

Table S1. Sample site designation for libraries deposited in the NCBI Sequence Read Archive (SRA) database.

<b>Library</b>	<b>Collection site</b>
620BA	Palmer Glacier snow
620BB	Palmer Glacier sediments
621EA	Mt. Adams Snowfield snow
621EB	Mt. Adams Snowfield sediments
621GA	Gotchen Glacier snow
621GC	Gotchen Glacier sediments
622I	Eliot Glacier snow
622J	Eliot Glacier sediments
625PA	Collier Glacier snow
625PB	Collier Glacier sediments
625PC	Collier Glacier sediments

Table S2. Photosynthetically active radiation (PAR) values recorded over the time course of each incubation period.

<b>Photosynthetically Active Radiation (<math>\mu\text{mol m}^{-2} \text{s}^{-1}</math>)</b>					
	T = 0	T = 60 min	T = 120 min	T = 240 min	Average
<b>Collier Glacier</b>	1242	1696	1552	1367	1464
	T = 0	T = 60 min	T=120 min		Average
<b>Eliot Glacier</b>	1542	1332	1656		1510
	T = 0	T = 60 min	T = 120	T = 300	Average
<b>Mt. Adams Snowfield</b>	1445	1003	1350	1434	1308

Table S3. *p*-values for t-tests for each comparison of <sup>13</sup>C uptake rates from the Mt. Adams snowfield microcosms at T = 60 min and T = 300 min. *p*-values in bold are below 0.05.

Mt Adams Snowfield	Light T=60 min	PO <sub>4</sub> <sup>3-</sup> T=60 min	NO <sub>3</sub> <sup>-</sup> T=60 min	NH <sub>4</sub> <sup>+</sup> T=60 min	UVblock T=60 min	Dark T=60 min
Light T=60 min	-	0.9969	0.9806	0.7039	0.9981	<b>0.0000</b>
PO <sub>4</sub> <sup>3-</sup> T=60 min		-	0.5668	0.4138	0.8801	<b>0.0000</b>
NO <sub>3</sub> <sup>-</sup> T=60 min			-	0.3374	0.5656	<b>0.0000</b>
NH <sub>4</sub> <sup>+</sup> T=60 min				-	0.4455	<b>0.0000</b>
UV block T=60 min					-	<b>0.0000</b>
Dark T=60 min						-
Mt Adams Snowfield	Light T=300 min	PO <sub>4</sub> <sup>3-</sup> T=300 min	NO <sub>3</sub> <sup>-</sup> T=300 min	NH <sub>4</sub> <sup>+</sup> T=300 min	UVblock T=300 min	Dark T=300 min
Light T=300 min	-	0.9953	0.9998	0.9980	0.3219	<b>0.0000</b>
PO <sub>4</sub> <sup>3-</sup> T=300 min		-	0.9905	1.0000	0.1561	<b>0.0000</b>
NO <sub>3</sub> <sup>-</sup> T=300 min			-	0.9953	0.3590	<b>0.0000</b>
NH <sub>4</sub> <sup>+</sup> T=300 min				-	0.1773	<b>0.0000</b>
UV block T=300 min					-	<b>0.0000</b>
Dark T=300 min						-

Table S4. *p*-values for t-tests for each comparison of <sup>13</sup>C uptake rates from the Eliot Glacier microcosms. *p*-values in bold are below 0.05.

Eliot Glacier	Light	PO <sub>4</sub> <sup>3-</sup>	NO <sub>3</sub> <sup>-</sup>	NH <sub>4</sub> <sup>+</sup>	UV block	Dark
Light	-	0.3013	0.9755	<b>0.0003</b>	<b>0.0098</b>	<b>0.0030</b>
PO <sub>4</sub> <sup>3-</sup>		-	0.1015	<b>0.0000</b>	<b>0.0003</b>	<b>0.0004</b>
NO <sub>3</sub> <sup>-</sup>			-	<b>0.0007</b>	<b>0.0330</b>	<b>0.0006</b>
NH <sub>4</sub> <sup>+</sup>				-	0.2495	<b>0.0000</b>
UV block					-	<b>0.0049</b>
Dark						-



Table S6. Taxonomic classification and the number of sequences assigned to the 10 most abundant eukaryal OTUs. Sediment (Sed); supraglacial snow (Supra); snowfield samples (Snow).

Eukarya														
				Palmer Glacier		Mt Adams Snowfield		Gotchen Glacier		Eliot Glacier		Collier Glacier		
Abundance														
OTU	Phylum <sup>a</sup>	Genus <sup>a</sup>	Closest BlastN match (accession number, percent identity) <sup>b</sup>	Supra	Sed	Supra	Sed	Supra	Sed	Supra	Sed	Supra	Sed	
1	Chlorophyceae	Chlamydomonas	Alpine snow (GU117574, 99%)	6151	294	566	421	1111	67	4162	113	2492	31	3313
2	Chlorophyceae	Chloromonas	Swiss Alps seasonal snow pack (KT184442, 99%)	4384	31	57	57	4355	47	2001	486	2171	79	4111
3	Chlorophyceae	Chlamydomonas	Alpine snow (GU117575, 99%)	411	3463	3470	16	2216	16	211	556	929	4354	741
4	Chlorophyceae	Chloromonas	Mountain snow (EF408044, 100%)	55	664	4384	66	234	57	1355	12	486	211	569
5	Chlorophyceae	Chlamydomonas	Red snow (AB902973, 98%)	417	2395	1389	45	389	251	194	11	1383	44	908
6	Chlorophyceae	Chlamydomonas	Swiss Alps seasonal snow pack (KT184415, 97%)	311	59	516	429	2444	41	338	9	1007	10	378
7	Chlorophyceae	Chlamydomonas	Middle Fork Toklat Glacier (KM87066, 98%)	265	11	476	0	2326	0	0	119	1431	112	762
8	Agaricostilbomycetes	Bensingtonia	Swiss Alps seasonal snow pack (KT184422, 99%)	3	179	0	1690	3	137	1451	5	217	696	864
9	Agaricomycetes	Mycocalia	Paddy soil (KJ021750, 100%)	11	360	7	675	33	439	1234	5	7	793	670
10	Euglenida	Euglena	Copper mine tailings (KM016992, 99%)	12	918	19	632	2	194	1173	11	49	504	39

<sup>a</sup> Phylum and Genus affiliation based on Silva classification.

<sup>b</sup> Environment where the most closely related sequence (based on BLASTN analyses) was recovered from.

Table S7. Taxonomic classification and the number of sequences assigned to the 10 most abundant bacterial OTUs. Sediment (Sed); supraglacial snow (Supra); snowfield samples (Snow).

				Bacteria										
				Palmer Glacier		Mt Adams Snowfield		Gotchen Glacier		Eliot Glacier		Collier Glacier		
				Abundance										
OTU	Phylum <sup>a</sup>	Genus <sup>a</sup>	Closest BlastN match (accession number, percent identity) <sup>b</sup>	Supra	Sed	Snow	Sed	Supra	Sed	Supra	Sed	Supra	Sed	Sed
1	Bacteroidetes	Solitalea	Gulkana Glacier surface (AB464935, 99%)	92	2057	2060	4549	15	3681	101	286	41	972	80
2	Bacteroidetes	Ferruginibacter	Freshwater biofilm (KU221939, 99%)	96	820	1524	709	43	2270	136	2234	47	1090	1293
3	Proteobacteria	Polaromonas	Drinking water treatment plant (KU13256, 100%)	674	1080	1491	494	390	1456	542	1324	357	161	1617
4	Bacteroidetes	Hymenobacter	Kuytun Glacier surface (EU263709, 100%)	30	293	67	26	39	205	110	1509	84	2633	366
5	Proteobacteria	Polaromonas	Lake Taihu (KX365928, 100%)	460	338	1027	293	231	586	401	658	361	281	617
6	Proteobacteria	Acidocella	Glacier ice worm-associated (AB98911, 100%)	39	306	647	1029	18	1392	33	491	28	994	90
7	Proteobacteria	Novosphingobium	Glacier ice worm-associated (AB991104, 100%)	116	94	378	1489	30	464	66	86	31	195	89
8	Actinobacteria	Unclassified	Glacier ice worm-associated (AB98967, 100%)	88	231	331	281	60	253	40	395	111	207	168
9	Proteobacteria	Acidicaldus	Peat soil (LK025473, 100%)	126	764	168	5	8	164	141	234	23	14	312
10	Proteobacteria	Polaromonas	Lake Naheul Huapi (KM132951, 100%)	212	200	165	138	231	208	221	128	216	84	135

<sup>a</sup> Phylum and Genus affiliation based on Silva classification.

<sup>b</sup> Environment where the most closely related sequence (based on BLASTN analyses) was recovered from.

Table S8. Taxonomic classification and the number of sequences assigned to the 10 most abundant archaeal OTUs. Sediment (Sed); supraglacial snow (Supra); snowfield samples (Snow).

Archaea														
OTU	Phylum <sup>a</sup>	Group/Class	Closest BlastN match (environmental) (accession number, percent identity) <sup>b</sup>	Abundance										
				Palmer Glacier		Mt Adams Snowfield		Gotchen Glacier		Eliot Glacier		Collier Glacier		
				Supra	Sed	Snow	Sed	Supra	Sed	Supra	Sed	Supra	Sed	Sed
1	Thaumarchaeota	Soil Crenarchaeotic Group (SCG)	Gas hydrate zone permafrost (KU297806, 100%)	82	1	4	132	3	1	2	19	1	2	3
2	Thaumarchaeota	South African Gold Mine Gp 1 (SAGMCG-1)	Lake Maggiore deep hypolimnion (KP866347, 100%)	12	2	3	0	0	0	86	20	0	3	6
3	Euryarchaeota	Thermoplasmata	Lake Taihu (JN617345, 100%)	11	3	5	0	1	0	0	3	16	0	0
4	Thaumarchaeota	Soil Crenarchaeotic Group (SCG)	Air filter (JQ249548, 100%)	18	1	2	3	14	2	1	1	1	5	4
5	Thaumarchaeota	Soil Crenarchaeotic Group (SCG)	Gas hydrate zone permafrost (KU297799, 99%)	0	0	0	7	0	0	0	0	1	0	0
6	Euryarchaeota	Thermoplasmata	Receding glacier forefield (HM065810, 100%)	2	0	0	0	0	0	3	1	1	0	0
7	Euryarchaeota	Thermoplasmata	Bioleaching system of Dexing copper (KT067921, 100%)	1	3	0	2	0	1	0	1	4	0	1
8	Euryarchaeota	Thermoplasmata	Yellow brown soil (KP018525, 100%)	3	0	1	0	1	0	3	1	1	1	0
9	Thaumarchaeota	Marine Group I	Antarctic surface seawater (KF558563, 99%)	1	0	1	0	2	0	1	0	1	2	0
10	Euryarchaeota	Thermoplasmata	Freshwater sediment (GU257191, 99%)	1	2	1	0	3	0	0	0	1	0	0

<sup>a</sup> Phylum and Group/Class affiliation based on Silva classification.

<sup>b</sup> Environment where the most closely related sequence (based on BLASTN analyses) was recovered from.