Supplementary Material

To what extent do sea ice algae affect the modelled transmittance of photosynthetically active radiation (PAR) to the ice-ocean interface?

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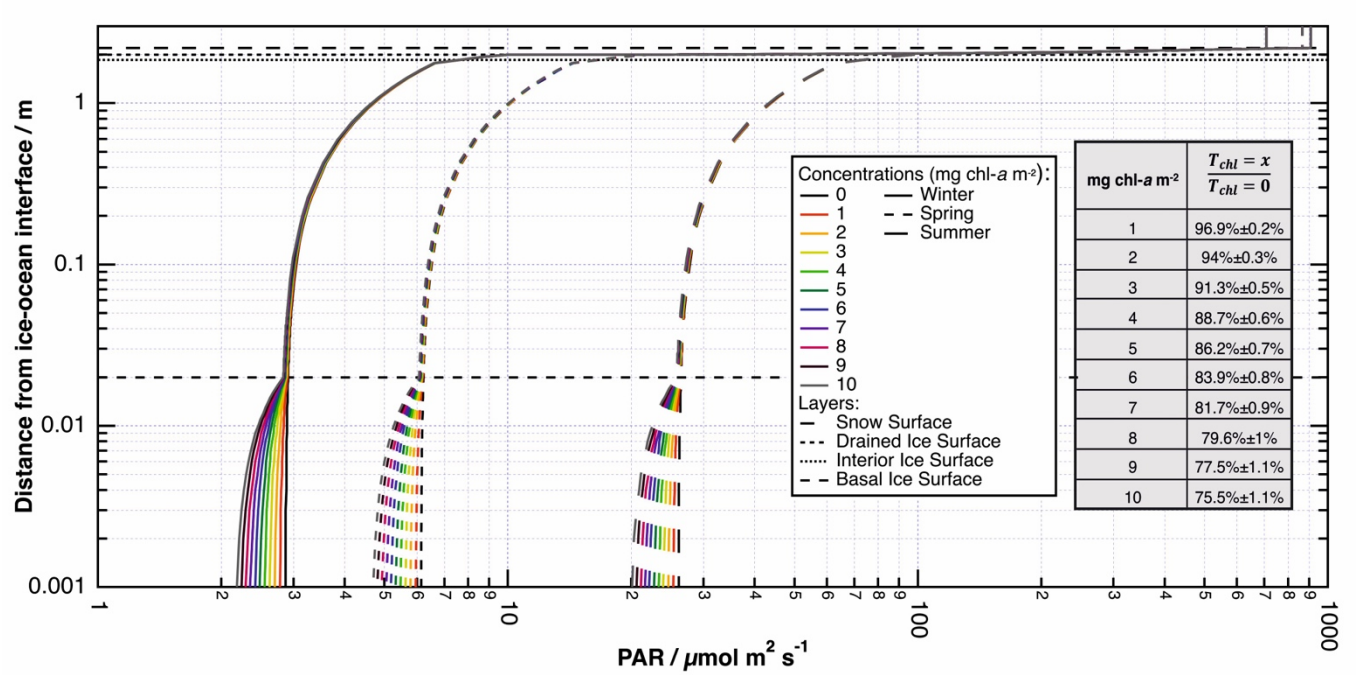

Figure S1. Modelled values of PAR through snow (0.2 m) and sea ice (2 m) layers for the Summer, Spring, and Winter scenarios. The column-integrated concentrations of sea ice algae in the basal 20 mm of the ice increase from 0–10 mg chl-*a* m^{-2}. The change in T_{Rel} as column-integrated concentrations of chl-a increase relative to the algae-free sea ice ($T_{Rel} = \frac{T_{chl=x}}{T_{chl=0}}$) is shown for each seasonal scenario in the boxes.

Table S1. Comparison of T_{Rel} values under bare sea ice conditions with a cloud cover and with clear skies against the averaged Winter, Spring, and Summer scenario values considered in Figure 2. The maximum relative difference between the bare ice conditions and the different seasonal snow-covered conditions varies between 0.06–3.7%.

Chlorophyll Columnar Concentration (mg chl-*a* m^{-2})	$\frac{T_{chl}=x}{T_{chl}=0}$ Bare Ice (2 m) Cloud	Bare Ice (2 m) Clear Sky (60° SZA)	Ice and Snow (2 m + 0.2 m) Averaged over all Scenarios	Maximum Relative Difference
0.2	99.43%	99.43%	99.4%±0.03	±0.06%
2	94.48%	94.60%	94%±0.3%	±0.6%
10	77.22%	77.74%	75.5%±1.2%	±2.2%
20	61.82%	62.56%	59.5%±1.7%	±3.1%
50	35.12%	35.99%	32.3%±2.1%	±3.7%
100	16.66%	17.38%	14.4%±1.7	±3%
150	9.21%	9.72%	7.6%±1.3%	±2.2%
200	5.60%	5.97%	4.4%±0.9%	±1.5%
340	1.85%	2.00%	1.3%±0.4%	±0.7%
500	0.71%	0.79%	0.5%±0.2%	±0.3%

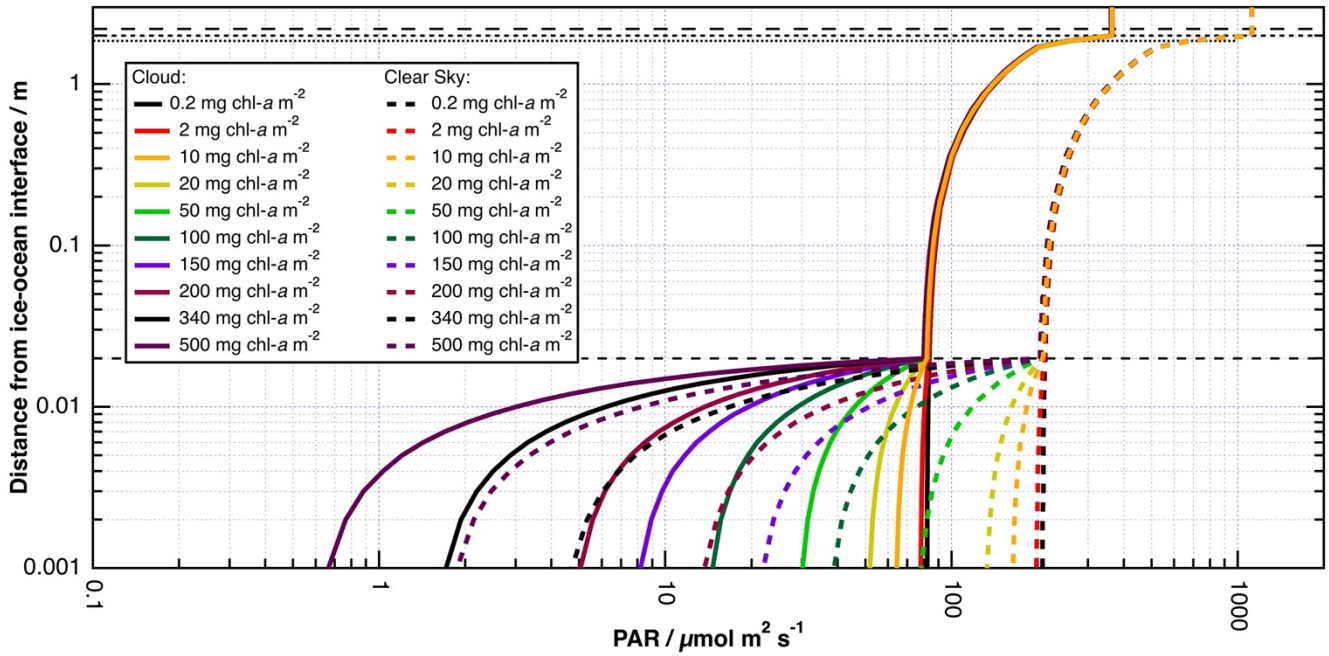

Figure S2. Modelled values of PAR through a 2 m thick sea ice layer under the Spring scenario, with a diffuse cloud layer and clear sky conditions. A comparison of the T_{Rel} values from the bare ice with the snow-covered sea ice is presented in Table S1.

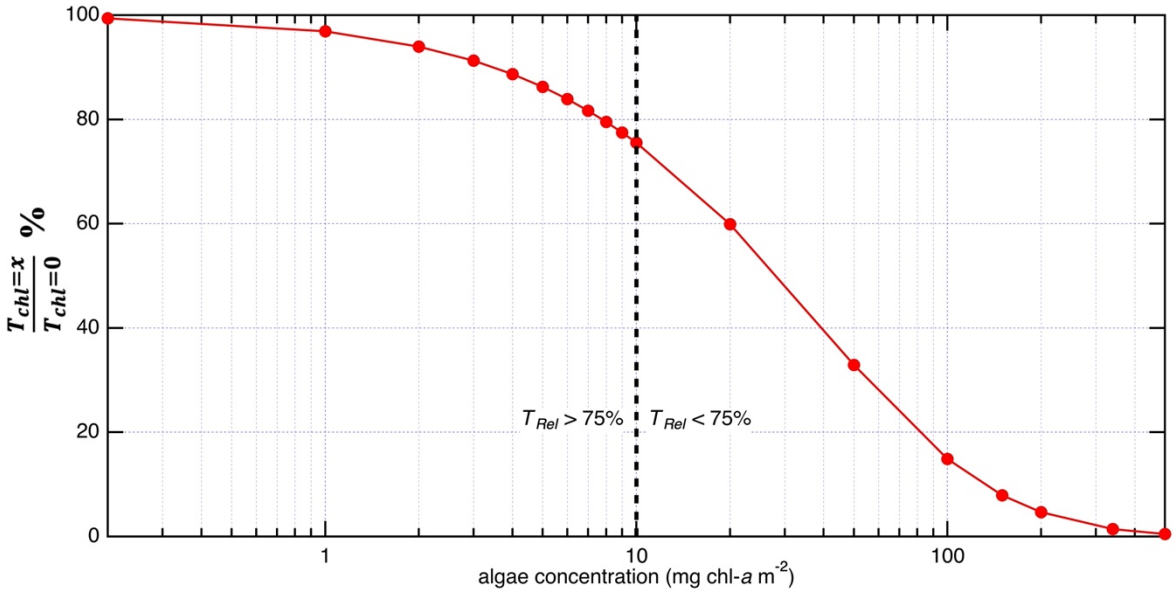

Figure S3. T_{Rel} values against increasing algal concentration. Below 10 mg chl-*a* m^{-2}, the effect on T_{Rel} is small (< 75%), whereas above 10 mg chl-*a* m^{-2}, the effect is large (> 75).