Not All That Glitters Is Gold:

Analysis of Sediments from an Antarctic Stream Bed

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Introduction

•The McMurdo Dry Valleys are the largest ice-free area of Antarctica

•This region only receives between 3-50 mm of precipitation a year; it's classified as a polar desert

•Streams are one of two vectors that connects glaciers to soils to lakes, and are host to a range of algae and micro-organisms

•Little research has been done on the presence of physical vs. chemical weathering in the streams; The sediments could be a source of nutrients

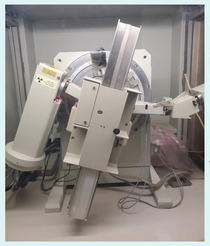
Objective

•To investigate the grain size distribution and mineralogy of sediments from an Antarctic stream as a first step in understanding where weathering occurs

Methods

(1) Samples were dried before the grain size and mineralogical analysis

(2) A Ro-tap was used to sieve samples for grain size analysis



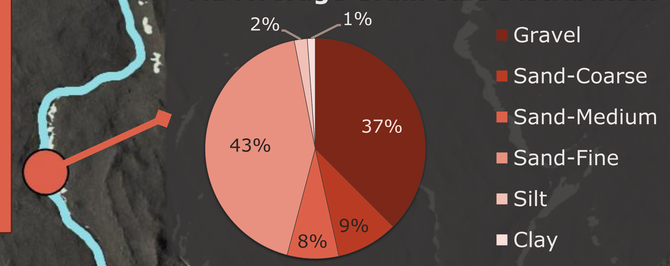
(3) X-ray diffraction was used for the mineralogy analysis on 6 of the 15 sample

- Von Guerard stream flows North into Lake Fryxell in the Taylor Valley
- Streams in the Antarctic flow for 4-12 weeks out of the year
- Fifteen samples were collected in 2019 at 3 cross-sections where the stream had a meandering feature

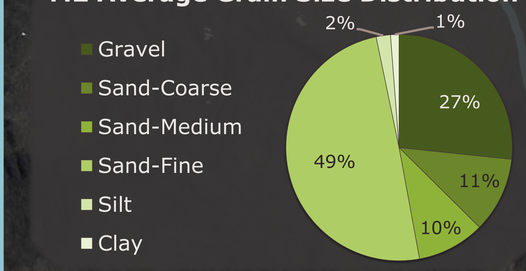
Soil Type		Particle Size (mm)	XRD Analysis Combinations
Gravel		4.75 - 75	Coarse Combination
Sand	Coarse	2.0 - 4.75	
	Medium	0.42 - 2.0	
	Fine	0.075 - 0.42	Fine Combination
Silt		0.002 - 0.075	
Clay		<0.002	

- Upstream has the most Gravel
- Larger sediments can settle in faster running water

M1 Average Grain Size Distribution

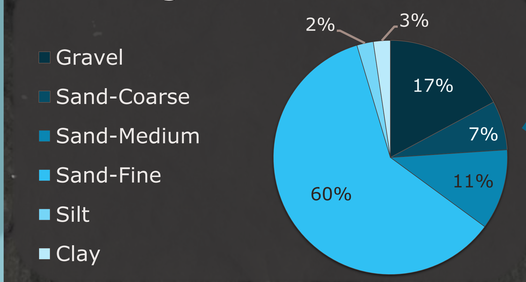


M2 Average Grain Size Distribution



- Midstream had most amount of coarse and medium sand
- Distribution is similar to upstream

M3 Average Grain Size Distribution



- Downstream has larger amount of fine sediment
- Change in size distribution is evidence of physical weathering in stream

XRD Results

	M1-3 Coarse		M3-3 Coarse	
	% Weight	Mineral	% Weight	Mineral
NON-CLAYS	13	Quartz	12.4	Quartz
	67.4	Feldspar	68.9	Feldspar
	7.6	Pyroxene	5.7	Pyroxene
	0.5	Hematite	0.5	Pyrite
	1.8	Forsterite	0.2	Hematite
CLAYS	2.9	Saponite	3.3	Saponite
	3.2	Illite	4.5	Illite
	0.9	Biotite	0.8	Biotite
	0.5	Chlorite	1.5	Chlorite
	1.7	Sepiolite	2.0	Sepiolite
	M1-3 Fine		**M3-3 Fine**	
	% Weight	Mineral	% Weight	Mineral
NON-CLAYS	11	Quartz	12.8	Quartz
	43.2	Feldspar	46.1	Feldspar
	17.1	Pyroxene	13.6	Pyroxene
	1.8	Magnetite	0.9	Magnetite
	2.7	Maghemite	3.6	Maghemite
	5.7	Forsterite	3.6	Forsterite
	0.7	Volcanic glass	1.6	Volcanic glass
CLAYS	8.1	Saponite	8.9	Saponite
	7.7	Illite	6.8	Illite
	0.8	Chlorite	0.6	Biotite

Discussion and Summary

- Sediments of an Antarctic stream show clear differences between grain size (upstream has coarsest material) and minimal differences in bulk mineralogy
- Fine samples have more percent weight of clays; Coarse samples have more feldspars which breakdown into clays with water
- Additional analysis of bulk chemical composition of the stream can help to identify specific mineral phases that may be sources of nutrients in the system

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References, citations and additional information can be found by scanning the QR code:

Questions? Comments? Email me at izze.marler@colorado.edu