

Pigment composition and photoprotection of Arctic sea ice algae during spring

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Table S1. Initial (before CHEMTAX analysis) and final (optimized after 10 successive runs) marker pigment to chlorophyll *a* ratios for each algal group encountered in the bottom sea ice. Matrices are shown for the two snow cover conditions (thin and thick) during the three snow periods. Empty pigment columns indicate that these pigments were absent or that CHEMTAX results were improved by removing some pigments from the analysis. Pigment abbreviations: Chl *c*₃ = chlorophyll *c*₃; Chl *c*₂ = chlorophyll *c*₂; Chl *c*₁ = chlorophyll *c*₁; MgDVP = Mg-2,4-divinyl pheophytin *a*₅ monomethyl ester; Peri = peridinin; Fuco = fucoxanthin; Neo = neoxanthin; Viola = violaxanthin; Allo = alloxanthin; Zea = zeaxanthin; Lut = lutein; Chl *b* = chlorophyll *b* and Chl *a* = chlorophyll *a*. RMS: root mean square error.

Class/Pigment	Chl <i>c</i> ₃	Chl <i>c</i> ₂	Chl <i>c</i> ₁	MgDVP	Peri	Fuco	Neo	Viola	Allo	Chl <i>b</i>	Chl <i>a</i>
<i>Initial ratio matrix – before snow events under thin snow cover</i>											
Prasino 2	0	0		0.023	0	0	0.056	0.055	0	0.786	1
Dino 1	0	0.162		0.004	0.675	0	0	0	0	0	1
Crypto	0	0.204		0	0	0	0	0	0.253	0	1
Diatom 2	0.066	0.299		0	0	0.755	0	0	0	0	1
<i>Output ratio matrix – before snow events under thin snow cover (RMS=0.02)</i>											
Prasino 2	0	0		0.111	0	0	0.719	0.526	0	4.408	1
Dino 1	0	0.627		0.015	5.997	0	0	0	0	0	1
Crypto	0	7.677		0	0	0	0	0	0.752	0	1
Diatom 2	0.014	0.066		0	0	0.450	0	0	0	0	1

Class/Pigment	Chl c_3	Chl c_2	Chl c_1	MgDVP	Peri	Fuco	Neo	Viola	Allo	Chl b	Chl a
<i>Initial ratio matrix – before snow events under thick snow cover</i>											
Prasino 2	0		0	0.023		0			0	0.729	1
Dino 1	0		0	0		0			0.253	0.000	1
Crypto	0		0	0		0			0	0.330	1
Diatom 2	0.066		0	0		1.100			0	0	1
Diatom 1	0		0.110	0		0.722			0	0	1
<i>Output ratio matrix – before snow events under thick snow cover (RMS = 0.0003)</i>											
Prasino 2	0		0	0.0003		0			0	3.403	1
Dino 1	0		0	0		0			0.288	0	1
Crypto	0		0	0		0			0	0.003	1
Diatom 2	0.035		0	0		0.511			0	0	1
Diatom 1	0		0.0002	0		0.832			0	0	1

Class/Pigment	Chl c_3	Chl c_2	Chl c_1	MgDVP	Peri	Fuco	Neo	Viola	Allo	Chl b	Chl a
<i>Initial ratio matrix – during snow events</i>											
Prasino 2	0	0	0	0.023	0	0			0	0.786	1
Dino 1	0	0.282	0	0.004	0.714	0			0	0	1
Crypto	0	0.170	0	0	0	0			0.278	0.330	1
Diatom 2	0.066	0.299	0	0	0	1.100			0	0	1
Diatom 1	0	0.189	0.070	0	0	0.700			0	0	1
<i>Output ratio matrix – during snow events (RMS = 0.04)</i>											
Prasino 2	0	0	0	0.012	0	0			0	0.108	1
Dino 1	0	0.072	0	0.004	0.714	0			0	0	1
Crypto	0	0.526	0	0	0	0			0.321	0.706	1
Diatom 2	0.046	0.084	0	0	0	0.511			0	0	1
Diatom 1	0	0.160	0.0014	0	0	0.545			0	0	1

Class/Pigment	Chl c_3	Chl c_2	Chl c_1	MgDVP	Peri	Fuco	Neo	Viola	Allo	Zea	Lut	Chl b	Chl a
<i>Initial ratio matrix – during snow events</i>													
Prasino 2	0	0		0.023	0.000	0	0.120	0.160	0	0	0.009	0.945	1
Dino 1	0	0.300		0.008	1.063	0	0	0	0	0	0	0	1
Crypto	0	0.200		0	0.000	0	0	0	0.229	0	0	0	1
Diatom 2	0	0		0	0	0	0.020	0.040	0	0.009	0.203	0.263	1
Diatom 1	0.066	0.299		0	0	0.755	0	0	0	0	0	0	1
<i>Output ratio matrix – snow melt (RMS=0.05)</i>													
Prasino 2	0	0		0.096	0	0	0.726	0.670	0	0	0.046	3.695	1
Dino 1	0	0.506		0.014	1.843	0	0	0	0	0	0	0	1
Crypto	0	0.200		0	0	0	0	0	0.903	0	0	0	1
Diatom 2	0	0		0	0	0	0.005	0.010	0	0.003	0.015	0.002	1
Diatom 1	0.025	0.099		0	0	0.554	0	0	0	0	0	0	1

Table S2. Salinity and nutrient concentrations of the filtered seawater (FSW) used for the dilution of bottom ice cores. NO_x: nitrate+ nitrite, PO₄³⁻: phosphate, Si(OH)₄: silicic acid

Variable	Mean ± SD
Salinity (psu)	32
NO _x (μmol l ⁻¹)	4.68 ± 0.45
PO ₄ ³⁻ (μmol l ⁻¹)	0.80 ± 0.06
Si(OH) ₄ (μmol l ⁻¹)	6.06 ± 0.39