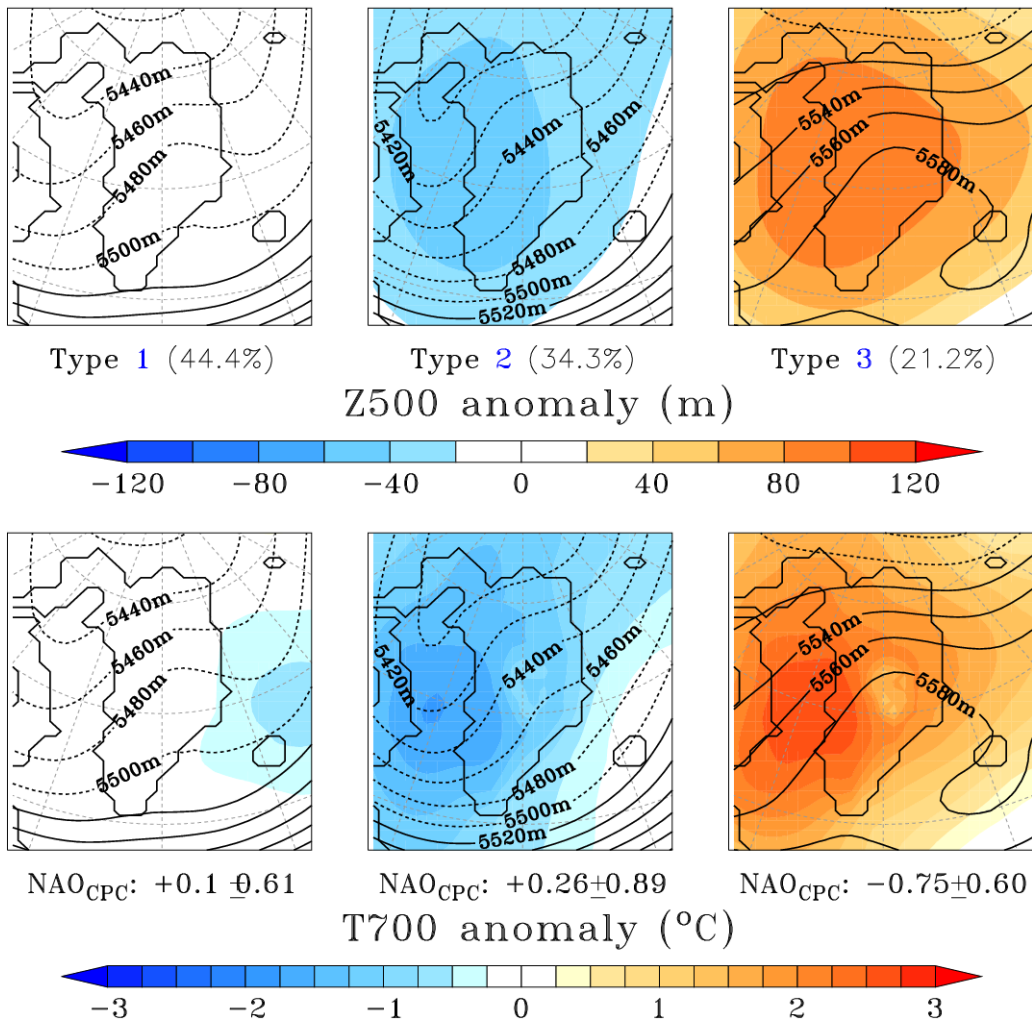


Fig. S3: The as Fig. 3 but by using the ECMWF reanalysis (ERA-40 over 1958-1978 and ERA-INTERIM over 1979-2011).

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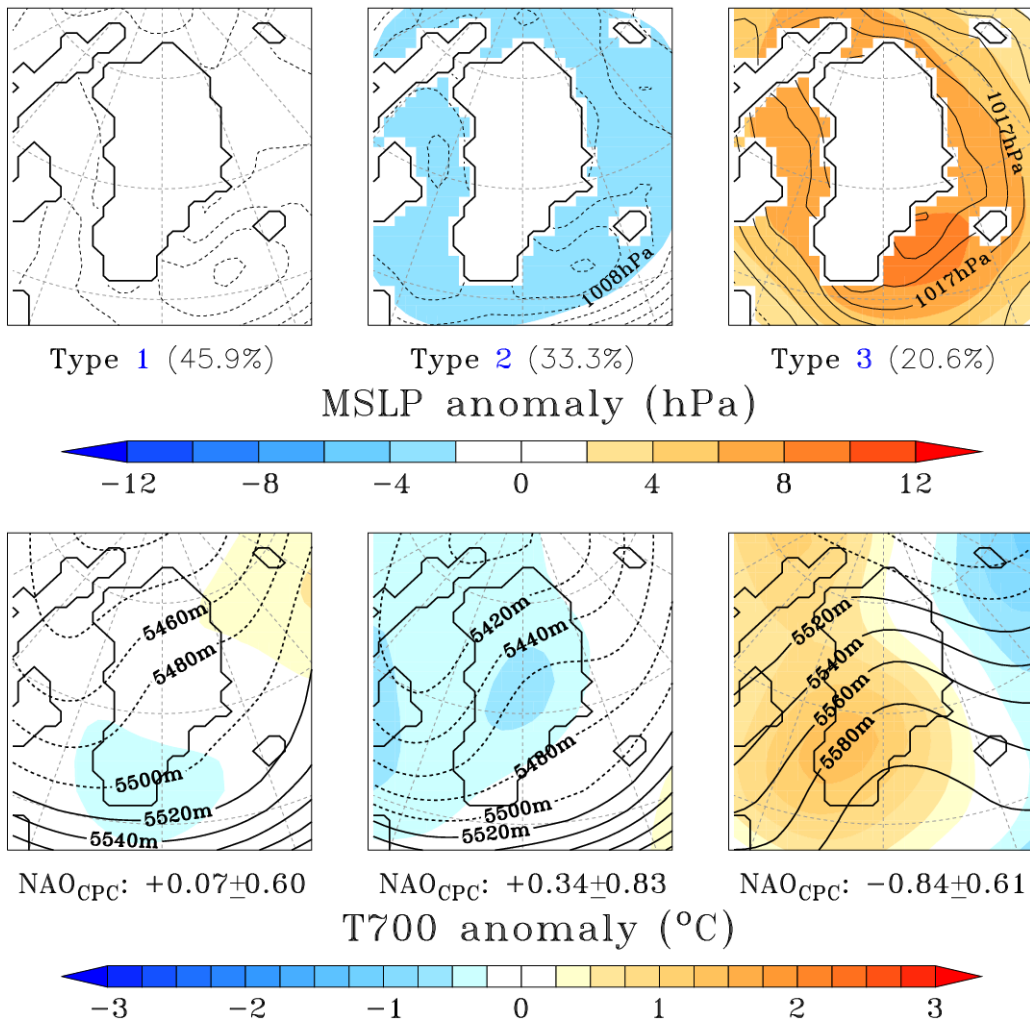


Fig. S4a: The as Fig. 3 but by using the same CTC with a similarity index based on SLP from the NCEP-NCAR reanalysis instead on Z500. The top figures shows the SLP anomalies in respect to the JJA SLP mean over 1958-2011 as well as the isobars for each classes. The corresponding Z500 is shown below.

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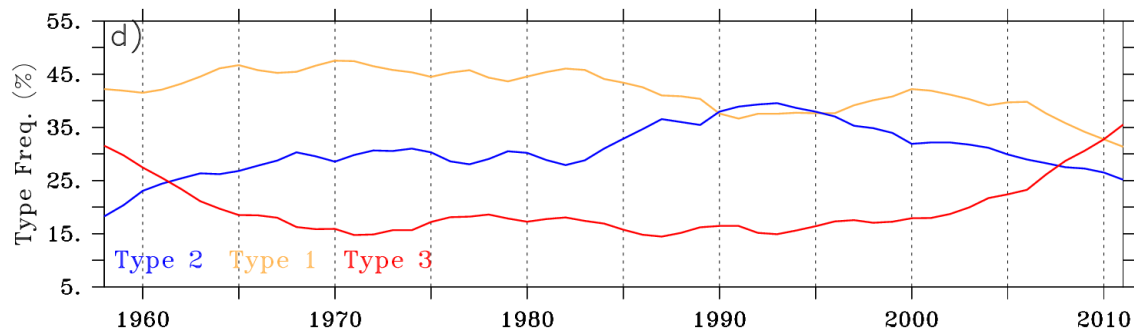


Fig. S4b: The same as Fig. 1C but for the MSLP-based CTC.

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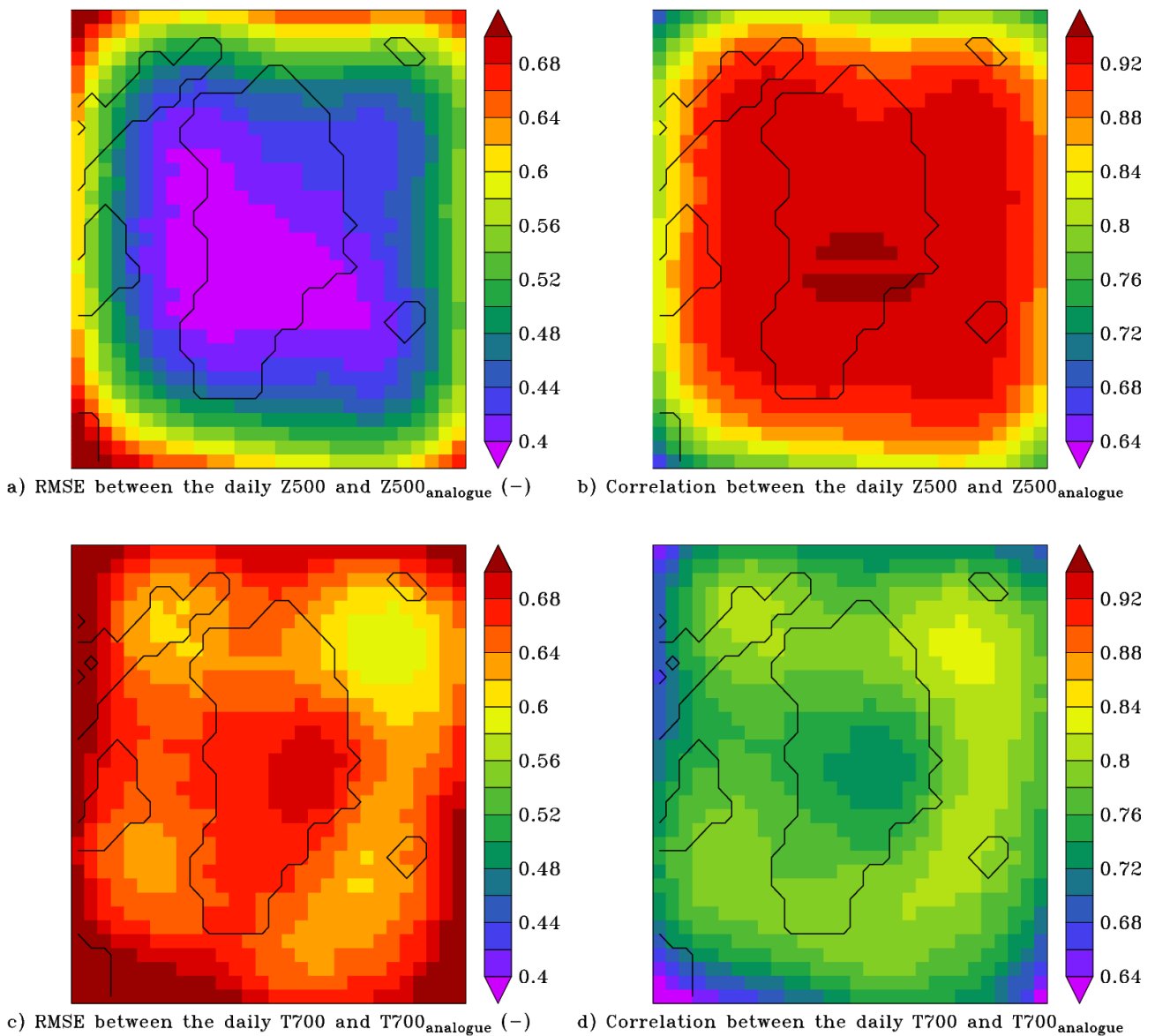
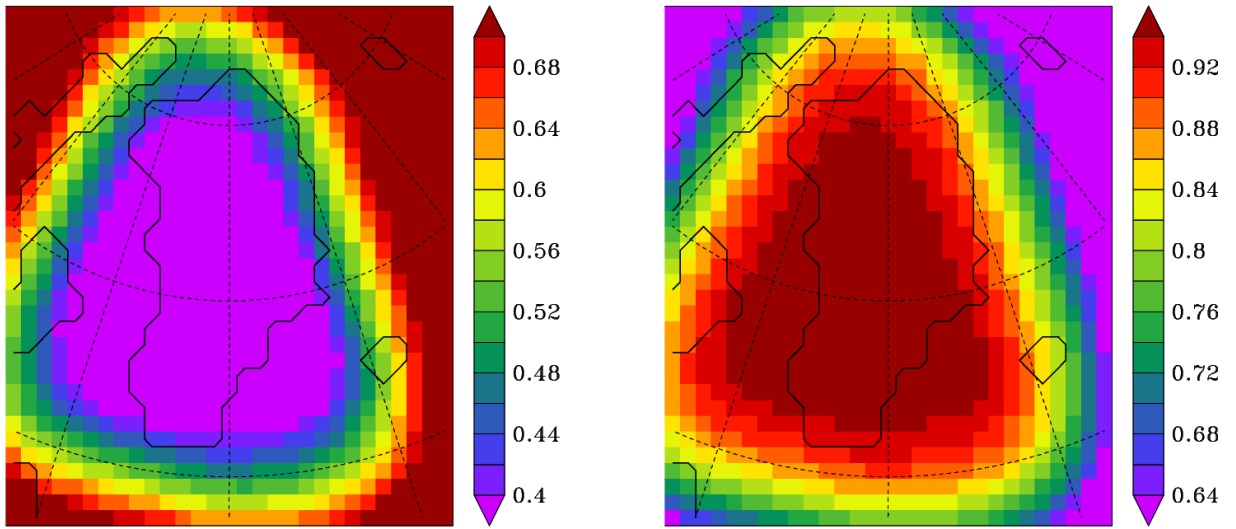
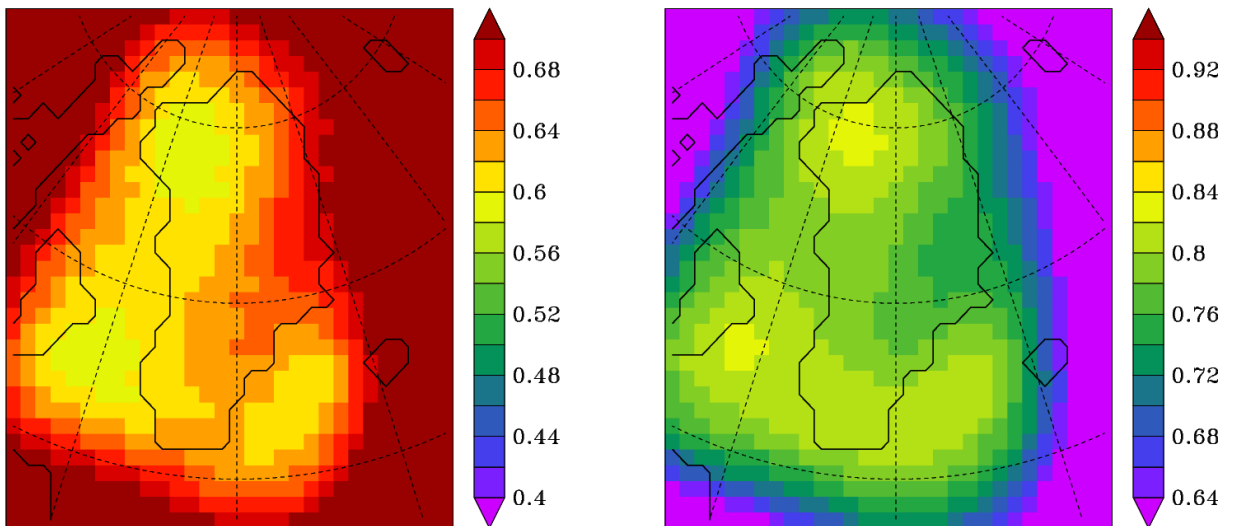


Fig. S5: a) RMSE of the Z500 analogue surface for each day of the summers 1992-2011 (20 yrs x 92 days = 1840 days) in respect to the corresponding daily Z500 surface. The RMSE is normalised here by the standard deviation of the daily Z500 surfaces over the summers 1992-2011. b) Correlation coefficient between the daily Z500 analogue surface and the corresponding daily Z500 surface. c) Same as a) but for T700. d) Same as b) but for T700.

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a) RMSE between the daily Z500 and Z500<sub>analogue</sub> (-)      b) Correlation between the daily Z500 and Z500<sub>analogue</sub>



c) RMSE between the daily T700 and T700<sub>analogue</sub> (-)      d) Correlation between the daily T700 and T700<sub>analogue</sub>

Fig. S6: The same as Fig. S5 but with a similarity index (used to find analogues) computed only over the area covering Greenland (lon: 70°W-20°W; lat: 60°N-85°N).

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Tables S1: Sensitivity of the parameters in the analogue flow method.

	$R_{Z500}$	$RMSE_{Z500}$	$R_{T700}$	$RMSE_{T700}$	$Trend_{1992-2011}$	$Trend_{1982-2011}$
CTRL run	0.99	13.2	0.85	1.26	71%	67%
40-day windows instead of 30-day	0.99	11.8	0.85	1.28	76%	71%
20-day windows instead of 30-day	0.99	15.2	0.86	1.24	69%	63%
15 years instead of 15 years	0.99	15.1	0.86	1.25	70%	65%
5 years instead of 15 years	0.99	13.5	0.84	1.29	72%	69%
daily anomaly instead of raw value	0.97	18.8	0.85	1.27	62%	58%
average instead of median	0.99	13.3	0.86	1.28	70%	65%
1958-2011 as reference period instead of 1961-1990	0.88	10.8	0.86	1.23	71%	67%
ECMWF reanalysis instead of NCEP-NCAR	0.99	13.1	0.85	1.25	65%	60%

where  $R_{Z500}$  (resp.  $RMSE_{Z500}$ ) is the average correlation (resp. RMSE) over the area covering the GrIS of the daily Z500 surfaces and the analogues based one over 1992-2011 and  $Trend_{1992-2011}$  is the percentage of the T700 1992-2011 trend over the area covering the GrIS resolved by the analogues based one.



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Tables S2: List of the 28 CMIP5 models used for Fig. 4:

ACCESS1-0  
ACCESS1-3  
BCC-CSM1-1  
**BNU-ESM**  
CanESM2  
CCSM4  
CESM1-BGC  
CMCC-CM  
CNRM-CM5  
CSIRO-Mk3-6-0  
FGOALS-s2  
FIO-ESM  
GFDL-CM3  
GFDL-ESM2M  
GISS-E2-R  
HadGEM2-AO  
HadGEM2-CC  
HadGEM2-ES  
INMCM4  
IPSL-CM5A-MR  
IPSL-CM5B-LR  
MIROC5  
MIROC-ESM-CHEM  
MIROC-ESM  
MPI-ESM-LR  
MPI-ESM-MR  
MRI-CGCM3  
NorESM1-M

The model plotted in black in Fig. 4 is BNU-ESM (RCP 8.5 scenario)