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Supplementary

Greenland Ice Sheet Surface Runoff Projections to 2200 Using Degree-Day Methods

Chao Yue [1], Liyun Zhao [1,2,*], Michael Wolovick [1,3] and John C. Moore [1,4,5]

[1] College of Global Change and Earth System Science, Beijing Normal University, Beijing 100875, China
yuechao.bnu@gmail.com (C.Y.); michael.wolovick@gmail.com (M.W.); john.moore.bnu@gmail.com (J.C.M.)
[2] Southern Marine Science and Engineering Guangdong Laboratory, Zhuhai 510301, China
[3] Alfred Wegener Institute, 27568 Bremerhaven, Germany
[4] CAS Center for Excellence in Tibetan Plateau Earth Sciences, Beijing 100101, China
[5] Arctic Centre, University of Lapland, 96101 Rovaniemi, Finland
* Correspondence: zhaoliyun@bnu.edu.cn

Introduction

Supporting Fig.S1 shows the downscaled and bias-corrected snowfall by individual ESM under RCP4.5 and RCP8.5 scenarios over Greenland ice sheet. Fig.S2–S4 and Table S1 mainly show the comparison between modeled and observed near-surface air temperature and AWS position over Greenland ice sheet.

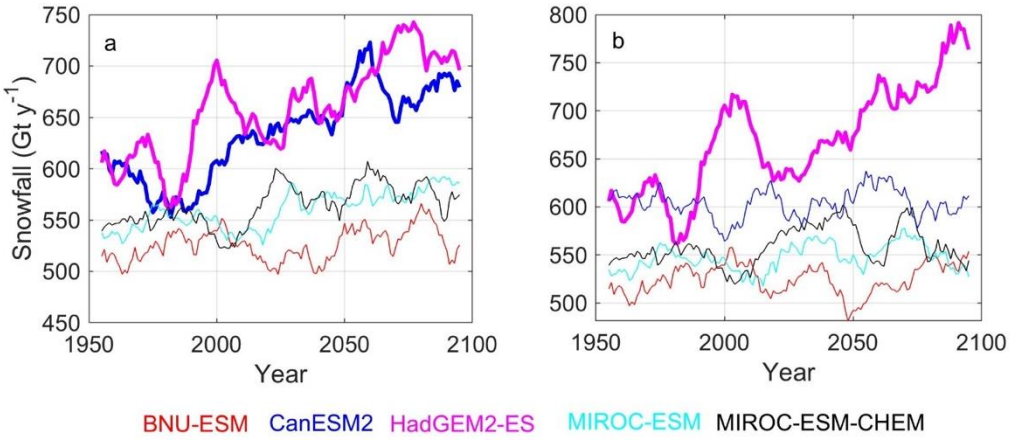

Figure S1. Downscaled and bias-corrected snowfall from BNU-ESM (red), CanESM2 (blue), HadGEM2-ES (magenta), MIROC-ESM (cyan) and MIROC-ESM-CHEM (black) under RCP4.5(a) and RCP8.5 (b) during 1950–2100. Thick curves indicate that significant trend in snowfall through Mann-Kendall test at 95% level.

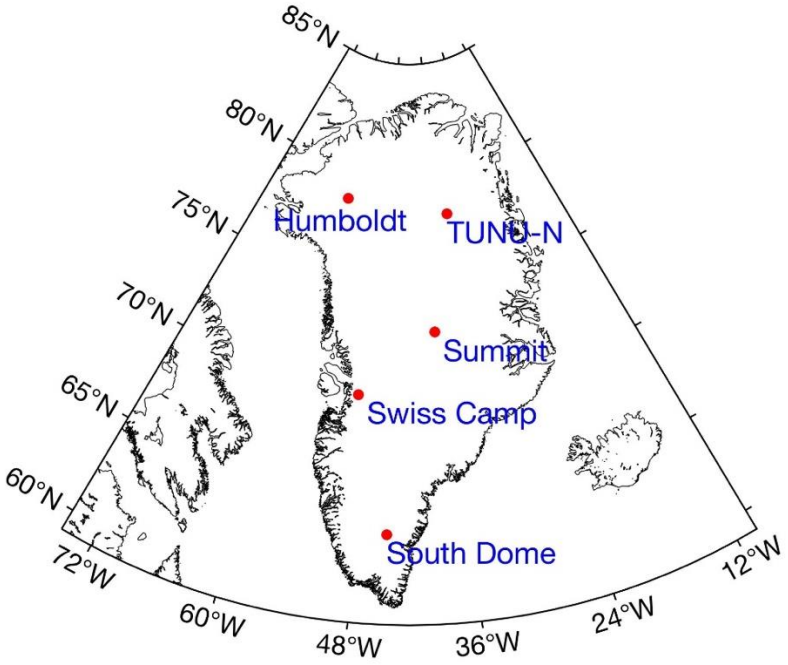

Figure S2. Map of AWS observations over GrIS.

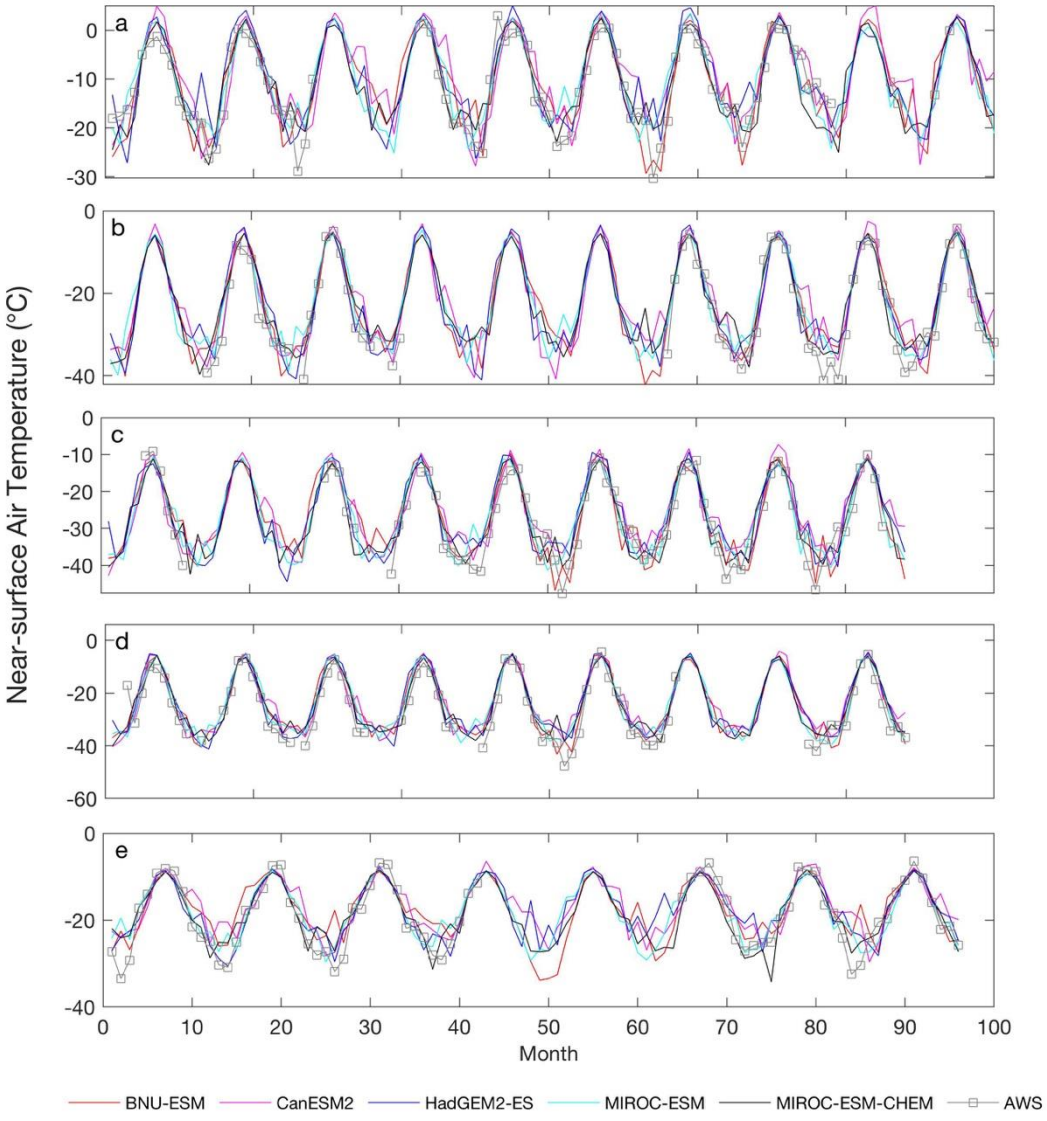

Figure S3. Historical monthly near-surface air temperature over GrIS site Swiss Camp (a), Humboldt (b), Summit (c), TUNU-N (d) and South Dome (e) from BNU-ESM (red), CanESM2 (magenta), HadGEM2-ES (blue), MIROC-ESM (cyan), MIROC-ESM-CHEM (black) and AWS observation (gray). ESMs are downscaled and bias-corrected by ISI-MIP. Note that Swiss Camp and Humboldt are during the period of 1996–2005, Summit and TUNU-N are 1997–2005, South Dome is 1998–2005.

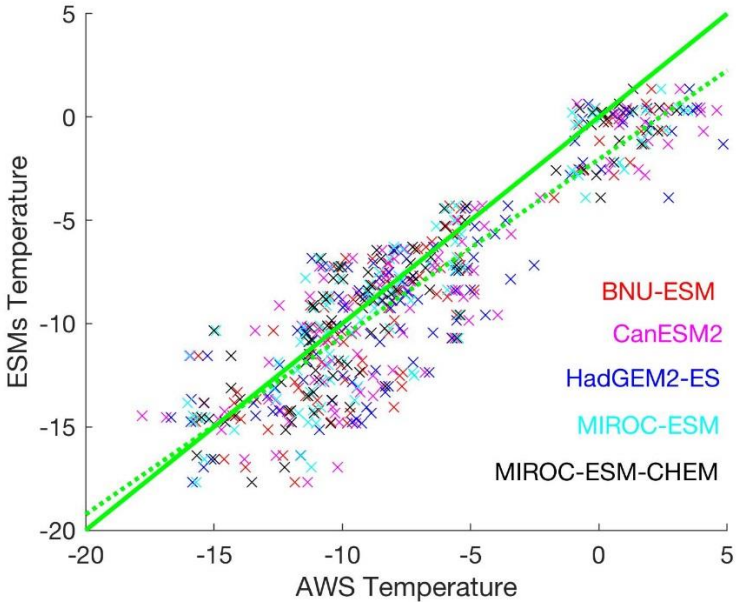

Figure S4. Scatter plot of historical summer season (JJA) monthly mean near-surface air temperature (°C) that downscaled and bias-corrected from BNU-ESM (red), CanESM2 (magenta), HadGEM2-ES (blue), MIROC-ESM (cyan) and MIROC-ESM-CHEM (black) versus that observed by AWS over GrIS site Swiss Camp, Humboldt, Summit, TUNU-N and South Dome. Solid green line shows the one-to-one line and dotted line shows linear fitted line by 5 ESMs. Note that temperatures at Swiss Camp and Humboldt were observed during the period 1996–2005, Summit and TUNU-N 1997–2005, South Dome 1998–2005.

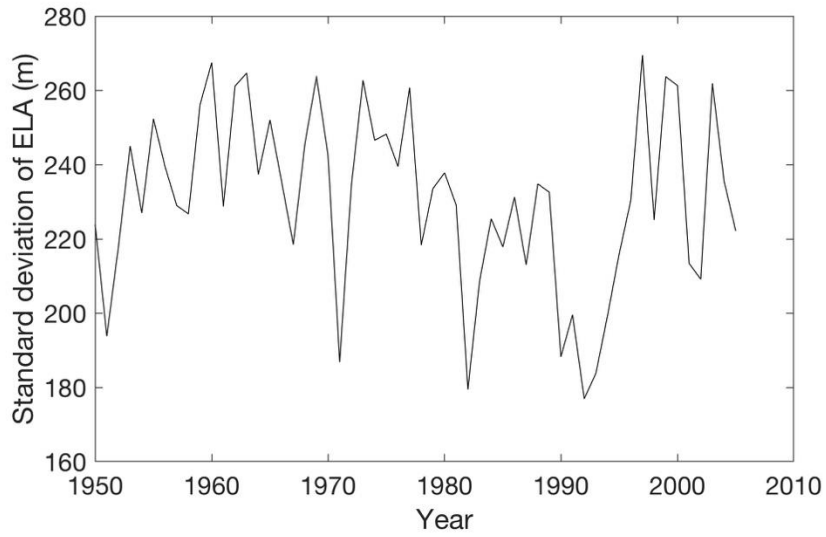

Figure S5. Annual standard deviation of ELA over GrIS modeled by SEMIC from ensemble mean of BNU-ESM, HadGEM2-ES, MIROC-ESM, MIROC-ESM-CHEM and CanESM2.

Table S1. AWS position over GrIS.

Station Name	Latitude	Longitude	Elevation (m)
Swiss Camp	69° 34′ 06″ N	49° 18′ 57″ W	1149
Humboldt	78° 31′ 36″ N	56° 49′ 50″ W	1995
Summit	72° 34′ 47″ N	38° 30′ 16″ W	3254
TUNU-N	78° 01′ 0″ N	33° 59′ 38″ W	2113
South Dome	63° 08′ 56″ N	44° 49′ 00″ W	2922