Supplementary Material

Characterization of Canadian High Arctic glacier surface albedo from MODIS C6 data, 2001-2016

Colleen A. Mortimer[1] and Martin Sharp[1]

[1]Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, T6G 2E3, Canada

Correspondence to: Colleen A. Mortimer (cmortime@ualberta.ca)

Contents of this file

Figures S1 to S7

Tables S1 to S2

Introduction

The following figures and tables present data that support, but are not essential. Figures S1-S3 present the mean June, July, and August for the period 2001-2016. Figures S4-S6 present the mean June, July, and August BSA anomalies, with respect to the 2001-2016 mean, for the period 2001-2016. Figure S7 presents the 16 year (2001-2016 average) mean summer LST and the rate of change of the mean summer LST. Table S1 presents the percentage of pixels having BSA observations according to the criteria outlined in Sect. 2.3. Table S2 presented the area-averaged mean summer BSA for the eight major glaciated regions in the QEI.

Table S1: Percentage of QEI ice cover having mean summer and monthly BSA observations.

Year	JJA*	June^	July†	August†
2001	78.5	82.3	96.4	92.3
2002	80.0	93.3	94.1	87.0
2003	75.6	98.4	99.2	76.4
2004	78.3	96.0	93.1	85.1
2005	94.3	99.2	97.8	96.6
2006	78.8	86.2	95.3	91.2
2007	96.6	98.6	99.1	98.0
2008	90.1	98.4	97.8	92.6
2009	95.9	99.6	98.6	97.2
2010	93.4	99.6	98.1	95.0
2011	96.8	99.5	99.4	97.5
2012	93.6	99.5	99.4	94.6
2013	74.9	91.0	99.1	81.5
2014	89.4	99.4	99.5	90.2
2015	93.7	98.4	99.1	94.9
2016	84.4	97.9	99.2	85.9

*: for each year, % of pixels having at least 45 of a possible 92 observations during June-August as well as having at least 10 observations in each month

^: for each year, % of pixels having at least 10 of a possible 30 observations.

†: for each year, % of pixels having at least 11 of a possible 31 observations.

Table S2: Clear-sky mean summer (JJA) BSA anomaly relative to the 2001-2016 mean for glaciated regions of the QEI (Fig. 1) ± 1 standard deviation.

Year	QEI	Agassiz IC	Axel Heiberg I	Devon I & Coburg I	Manson IF	Meighen IC	Northwest Ellesmere I	Prince of Wales IF	Sydkap IC
2001	0.0226 ± 0.0458	0.0191 ± 0.0406	0.0570 ± 0.0568	-0009 ± 0.0281	0.0099 ± 0.0426	0.0842 ± 0.0329	0.0107 ± 0.0362	0.0464 ± 0.0483	0.0154 ± 0.0400
2002	0.0316 ± 0.0320	0.0279 ± 0.0246	0.0648 ± 0.0370	0.0296 ± 0.0318	0.0279 ± 0.0367	0.0538 ± 0.0216	0.0324 ± 0.0272	0.0249 ± 0.0313	0.0514 ± 0.0340
2003	0.0292 ± 0.0329	0.0188 ± 0.0242	0.0530 ± 0.0316	0.0456 ± 0.0302	0.0527 ± 0.0267	0.0284 ± 0.0285	0.0320 ± 0.0286	0.0048 ± 0.0235	0.0640 ± 0.0361
2004	0.0517 ± 0.0318	0.0376 ± 0.0273	0.0721 ± 0.0336	0.0618 ± 0.0280	0.0721 ± 0.0326	0.0918 ± 0.0385	0.0513 ± 0.0275	0.0416 ± 0.0280	0.0816 ± 0.0344
2005	0.0035 ± 0.0282	-0.0011 ± 0.0167	-0.0266 ± 0.0408	0.0171 ± 0.0262	0.0301 ± 0.0286	-0.0063 ± 0.0334	0.0081 ± 0.0189	-0.0007 ± 0.0263	0.0037 ± 0.0214
2006	0.0030 ± 0.0282	-0.0032 ± 0.10149	-0.0287 ± 0.0411	0.0169 ± 0.0266	0.0301 ± 0.0286	-0.0065 ± 0.0336	0.0078 ± 0.0187	-0.0024 ± 0.0252	0.0048 ± 0.0217
2007	-0.0167 ± 0.0282	-0.0117 ± 0.0245	-0.0408 ± 0.0297	-0.0153 ± 0.0229	-0.0286 ± 0.0239	-0.0486 ± 0.0244	-0.0280 ± 0.0301	0.0004 ± 0.0201	-0.0374 ± 0.0219
2008	-0.0117 ± 0.0212	-0.0115 ± 0.0151	-0.0232 ± 0.0303	-0.0070 ± 0.0216	-0.0061 ± 0.0234	-0.0458 ± 0.0192	-0.0116 ± 0.0178	-0.0129 ± 0.0200	-0.0077 ± 0.0318
2009	-0.0177 ± 0.0220	-0.0087 ± 0.0167	-0.0174 ± 0.0286	-0.0228 ± 0.0214	-0.0349 ± 0.0233	-0.0180 ± 0.0271	-0.0119 ± 0.0194	-0.0216 ± 0.0205	-0.0217 ± 0.0240
2010	-0.0021 ± 0.0307	0.0058 ± 0.0175	0.0343 ± 0.0265	-0.0384 ± 0.0232	-0.0307 ± 0.0190	0.0102 ± 0.0381	-0.0042 ± 0.0223	0.0131 ± 0.0220	-0.0239 ± 0.0213
2011	-0.0651 ± 0.0326	-0.0449 ± 0.0256	-0.0908 ± 0.0314	-0.0717 ± 0.0332	-0.0845 ± 0.0235	-0.1286 ± 0.0254	-0.0698 ± 0.0289	-0.0556 ± 0.0258	-0.1026 ± 0.0356
2012	-0.0516 ± 0.0309	-0.0618 ± 0.0272	-0.0698 ± 0.0281	-0.0173 ± 0.0245	-0.0515 ± 0.0250	-0.0982 ± 0.0360	-0.0467 ± 0.0229	-0.0624 ± 0.5270	-0.0513 ± 0.0271
2013	0.0604 ± 0.0431	0.0502 ± 0.0346	0.0957 ± 0.0527	0.0419 ± 0.0319	0.0577 ± 0.0306	0.1404 ± 0.0478	0.0488 ± 0.0312	0.0798 ± 0.0502	0.0666 ± 0.0323
2014	0.0153 ± 0.0245	0.0053 ± 0.0180	0.0176 ± 0.0245	0.0277 ± 0.0280	0.0302 ± 0.0209	0.0957 ± 0.0296	0.0156 ± 0.0200	0.0114 ± 0.0249	0.0240 ± 0.0271
2015	-0.0223 ± 0.0248	-0.0214 ± 0.0170	-0.0403 ± 0.0327	-0.0156 ± 0.0234	-0.0121 ± 0.0245	-0.0689 ± 0.0278	-0.0121 ± 0.0199	-0.0318 ± 0.0232	-0.0130 ± 0.0320
2016	-0.0048 ± 0.0334	0.0168 ± 0.0181	0.0103 ± 0.0397	-0.0328 ± 0.0284	-0.0411 ± 0.0338	-0.0764 ± 0.0290	0.0015 ± 0.0275	-0.0040 ± 0.0274	0.0005 ± 0.0265

*pixels having mean summer (JJA) BSA observations in at least 11 of a possible 16 years (see Sect. 2.3)

25

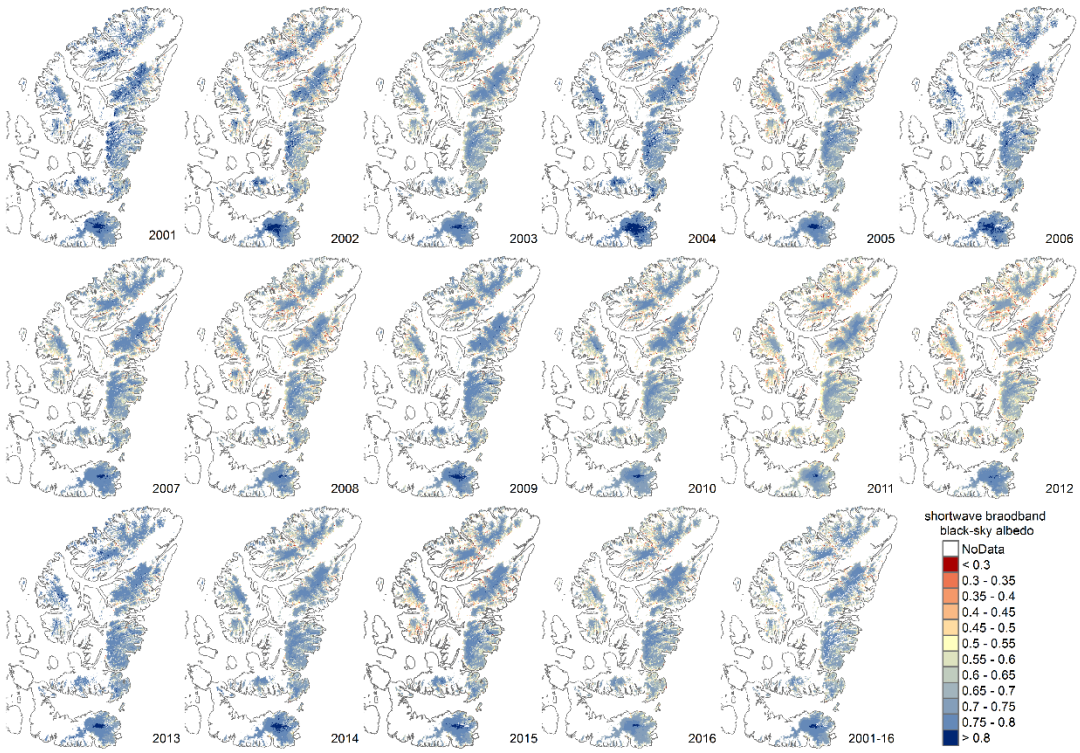

Figure S1: Mean June clear-sky shortwave broadband black-sky albedo for the QEI.

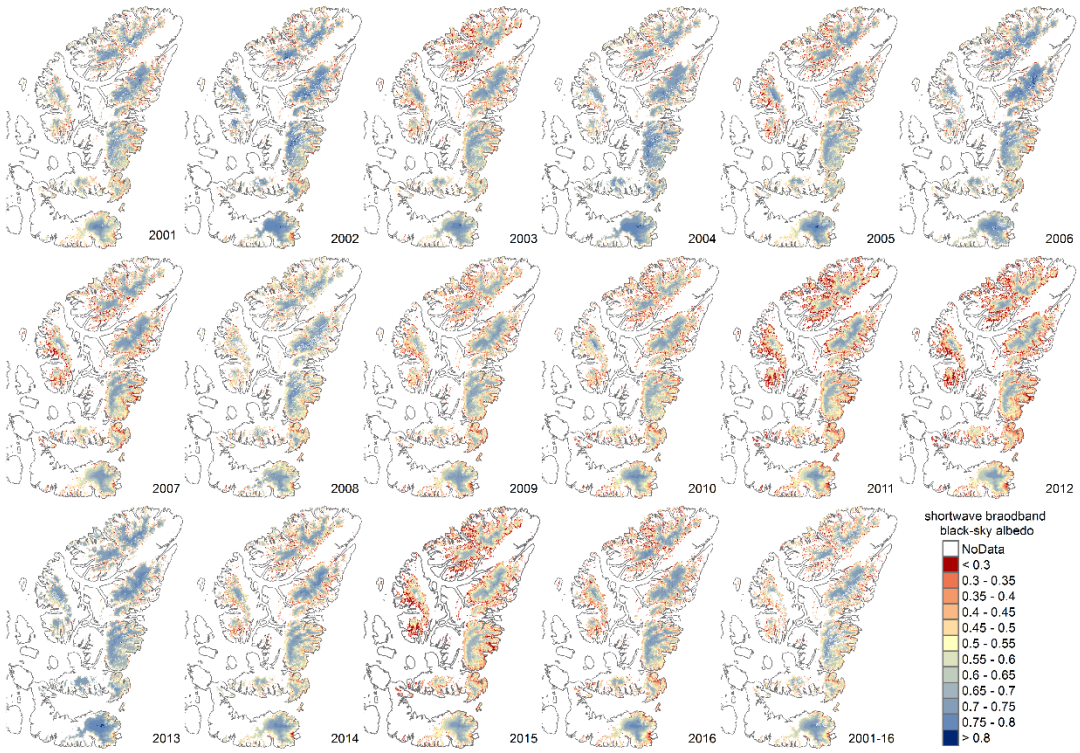

Figure S2: Mean July clear-sky shortwave broadband black-sky albedo for the QEI.

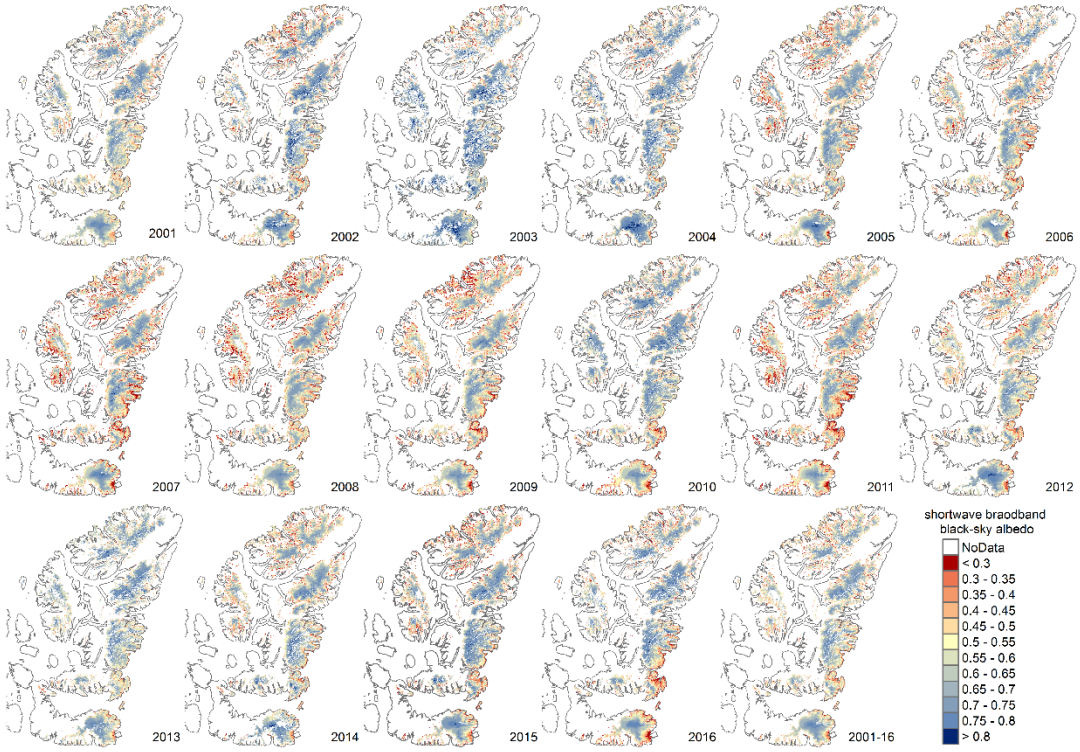

Figure S3: Mean August clear-sky shortwave broadband black-sky albedo for the QEI.

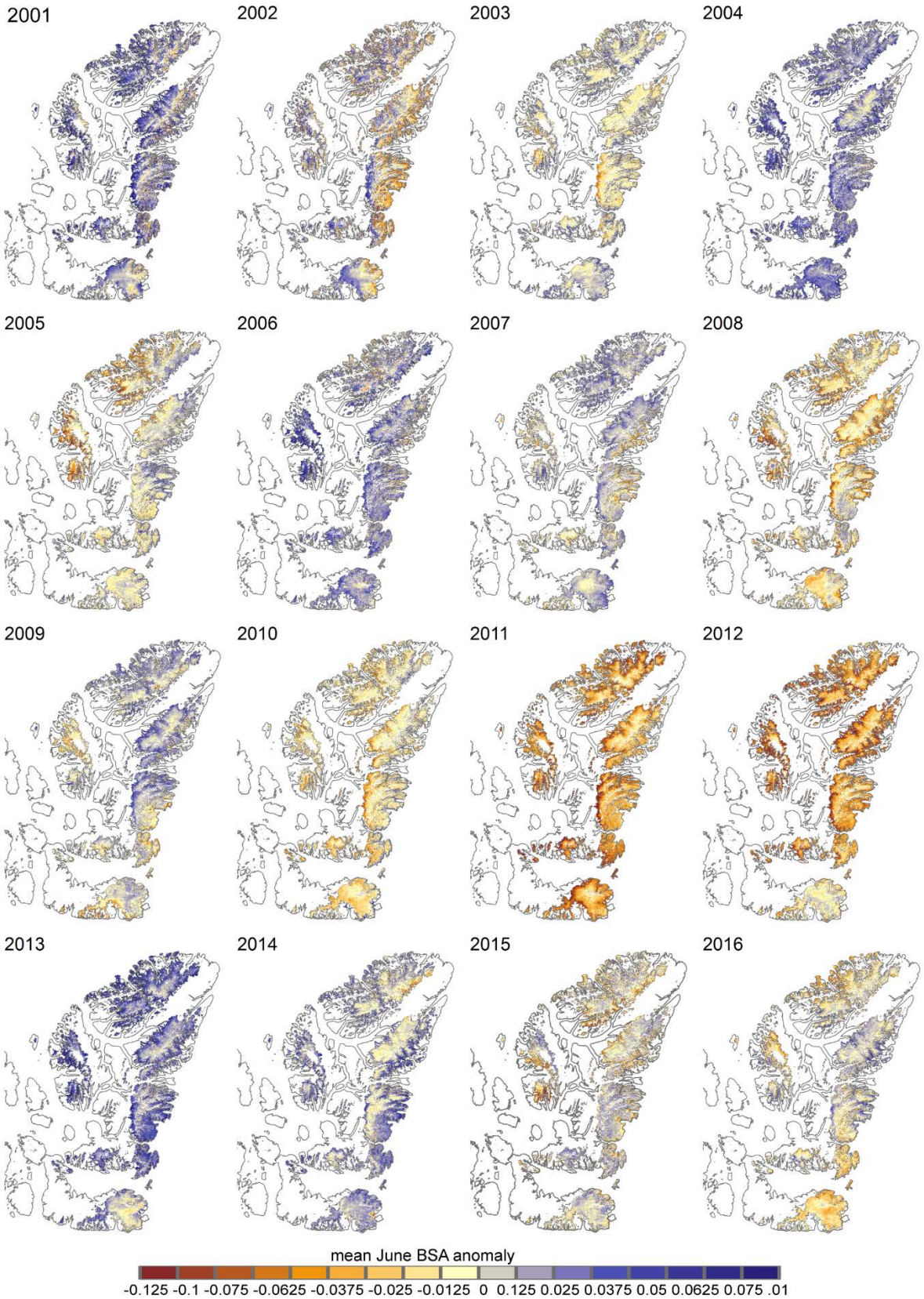

Figure S4: Mean June clear-sky BSA anomaly relative to the 2001-2016 mean for the QEI.

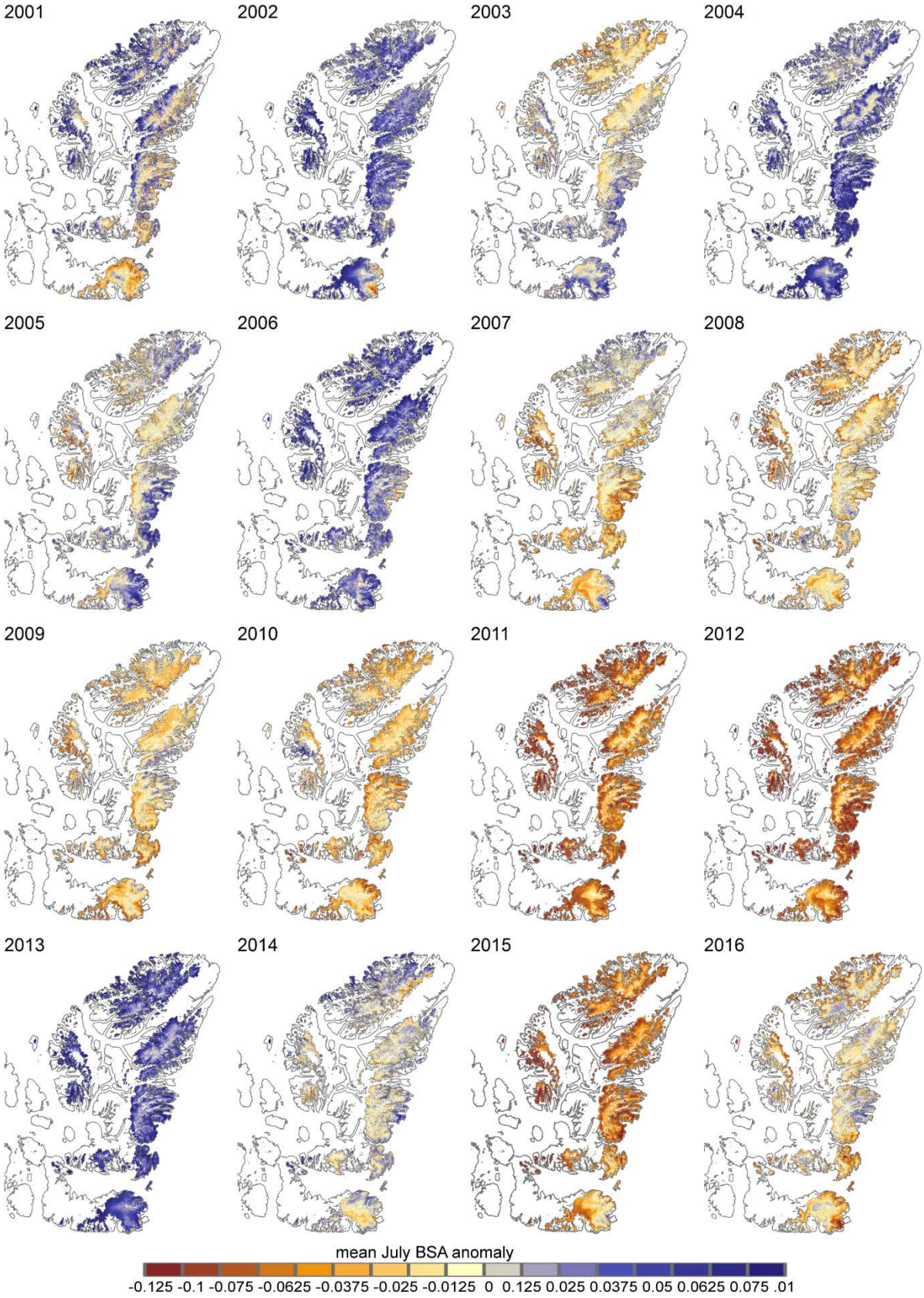

Figure S5: Mean July clear-sky BSA anomaly relative to the 2001-2016 mean for the QEI.

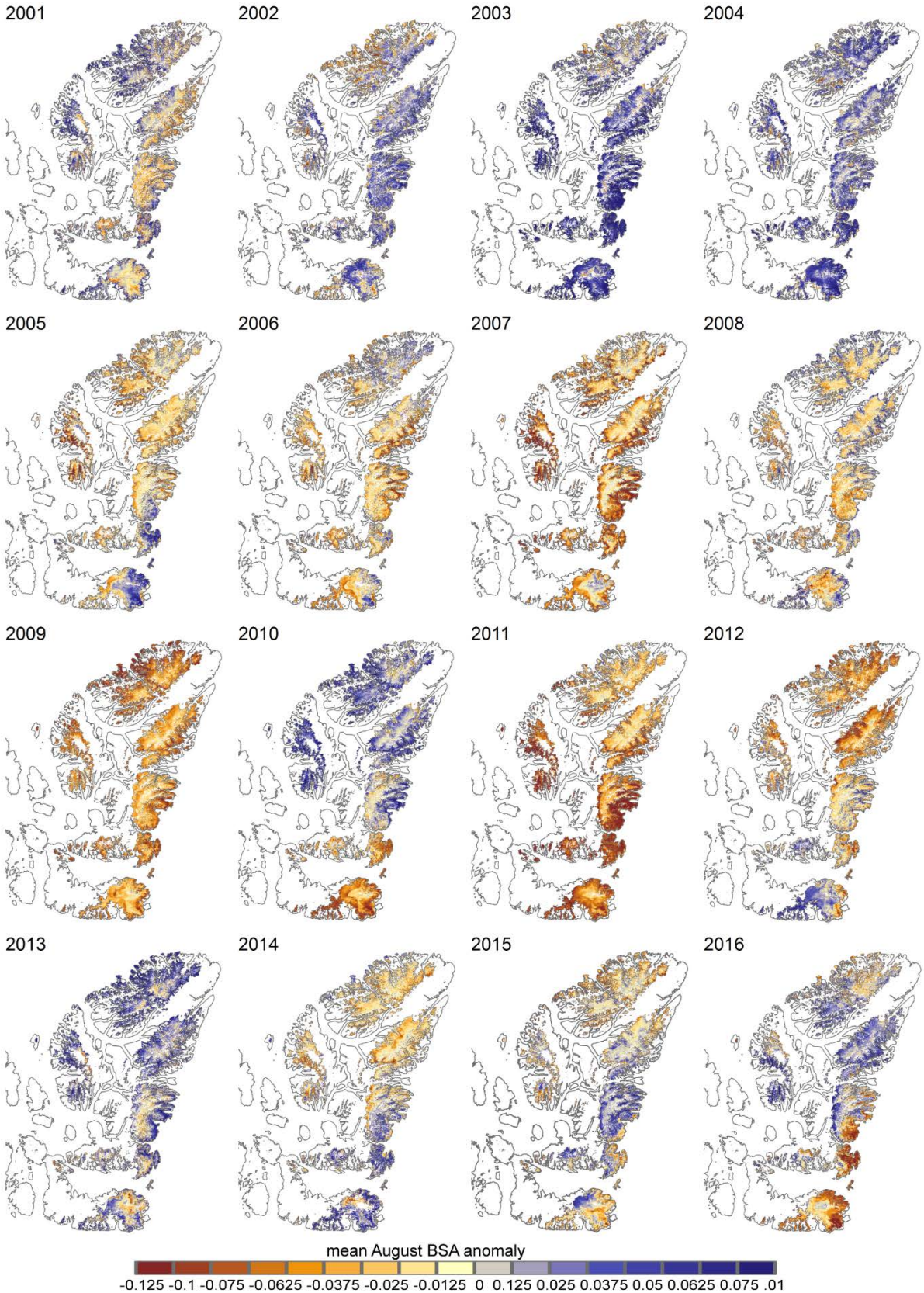

Figure S6: Mean August clear-sky BSA anomaly relative to the 2001-2016 mean for the QEI.

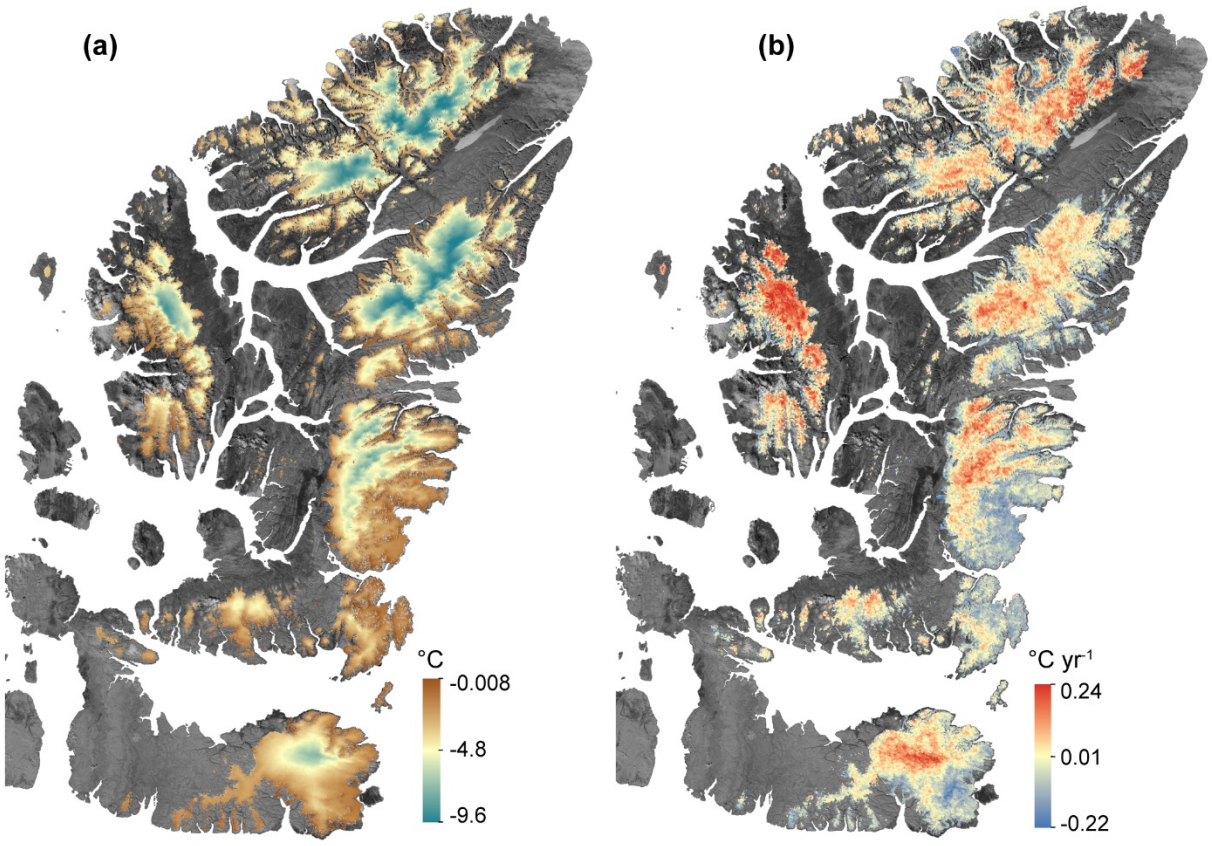

Figure S7: QEI (a) 16 year average mean summer land surface temperature (°C) and (b) linear rate of change of mean summer LST (°C yr^{-1}) for the period 2001-2016.