

LIFE RESPONDS TO ANTARCTIC WARMING

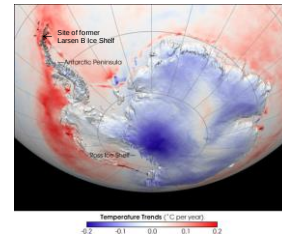


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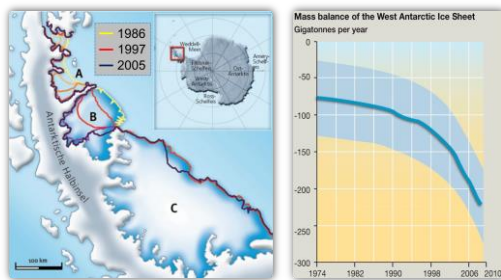
Antarctica is undergoing environmental change



- Most rapidly warming part of southern hemisphere 1950's-2000
- Warming has now stopped
- Precipitation changing



Breakup of ice sheets and melting of glaciers



- Ice sheets such as the Wilkins and Larsen A & B have completely disintegrated



Maritime Antarctic terrestrial environments

- Ice-free terrestrial environments are dominated by vegetation-free soils
- These soils harbour microorganisms that drive nutrient cycles



- Little is known about the response of these organisms to environmental change

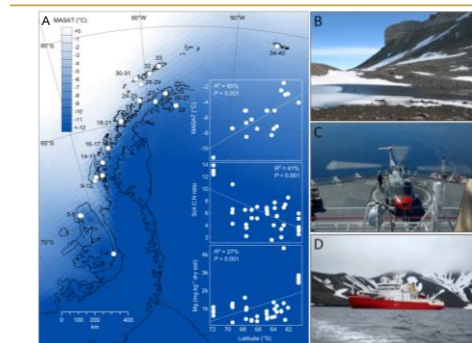


Key objectives

- Characterise the microbial diversity of maritime Antarctic soils
- Identify the environmental factors that most strongly influence microbial diversity



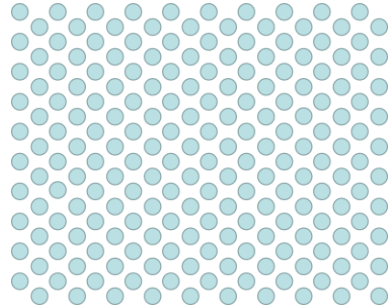
Sample collection



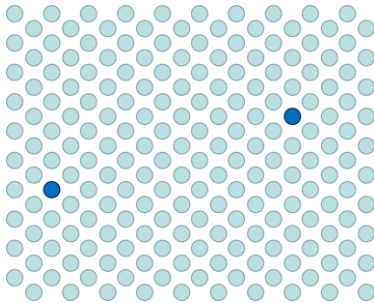
99% of soil microbes are difficult to culture



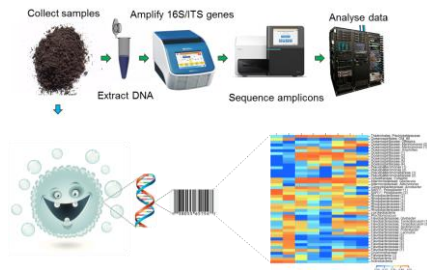
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Culture independent analysis of bacteria and fungi



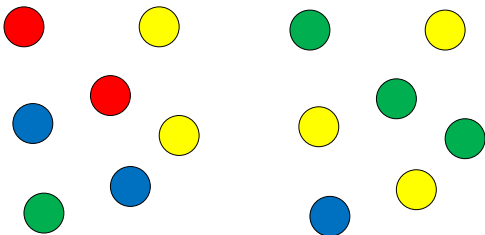
- Facilitates measurement of who's there and at what abundance



Which community is richer?

• Community 1

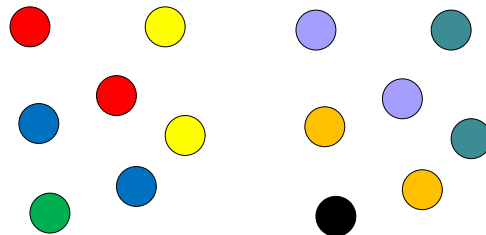
• Community 2



What differs between these communities?

• Community 1

• Community 2



Soil physicochemical measurements

Table S2 | Pearson's correlations between latitude, mean annual surface air temperature, altitude and the soil physicochemical parameters

Parameter	R	R ²	P value
MASAT (°C)	-0.81	65.0	<0.001***
Altitude (metres a.s.l.)	-0.31	9.7	0.051
pH	-0.21	4.3	0.197
EC (µS cm ⁻¹)	-0.01	0.0	0.957
Organic C*	0.18	3.1	0.775
N*	0.16	2.5	0.333
C:N	0.64	40.7	<0.001***
Ca*	0.15	2.3	0.397
Cu*	0.04	0.2	0.807
Fe*	-0.09	0.9	0.565
K*	0.14	1.9	0.392
Mg*	-0.52	26.7	<0.001***
Mn*	-0.10	1.0	0.537
P*	0.13	1.7	0.421
Zn*	0.18	3.3	0.288
Dissolved organic C*	0.21	4.3	0.201
Dissolved (NO ₃ ⁻ + NO ₂ ⁻) + NH ⁺	0.07	0.5	0.653
Dissolved NH ₄ ⁺ + NH ⁺	0.08	0.6	0.646
Dissolved SO ₄ ²⁻ + H ⁺	-0.01	0.0	0.938
Dissolved PO ₄ ³⁻ + H ⁺	0.11	1.2	0.500
Dissolved C*	0.02	0.0	0.829
Moisture content (H ₂ O)	-0.02	0.1	0.881

Abbreviations: a.s.l., above sea level; OTU, Operational Taxonomic Units.

Abbreviations: MASAT, Mean Annual Surface Air Temperature; EC, Electrical Conductivity.

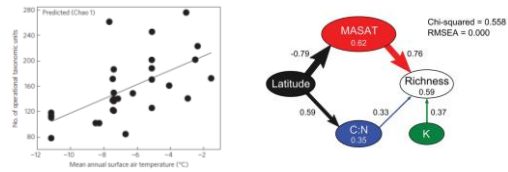
*Data are based on sequences clustered at 97% similarity and sorted to 5,120 reads per sample.

*Concentration (mg kg⁻¹) dry soil.

Fungal richness was associated with temperature

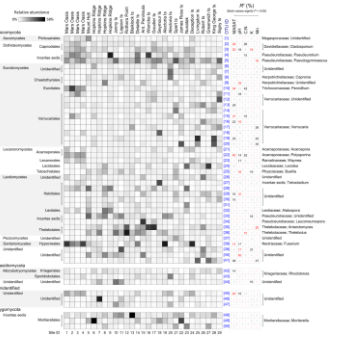
Table 1 | Data from stepwise multiple regression models using observed and predicted (Chao 1) numbers of OTUs as response variables.

Response variable	R ² (%)	Predictor variables	Slope	F value	P value
Observed no. OTUs	35	MASAT*	4.7	9.75	0.006
		Soil K concentration	4.4 × 10 ⁻¹	4.63	0.037
Predicted no. OTUs	57	MASAT*	14.8	24.55	<0.001
		Soil K concentration	9.2 × 10 ⁻¹	8.12	0.009
		Soil C:N ratio	4.8	4.66	0.045

*Mean annual surface air temperature. Error degrees of freedom in all analyses were 24. 100,000 and 100,000 concentration were converted to degrees Celsius and mg kg⁻¹ in these analyses, respectively, and C:N ratio was dimensionless. Intercepts in multiple regression models for observed and predicted numbers of OTUs were 102 and 100, respectively.

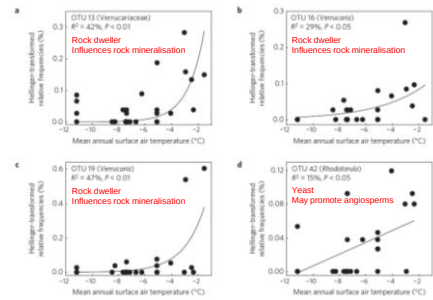
Fungal community composition

- Mostly Ascomycota



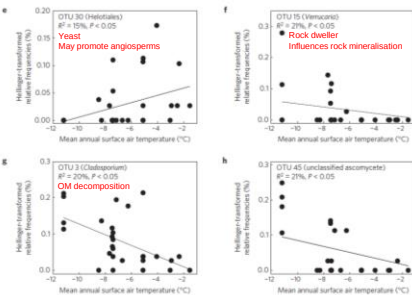
Fungal community composition

- Fungal community composition was associated with temperature, Mg and C:N ratio



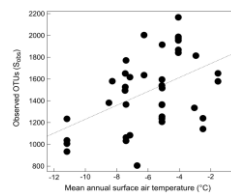
Fungal community composition

- Fungal community composition was associated with temperature, Mg and C:N ratio



Bacterial richness was associated with temperature and moisture

Response variable	R ² (%)	Intercept	Predictor variables	Slope	F value	P value
Observed OTUs (S _{obs})	44.0	1313	MASAT*	32.83	14.05	<0.001
			Soil moisture content	7.953	5.53	0.024
			Soil Mg concentration	1.57 × 10 ⁻²	8.71	0.006
Predicted OTUs (Chao1)	35.8	3752	MASAT*	136.8	10.51	0.003
			Soil moisture content	30.16	4.57	0.039
			Water extractable PO ₄ ³⁻ concentration	-13.42	4.95	0.032

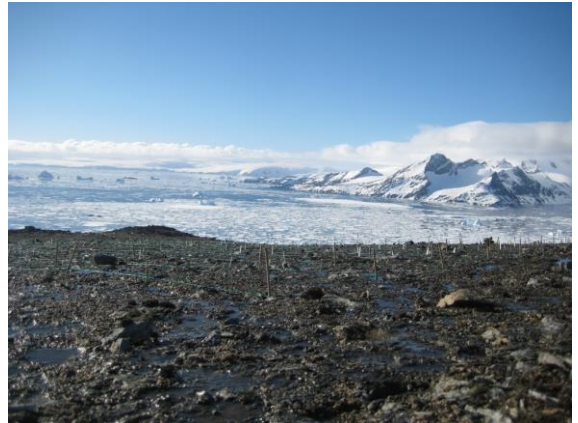
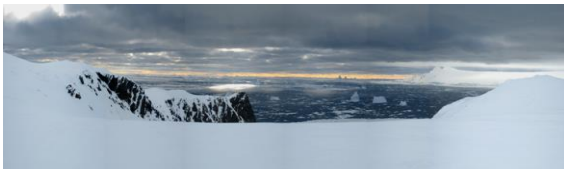




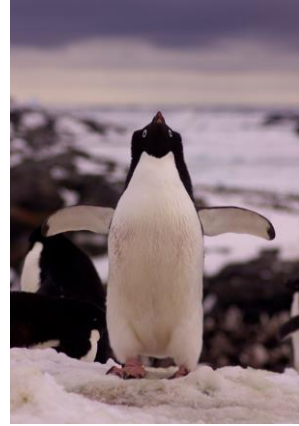




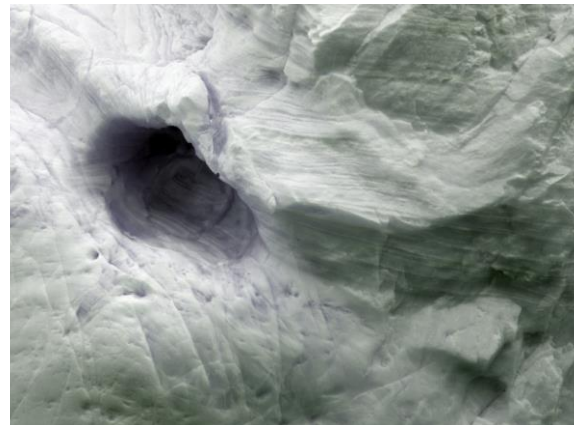








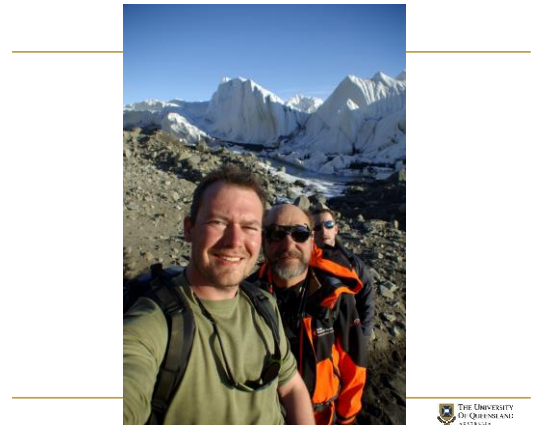














Questions



"In the interests of all mankind Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord."
Antarctic Treaty

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