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Physically based model of the contribution of red snow algal cells to temporal changes in albedo in northwest Greenland

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Supplement

Table S1: Meteorological conditions (10:00 LT) and snow layer depth from mid-June to early August at the study site for the PBSAM.

Day of the year	Solar zenith angle (degree)	Solar azimuth (degree)	Ratio of direct and diffuse radiation	Downward shortwave radiation (W m^{-2})	Snow layer depth (cm)
168	62.8	105.1	0.2	421.6	142.0
176	62.9	104.6	1.0	268.9	135.0
181	63.1	104.4	0.4	415.1	110.0
190	64.0	104.3	0.4	400.9	80.0
197	65.0	104.3	0.7	330.2	61.0
203	66.1	104.5	1.0	136.8	44.0
209	67.4	104.8	0.8	176.9	34.0
215	68.8	105.2	1.0	84.9	19.0

Table S2: Meteorological conditions (11:00 LT) from mid-June to early August at the study site for the PBSAM.

Day of the year	Solar zenith angle (degree)	Solar azimuth (degree)	Ratio of direct and diffuse radiation	Downward shortwave radiation (W m^{-2})
168	59.8	120.4	0.2	487.1
176	59.9	120.0	0.9	455.2
181	60.1	119.7	0.4	478.8
190	61.0	119.5	0.4	465.8
197	62.0	119.5	0.6	245.3
203	63.1	119.7	1.0	155.7
209	64.4	120.0	0.9	195.8
215	65.9	120.4	0.8	161.6

Table S3: Meteorological conditions (12:00 LT) from mid-June to early August at the study site for the PBSAM.

Day of the year	Solar zenith angle (degree)	Solar azimuth (degree)	Ratio of direct and diffuse radiation	Downward shortwave radiation (W m^{-2})
168	57.2	136.3	0.2	551.7
176	57.3	135.8	0.5	535.4
181	57.6	135.6	0.4	535.4
190	58.5	135.3	0.4	523.6
197	59.5	135.3	0.6	362.0
203	60.6	135.4	1.0	191.0
209	61.9	135.6	0.9	209.9
215	63.3	136.0	0.7	344.3

Table S4: Snow properties of the snow surface layer (depth = 0–2 cm) at the study site, derived from snow pit observations and used in the albedo model. The mass concentrations of OC were calculated from observed algal cell concentrations by equation (3). Because mass concentration of MD was not observed on day 168, that on day 168 was assumed to be same as that on day 176.

Day of the year	Snow grain size (mm)	Snow water equivalent (kg m^{-2})	Snow temperature (°C)	Mass concentration of mineral dust (mg L^{-1})	Mass concentration of black carbon (mg L^{-1})	Mass concentration of organic carbon (mg L^{-1})
168	0.3	7.7	-0.2	2.7×10^{-1}	2.1×10^{-3}	8.3×10^{-2}
176	0.6	9.7	-0.1	2.7×10^{-1}	4.4×10^{-3}	8.3×10^{-2}
181	0.9	7.0	0.0	1.0	7.8×10^{-3}	8.3×10^{-2}
190	0.7	9.4	0.0	1.5×10	2.5×10^{-2}	8.3×10^{-2}
197	0.7	7.0	-0.1	2.1×10	3.1×10^{-2}	8.3×10^{-2}
203	0.7	10.4	0.0	3.7×10	1.7×10^{-3}	8.8×10^{-2}
209	0.6	7.4	0.0	7.1	5.4×10^{-5}	1.5×10^{-1}
215	0.9	10.2	0.0	7.5×10	3.7×10^{-3}	5.1×10^{-1}

Table S5: Snow properties of the upper snow subsurface layer (depth = 2–5 cm) at the study site, derived from snow pit observations and used in the albedo model. Snow properties of the lower snow subsurface layer (depth = 5–10 cm) are equivalent to the properties of the upper subsurface layer.

Day of the year	Snow grain size (mm)	Snow water equivalent (kg m^{-2})	Snow temperature (°C)	Mass concentration of mineral dust (mg L^{-1})	Mass concentration of black carbon (mg L^{-1})	Mass concentration of organic carbon (mg L^{-1})
168	0.5	11.4	-0.1	3.3×10^{-1}	2.3×10^{-5}	4.9×10^{-2}
176	0.8	12.6	-0.1	3.3×10^{-1}	1.0×10^{-4}	4.9×10^{-2}
181	0.4	13.6	0.0	3.3×10^{-1}	1.0×10^{-3}	4.9×10^{-2}
190	0.7	15.2	0.0	6.4×10^{-1}	1.2×10^{-5}	4.9×10^{-2}
197	1.0	15.6	-0.1	7.2	3.5×10^{-5}	4.9×10^{-2}
203	0.8	14.6	0.0	2.5	3.3×10^{-3}	5.2×10^{-2}
209	1.1	13.8	0.0	2.7×10	5.6×10^{-3}	8.9×10^{-2}
215	1.1	15.3	0.0	1.4×10	1.8×10^{-2}	3.0×10^{-1}