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**Marked Seasonal Changes in the Microbial Production, Community Composition and Biogeochemistry of Glacial Snowpack Ecosystems in the Maritime Antarctic**

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**Contents of this file**

Figure S1  
Tables S1 to S3

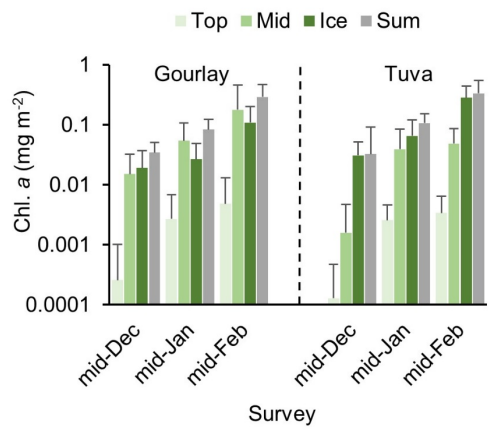
**Introduction**

Figure S1 shows the chlorophyll loading increases (in mg Chl. A m<sup>-2</sup>) at the two snowfields from one survey to the next.

Table 1 shows summary statistics for the snow chemistry data shown in Figure 3a – 3f of the manuscript, this includes the average, standard deviation and median. In each case, there are nine observations.

Table S2 shows the anion composition of snow during the mid-December survey. Values are average  $\pm$  standard deviation of the nine snowpits, followed by the median (underlined). These data are only used to demonstrate low concentrations of strong acid anions and are not otherwise discussed in the main manuscript. The data, and the analytical details are provided here: <https://data.bas.ac.uk/metadata.php?id=GB/NERC/BAS/PDC/00928>

Table S3 shows the best estimates of the cell concentrations (bacteria and autotroph cell counts per mL of snow) and cell loading (bacteria and autotrophs per m<sup>2</sup>). The data represent the entire snow column and were derived by flow cytometry.



**Figure S1.** Changes in chlorophyll *a* loading throughout the study.

Site	pH			NH <sub>4</sub> <sup>+</sup> (mg L <sup>-1</sup> )			TDIC (mg L <sup>-1</sup> )			DOC (mg L <sup>-1</sup> )			Chl. <i>a</i> (µg L <sup>-1</sup> )		
	Mid-Dec	Mid-Jan	Mid-Feb	Mid-Dec	Mid-Jan	Mid-Feb	Mid-Dec	Mid-Jan	Mid-Feb	Mid-Dec	Mid-Jan	Mid-Feb	Mid-Dec	Mid-Jan	Mid-Feb
Gourlay Top	5.25 ± 0.25 <u>5.31</u>	4.80 ± 0.279 <u>4.86</u>	4.49 ± 0.35 <u>4.50</u>	0.055 ± 0.014 <u>0.056</u>	0.138 ± 0.05 <u>0.118</u>	0.062 ± 0.017 <u>0.066</u>	0.467 ± 0.28 <u>0.47</u>	0.490 ± 0.067 <u>0.463</u>	0.697 ± 0.098 <u>0.683</u>	0.274 ± 0.11 <u>0.262</u>	0.212 ± 0.11 <u>0.182</u>	0.288 ± 0.073 <u>0.284</u>	0.007 ± 0.010 <u>0.002</u>	0.028 ± 0.044 <u>0.011</u>	0.060 ± 0.085 <u>0.041</u>
Gourlay Mid	5.25 ± 0.15 <u>5.28</u>	4.78 ± 0.21 <u>4.76</u>	4.32 ± 0.37 <u>4.58</u>	0.041 ± 0.050 <u>0.025</u>	0.104 ± 0.082 <u>0.082</u>	0.015 ± 0.010 <u>0.020</u>	0.438 ± 0.042 <u>0.444</u>	0.499 ± 0.037 <u>0.502</u>	0.665 ± 0.061 <u>0.649</u>	0.137 ± 0.054 <u>0.121</u>	0.241 ± 0.085 <u>0.216</u>	0.241 ± 0.067 <u>0.217</u>	0.040 ± 0.064 <u>0.020</u>	0.152 ± 0.14 <u>0.105</u>	0.400 ± 0.43 <u>0.187</u>
Gourlay Ice	4.20 ± 0.64 <u>4.04</u>	4.83 ± 0.14 <u>4.86</u>	4.35 ± 0.56 <u>4.52</u>	0.039 ± 0.014 <u>0.036</u>	0.173 ± 0.082 <u>0.179</u>	0.032 ± 0.021 <u>0.034</u>	0.399 ± 0.048 <u>0.416</u>	0.483 ± 0.079 <u>0.454</u>	0.739 ± 0.12 <u>0.724</u>	0.634 ± 0.24 <u>0.646</u>	0.821 ± 0.27 <u>0.790</u>	0.507 ± 0.44 <u>0.365</u>	0.029 ± 0.051 <u>0.008</u>	0.175 ± 0.15 <u>0.154</u>	0.789 ± 0.61 <u>0.694</u>
Tuva Top	5.51 ± 0.33 <u>5.52</u>	4.84 ± 0.30 <u>4.84</u>	4.58 ± 0.28 <u>4.57</u>	0.052 ± 0.013 <u>0.052</u>	0.065 ± 0.021 <u>0.065</u>	0.076 ± 0.016 <u>0.071</u>	0.550 ± 0.11 <u>0.536</u>	0.261 ± 0.073 <u>0.261</u>	0.777 ± 0.13 <u>0.739</u>	0.263 ± 0.085 <u>0.276</u>	0.521 ± 0.067 <u>0.521</u>	0.405 ± 0.13 <u>0.352</u>	0.001 ± 0.004 <u>0.000</u>	0.028 ± 0.023 <u>0.028</u>	0.037 ± 0.044 <u>0.027</u>
Tuva Mid	5.39 ± 0.27 <u>5.33</u>	4.89 ± 0.22 <u>4.89</u>	4.42 ± 0.34 <u>4.48</u>	0.034 ± 0.26 <u>0.026</u>	0.311 ± 0.48 <u>0.311</u>	0.012 ± 0.008 <u>0.012</u>	0.496 ± 0.088 <u>0.469</u>	0.476 ± 0.30 <u>0.476</u>	0.686 ± 0.11 <u>0.666</u>	0.332 ± 0.12 <u>0.333</u>	0.519 ± 0.057 <u>0.519</u>	0.539 ± 0.37 <u>0.491</u>	0.007 ± 0.014 <u>0.000</u>	0.453 ± 0.58 <u>0.453</u>	0.649 ± 0.49 <u>0.500</u>
Tuva Ice	5.39 ± 0.44 <u>5.38</u>	4.77 ± 0.20 <u>4.77</u>	4.37 ± 0.28 <u>4.29</u>	0.026 ± 0.032 <u>0.013</u>	0.337 ± 0.40 <u>0.337</u>	0.020 ± 0.016 <u>0.011</u>	0.396 ± 0.075 <u>0.385</u>	0.744 ± 0.43 <u>0.744</u>	0.732 ± 0.28 <u>0.766</u>	0.470 ± 0.18 <u>0.393</u>	0.525 ± 0.039 <u>0.525</u>	2.37 ± 2.63 <u>1.140</u>	0.138 ± 0.090 <u>0.131</u>	0.292 ± 0.27 <u>0.292</u>	1.267 ± 0.81 <u>1.086</u>

**Table S1.** Summary statistics describing pH, ammonium (NH<sub>4</sub><sup>+</sup>), total dissolved inorganic carbon (TDIC), dissolved organic carbon (DOC) and Chlorophyll *a* (Chl. *A*) in the snow during the three surveys. Values are average ± standard deviation of the nine snowpits, followed by the median (underlined).

Site	SO <sub>4</sub> <sup>2-</sup> (mg L <sup>-1</sup> )	Cl <sup>-</sup> (mg L <sup>-1</sup> )	NO <sub>3</sub> <sup>-</sup> (mg L <sup>-1</sup> )
Gourlay Top	2.97 ± 0.77 <u>3.20</u>	0.053 ± 0.017 <u>0.046</u>	0.713 ± 0.358 <u>0.633</u>
Gourlay Mid	4.54 ± 1.86 <u>4.16</u>	0.029 ± 0.040 <u>0.003</u>	0.694 ± 0.383 <u>0.563</u>
Gourlay Ice	17.8 ± 13.3 <u>16.4</u>	0.034 ± 0.050 <u>0.009</u>	2.55 ± 2.05 <u>2.28</u>
Tuva Top	3.86 ± 1.56 <u>3.12</u>	0.058 ± 0.023 <u>0.065</u>	0.731 ± 0.071 <u>0.759</u>
Tuva Mid	3.68 ± 1.35 <u>4.22</u>	0.048 ± 0.015 <u>0.050</u>	0.757 ± 0.204 <u>0.707</u>
Tuva Ice	6.56 ± 1.65 <u>5.97</u>	0.059 ± 0.161 <u>0.000</u>	1.091 ± 0.303 <u>1.03</u>

**Table S2.** Anion composition of snow during the mid-December survey. Values are average ± standard deviation of the nine snowpits, followed by the median (underlined).

Site/Survey	Autotroph Concentration Cells mL <sup>-1</sup>	Bacterial Concentration Cells mL <sup>-1</sup>	Autotroph Load x 10 <sup>6</sup> m <sup>-2</sup>	Bacterial Load x 10 <sup>6</sup> m <sup>-2</sup>
Gourlay, 1 <sup>st</sup> survey	190 ± 96	1400 ± 640	160 ± 89	1100 ± 810
Gourlay, 2 <sup>nd</sup> survey	250 ± 73	3500 ± 1000	170 ± 68	2400 ± 1200
Gourlay, 3 <sup>rd</sup> survey	470 ± 110	15000 ± 23000	300 ± 110	10000 ± 15000
Tuva, 1 <sup>st</sup> survey	330 ± 110	2300 ± 1000	140 ± 48	980 ± 550
Tuva, 2 <sup>nd</sup> survey	520 ± 290	12000 ± 2900	170 ± 96	4000 ± 2500
Tuva, 3 <sup>rd</sup> survey	130 ± 110	6600 ± 5500	43 ± 37	2200 ± 2600

**Table S3.** Flow cytometry results and the best estimates of autotrophic and bacterial cell abundance during the three surveys at Gourlay and Tuva snowfields. The cell concentrations are the average ± standard deviation of the nine snow pits. “Load” is the average product of the cell concentration and the snow water equivalent depth at each pit.