Supplementary Material
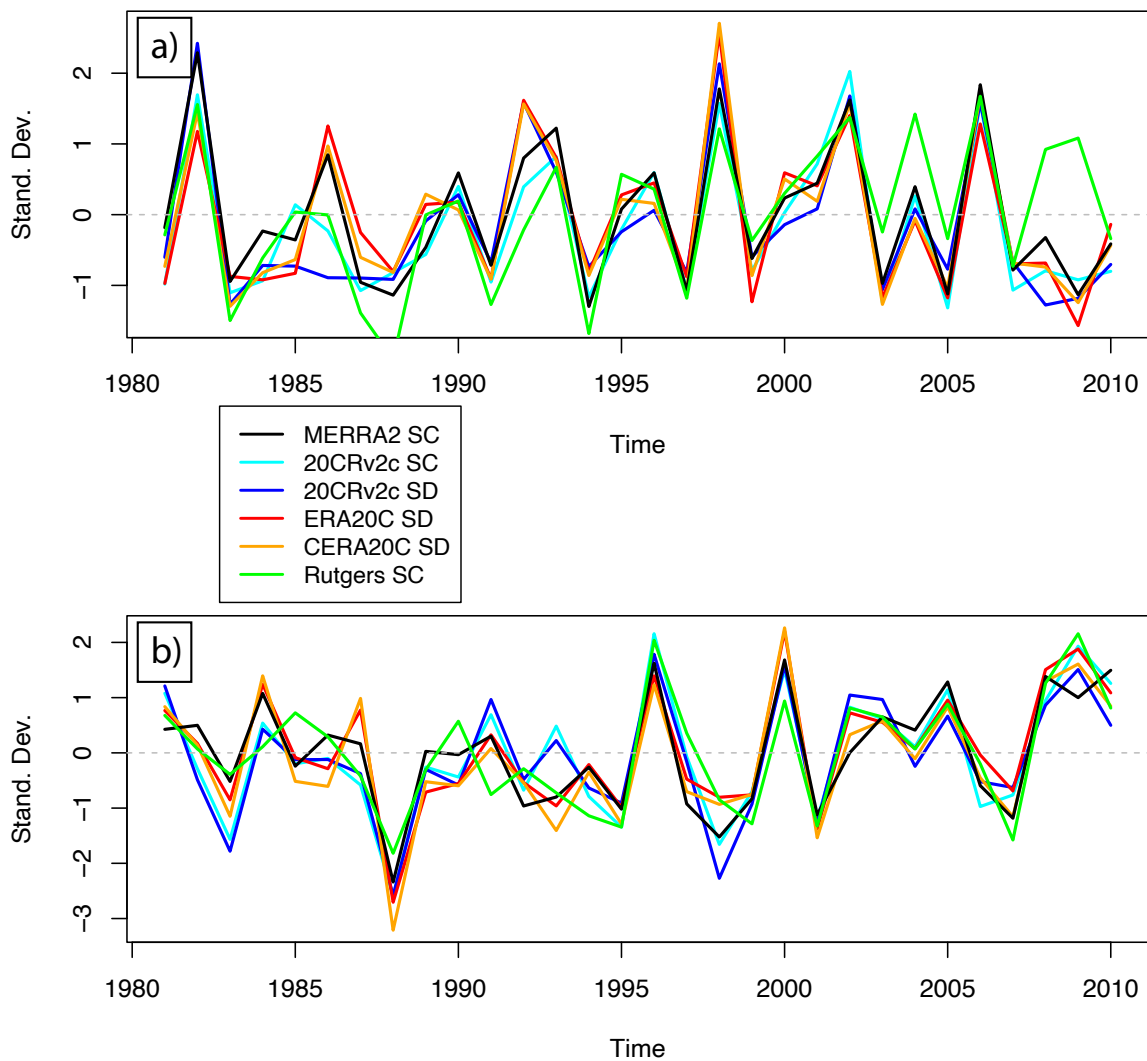
*Figure S1: Comparison of a) October snow indices and b) November snow indices for the period 1981-2010 in multiple reanalysis products as well as the Rutgers snow laboratory satellite–based snow cover product (**Robinson et al. 2012**).*

Table S2: Correlation coefficient for 110 years between reconstructed NAO index values and ERA20C, ASF-20C CTL ensemble mean and ASF-20C EXP ensemble mean NAO index values

	DEC	JAN	FEB	DJF
ERA-20C	0.67	0.88	0.9	0.83
ASF-20C CTL	-0.09	0.25	0.19	0.33
ASF-20C EXP	-0.13	0.2	0.16	0.34
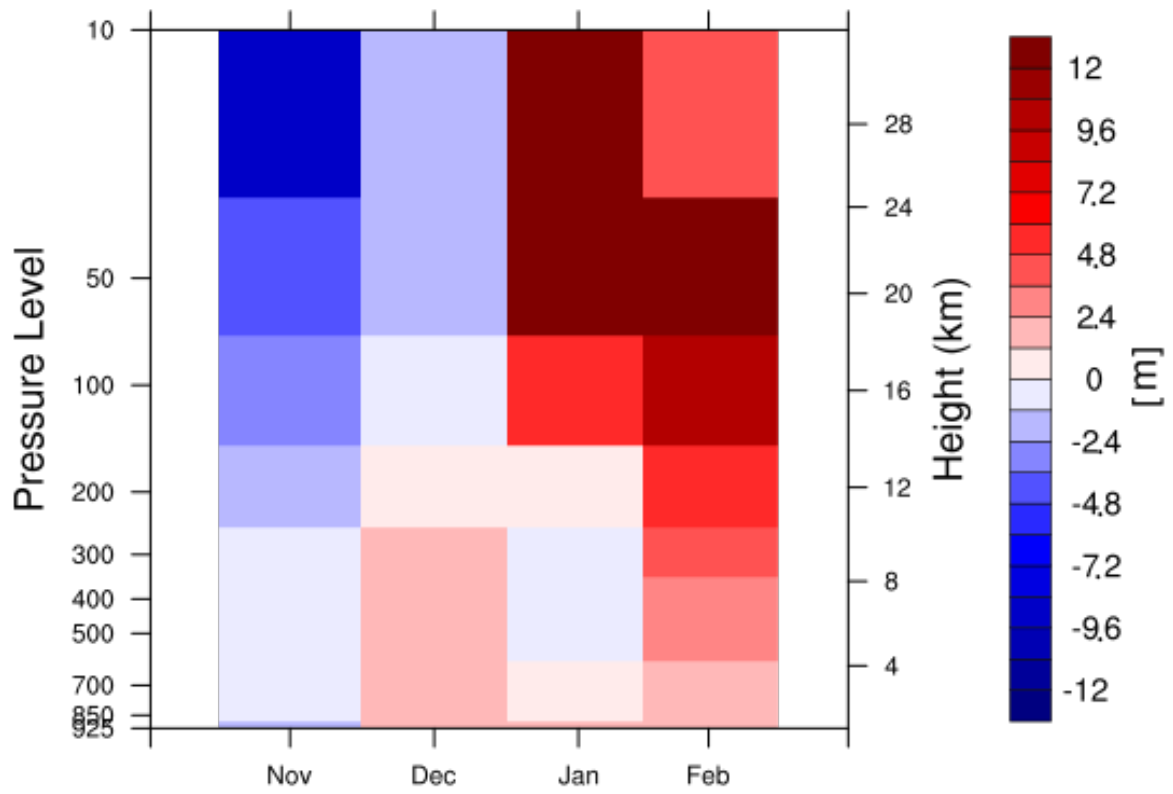
Figure S2: Polar-cap averaged (180°E–180°W, 60°N–90°N) geopotential (height) anomalies for the period 1901-2010 between high-snow and low-snow ASF-20C EXP ensemble means. Shading indicates 90% significance level.

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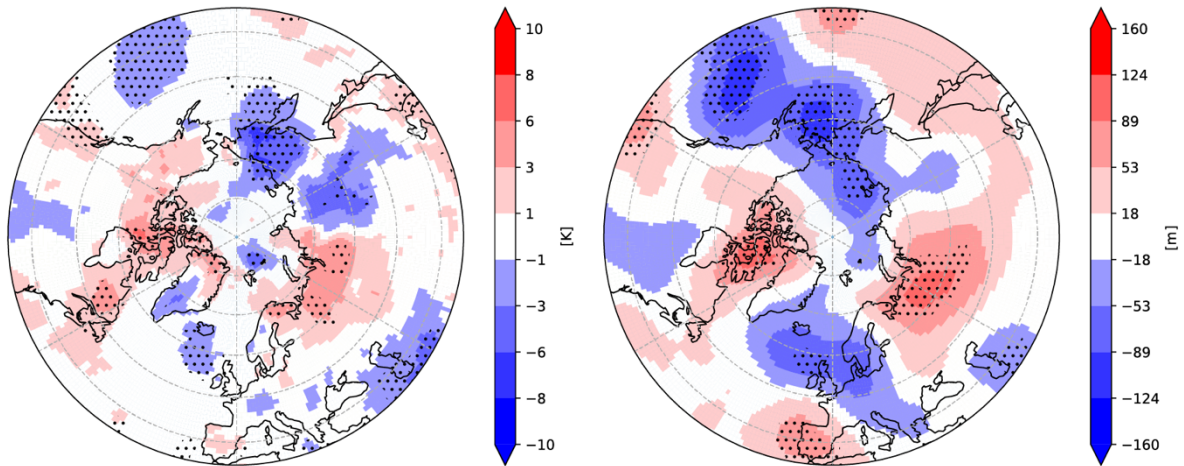
Figure S3: November 1st precondition composites where the NAO DJF of the AFS20C CTL
ensemble mean is < 1 stand. dev minus composites where the NAO DJF of the AFS20C CTL
ensemble mean is > 1 stand. dev. (for a list of years see below). From left to right: 2m
temperature and 500 hPa GPH anomalies. Stippled areas represent 90% significance.
+ NAO DJF
years:1901,1904,1908,1909,1915,1919,1920,1922,1925,1927,1930,1932,1945,1964,1973,19
78,1989,2000,2002
- NAO DJF years:
1917,1918,1924,1931,1934,1940,1941,1950,1951,1977,1980,1982,1998,2010

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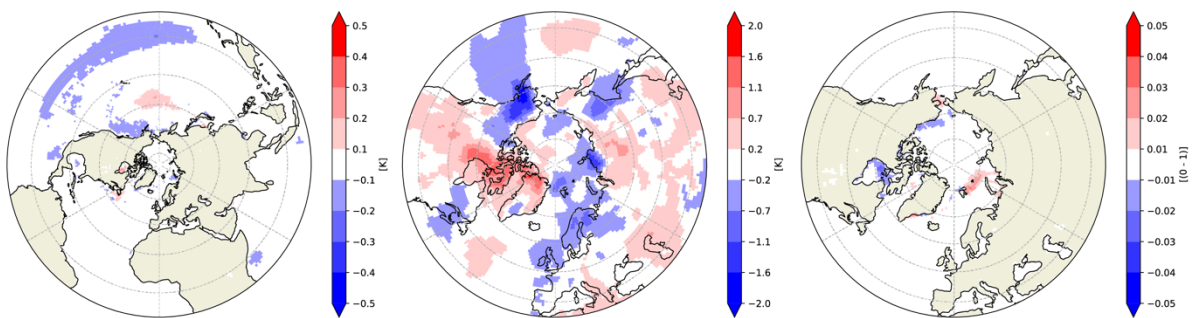
Figure S4: ERA20C climate anomaly composites of November 1st preconditions after which a
positive snow dipole forcing resulted in a negative DJF NAO signal (based on Figure 3c):
From left to right: SSTs, 2m temperature and sea ice concentration anomalies. Anomalies are
computed with respect to the 1901–2010 average.

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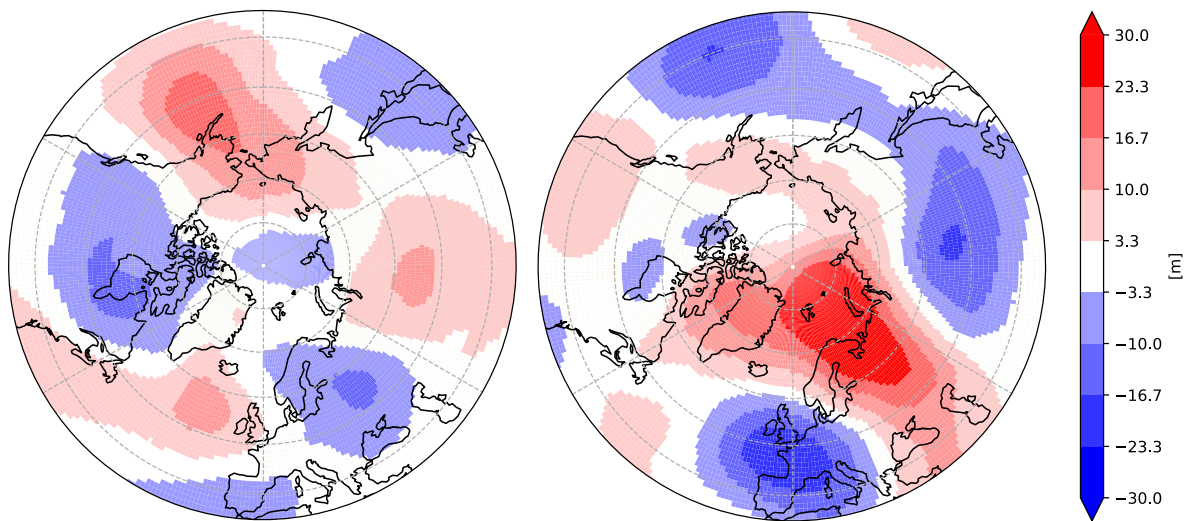
Figure S5: Averaged 500 hPa geopotential height anomalies for left) the period 1921–1941
and right) 1991–2010 between high-snow and low-snow ASF-20C EXP ensemble means in
December.