CORRELATION OF THE BACTERIAL COMMUNITIES WITH VEGETATION AND SOIL NUTRIENT STATUS IN A DEVELOPING ECOSYSTEM

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Background

Microbial communities have previously been shown to assemble in patterns reminiscent of vegetative succession during soil and ecosystem development. However, recent studies link multiple environmental gradients with succession and soil development. An experiment across a gradient of ecosystem development was undertaken to further test the relationship between soil microbial community composition and their associated environmental habitat characteristics.

Hypothesis

Changes in bacterial communities would closely follow the developing gradient of physiological and vegetative changes that define the soil habitat during ecosystem development.

Study Site

Franz Josef Glacier, New Zealand

- Chronosequence of nine sites dating ~5 to 120,000 y since glacial retreats.

- Significant change in plant community throughout the ecosystem.

Experimental Strategy

Sampling and collection

Sample Clean-Up

Soil Physicochemical Analysis

Vegetation Community PFA Analysis

16S rRNA gene Pyrosequencing

Results

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<th>Diversity Index</th>
<th>5 y</th>
<th>60 y</th>
<th>130 y</th>
<th>250 y</th>
<th>500 y</th>
<th>5K y</th>
<th>14K y</th>
<th>60 K y</th>
<th>120K y</th>
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<td># OTUs (S)*</td>
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Decline in bacterial community richness associated with pH & soluble phosphorus

Relationship between bacterial community structure and soil properties

Change in bacterial community composition along the chronosequence

Changes in OTU abundance

Conclusions

- Strong association between bacterial communities with soil and ecosystem habitat factors.
- Greatest community change occurred during the first several hundred years of soil and ecosystem development.
- Changes were closely related to soil chemical properties, especially pH, soluble phosphorus, and nutrient content across the gradient.
- Direct effect of plant species on soil bacterial community assembly is relatively small.

Acknowledgements

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