Table S1. Letter representations and their meanings and units.

abbreviation	meaning	unit	abbreviation	meaning	unit
SICb	SIC change rate during the 7 days before the cyclone	% d^{-1}	*SSTa*	SST change rate during the 7 days after the cyclone	°C d^{-1}
SICd	SIC change rate during the cyclone	% d^{-1}	*Vb*	Sea ice motion speed during the 7 days before the cyclone	cm s^{-1}
SICa	SIC change rate during the 7 days after the cyclone	% d^{-1}	*Vd*	Sea ice motion speed during the cyclone	cm s^{-1}
SIAb	SIA change rate during the 7 days before the cyclone	10^3 km^2 d^{-1}	*Va*	Sea ice motion speed during the 7 days after the cyclone	cm s^{-1}
SIAd	SIA change rate during the cyclone	10^3 km^2 d^{-1}	*Divb*	Ice divergence during the 7 days before the cyclone	cm s^{-1} m^{-1}
SIAa	SIA change rate during the 7 days after the cyclone	10^3 km^2 d^{-1}	*Divd*	Ice divergence during the cyclone	cm s^{-1} m^{-1}
SSTb	SST change rate during the 7 days before the cyclone	°C d^{-1}	*Diva*	Ice divergence during the 7 days after the cyclone	cm s^{-1} m^{-1}
SSTd	SST change rate during the cyclone	°C d^{-1}			

Table S2. The initial SIA (10^3 km^2) and variations in the SIA change rate (10^3 km^2 d^{-1}) before and after the passage of the summer Arctic cyclones in the ES, CS and BF regions. Abbreviations as in Table 1 and Table S1.

Cyclone number	Initial SIA	*SIAb*	*SIAd*	*SIAa*	ΔS	*SIAr*
ES-1	91.92	-0.01	-3.54	-4.37	-45.47	1
ES-2	249.29	-0.97	-12.94	-7.23	-112.04	0.89
ES-3	42.11	-2.18	-3.16	-0.68	-31.26	0.09
ES-4	195.31	-3.08	-10.34	-0.61	-147.55	0.60
ES-5	80.56	-6.14	-4.77	-0.36	-49.86	-0.48
ES-6	32.26	1.19	-3.75	-2.53	-18.95	1.75
ES-7	114.48	-6.81	-5.23	-2.98	-66.54	-0.33
ES-8	12.48	-1.65	-0.60	0.04	-6.43	-2.34
CS-1	73.15	1.11	-2.26	-2.56	-29.36	1.57
CS-2	106.49	-5.26	-9.92	-4.23	-63.88	0.18
CS-3	18.98	-0.08	-0.21	-0.96	-10.19	0.87
CS-4	52.83	-3.27	-1.60	-2.24	-24.88	-0.18
CS-5	8.10	-0.89	-0.56	-0.15	-7.48	-0.55
CS-6	10.37	-1.82	-0.53	-0.10	-9.24	-1.36
CS-7	1.46	0.01	-0.17	0	-1.46	1.11
BF-1	230.30	0.84	1.79	4.37	26.37	0
BF-2	85.04	-1.69	-5.65	-0.50	-58.97	0.63
BF-3	203.28	2.18	-5.15	-1.89	-20.84	2.36
BF-4	106.34	-1.71	-8.12	5.56	-34.83	0.46
BF-5	198.10	-1.12	-4.68	0.63	-10.62	-0.16
BF-6	5.04	0.61	-0.61	1.44	4.69	-1.60

Table S3. The initial SIA (10^3 km^2) and variations in the SIA change rate (10^3 km^2 d^{-1}) before and after the passage of the 20030728 cyclone in the 3 subregions. Abbreviations as in Table 1 and Table S1.

Regions	Initial SIA	*SIAb*	*SIAd*	*SIAa*	ΔS	*SIAr*
ES	119.59	-4.56	-9.83	-5.76	-64.87	0.23
CS	9.49	0.36	-0.22	-0.38	0.30	-12.2
BF	213.30	-3.62	-5.77	-5.69	-43.46	0.08

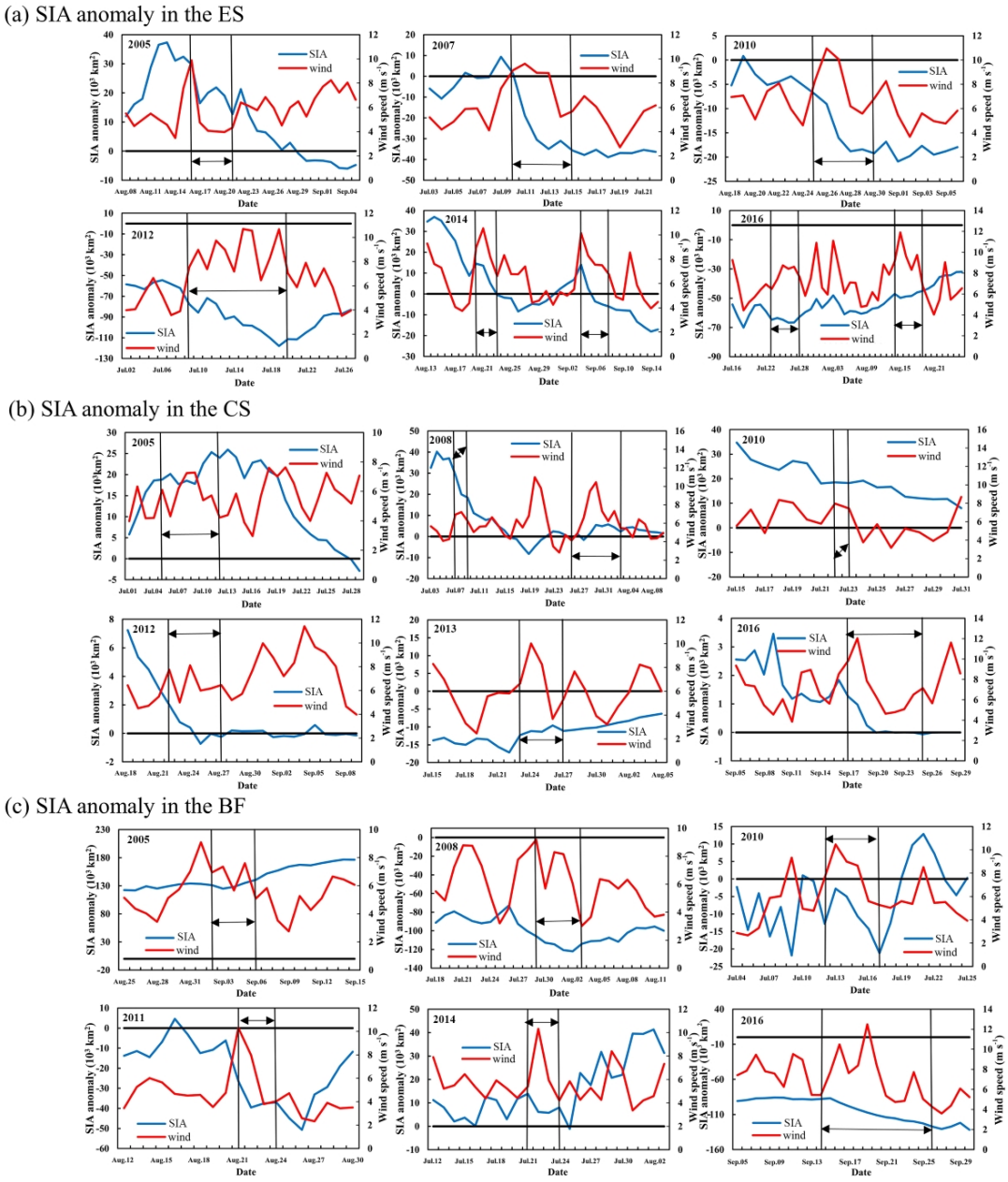

Fig. S1. Average daily variations in the SIA anomaly and wind speed in the (a) ES, (b) CS and (c) BF regions (see Fig. 1)) before and after the Arctic cyclones. The black "0 line" represents the average SIA in 2003-2016; the black arrow shows the transit time of the cyclone.

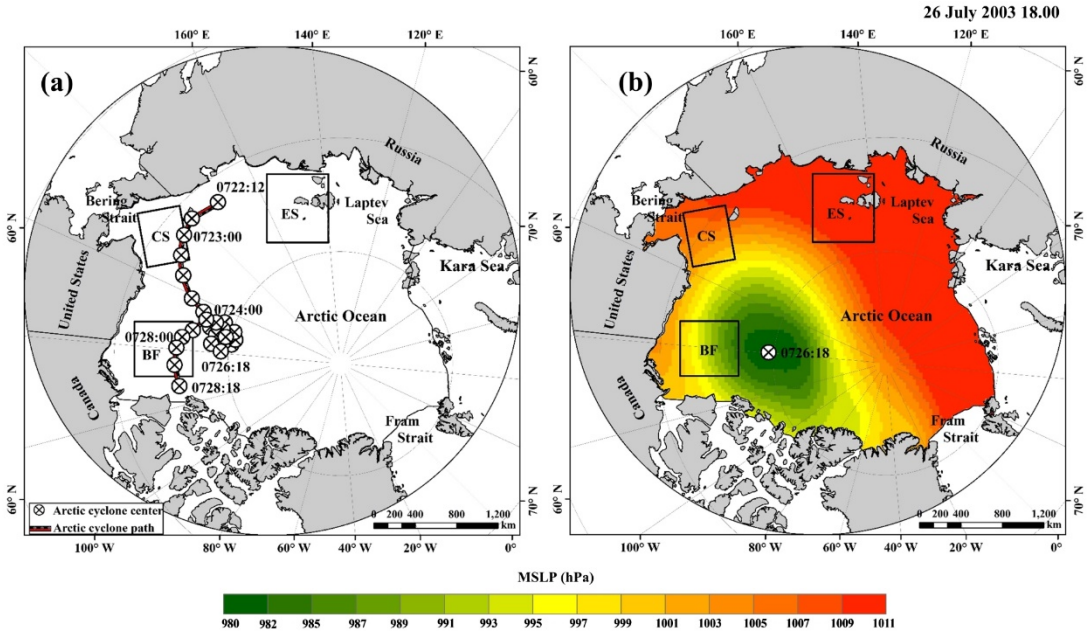

Fig. S2. (a) Path of the 20030722 Arctic cyclone and (b) the spatial distribution of MSLP at 18:00h UTC on 26 July, 2003 (the date format is mmdd:h, where mm denotes the month, dd denotes the day, and h denotes the UTC hour.

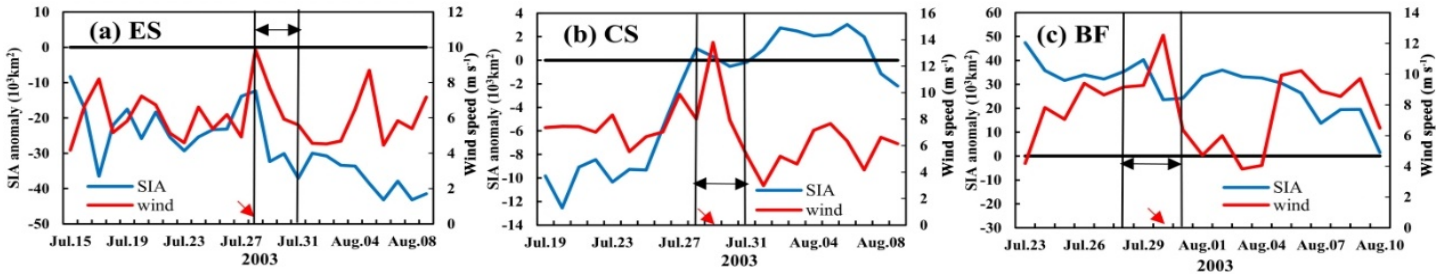

Fig. S3. Average daily variations in the SIA anomaly and wind speed in the (a) ES, (b) CS and (c) BF regions (see Fig. 1) in 2003. The black "0 line" represents the average SIA in 2003-2016; the black arrow shows the transit time of the selected cyclone, and the red arrow shows the date when the cyclone was closest to the subregion.