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ABSTRACTS

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Abstracts from the Atlantic Universities Geoscience Conference (AUGC) are published annually in Atlantic Geology. Such publication provides a permanent record of the abstracts, and also focuses attention on the excellent quality of both oral and poster presentations and posters at the conference and the interesting and varied geoscience topics that they cover. Due to the pandemic and related Covid-19 travel restrictions the entire day-long conference was held virtually and by using this format, the traditional timing of an AUGC was preserved.

Although the abstracts have been modified and edited as necessary for clarity and to conform to Atlantic Geology format and standards, the journal editors do not take responsibility for their content or quality.

THE EDITORS

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Electrochemical investigation of microbial carbon cycling

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Carbon dioxide emissions are increasing the amount of CO_2 in the atmosphere at unprecedented rates. Microbes are responsible for much of the global carbon cycle and therefore are impacted by the rising CO_2 levels. This research will look at the impacts of a reduced carbon influx on microbial carbon cycling. In situ electrochemical data were collected from inside a mesocosm that simulates a flooded wetland. The aim of the research is to understand how the microbes will react, physically, to an influx of carbon. Many of the current analytical processes surrounding microbes analyze one of the biogeochemical processes in isolation, rather than looking at the interaction and influence among processes. This research is important as we currently lack effective methods of evaluating microbial and biogeochemical processes in situ. The research being done uses a detrended fluctuation analysis (DFA) to measure the strength of correlation or memory for the time series. The result is a correlation coefficient (a). DFA measures the strength of relationships between earlier and later values of a time series. Correlation strength ranges from 0 to 2, where 0.5 indicates a random (uncorrelated) process, 1.0 indicates a linear process, which, in the context of sensor measurements indicates a process not influenced by microbes. Correlation strength greater than 1 indicates a microbial influence on the geochemistry. The time series data were collected from a mesocosm where organic matter was dumped into the top of a soil column equipped with graphite electrodes spaced at 5 cm intervals. The electrode response measures concentration of organic matter, and when the concentration is analyzed over time reaction pathways are revealed by the correlation strength. When analyzing the electrode signals throughout the entire experiment period, the alpha values range from 1–2, indicating organic matter oxidation carried out by microbes. The range of alpha values after the carbon influx was 1.4–2.0 with an average value of 1.89, whereas before they ranged from 0.8–1.9 with an average value of 1.39. The response of the soil microbial community to the organic matter influx indicates an immediate increase in organic matter oxidation. Spatial relationships are still being analyzed. [Poster presentation]

Oxidative weathering of fresh komatiite: mineralogical, textural, and chemical evolution

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Komatiites (ultramafic volcanic rocks) are typical of Archean greenstone belts, but are rare throughout the post-Archean geological record. Geochemical evidence from siliciclastic and chemical sedimentary rocks suggests that komatiite-tholeiite sequences constituted a significantly greater volumetric component of the exposed Archean upper crust than what is preserved in greenstone belts. Accordingly, the subaerial exposure and weathering of komatiite-tholeiite at the Archean surface is thought to have played an essential role in past chemical fluxes from the lithosphere to hydrosphere, with important impacts on the microbial biosphere. However, detailed characterization of komatiite breakdown via chemical weathering from its original igneous chemistry and mineralogy into solutes and clastic sediment is hindered by a lack of preserved paleosols developed on Archean komatiites. Further, all Archean komatiite and its clastic derivatives are variably modified by some combination of hydrothermal alteration, metasomatism, and metamorphism. As such, the rates of mineral weathering, secondary mineralogical weathering products and their textures, and flux of soluble elements accompanying fresh komatiite weathering are poorly understood. Only one occurrence of komatiitic flows is known in the Phanerozoic eon, those on Gorgona Island off the coast of Columbia. Although the present atmosphere differs significantly in composition from that of the Archean and thus some chemical weathering pathways are expectedly different, the Gorgona Island komatiites provide the best opportunity to study komatiite chemical weathering starting from a "fresh" state (less altered than any preserved Archean example). This study will document the textural and mineralogical changes from komatiite bedrock to saprolite to soil, alongside bulk rock major element and some minor- to trace-element (e.g., Ni, Co) chemical changes, captured in 15 samples across 2 weathering profiles. Komatiite in Gorgona occurs in differentiated flows similar to Archean examples, with basal cumulate layers, middle spinifex texture horizons, and an upper polyhedral zone. As such, this study can examine how specific mineral-textural features of komatiite alter to secondary products, shedding new light on how such reactions may have occurred in the Archean. Preliminary results from this study are presented, including the geological context, petrographic textural analyses, and X-ray diffraction (XRD) patterns. [Poster presentation]

Magnetic study within the Valentine Lake gold property, Newfoundland and Labrador, Canada

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Marathon Gold Corporation's Valentine Lake property is located in west-central Newfoundland. The property has four known gold deposits in early exploration stages along a 20 km-long northeast to southwest trend. It is a future site for an open-pit gold mine, and upon completion, will be the largest gold mine in Atlantic Canada. The Valentine Lake property contains orogenic-type quartz-tourmaline-pyrite veins which are gold-bearing. These veins are structurally controlled, occurring along or proximal to the Valentine Lake Shear Zone. The mineralization is mostly on one side of the shear zone in intrusive rocks, and is rare in the conglomerate on the other side. The area has numerous basaltic dykes, which show up well when conducting a magnetic survey due to their proportions of magnetite. Though their relationship to the mineralization is uncertain, these dykes can help indicate structure. In a complex area such as the Valentine Lake property, geophysical surveying can help interpolate the data between drill holes. A large-scale magnetic survey was completed over a portion of the shear zone in 2014; however, it was unable to resolve the geometry of the boundary in a key location. To further constrain the location of the shear zone (and hence the mineralized region), a detailed magnetic survey was conducted over a 200 m × 300 m section in this key location using a GPS- enabled Overhauser magnetometer. In this study, total magnetic intensity maps will be created and further processed using pole reduction and first vertical derivative computation. Magnetic susceptibility measurements of surrounding rock types were taken to supplement data provided by Marathon Gold. These data in addition to data from the three drill cores from the survey area will be used to create a three-dimensional structural model. [Poster presentation]

Winner of the Imperial Oil Award for the best poster presentation

Geophysical characterization study of Robin Hood Bay landfill, St. John's, Newfoundland, Canada

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The Robin Hood Bay landfill is located in the northeast part of St. John's, Newfoundland. It is the solid waste management facility for the City of St. John's and the greater Avalon region. It was first used by the American Military in the 1940s as a training facility and a waste disposal site before becoming the City of St. John's landfill in 1963. In the past, there have been concerns for leachate drainage from the site into the ocean and also into adjacent streams because there was no bottom liner beneath the landfill to prevent leachate from penetrating the groundwater. In 2006, the landfill underwent a large-scale renovation that included adding a geosynthetic cover, creating regulations for residential dumping, and adding gas and groundwater monitoring wells to the site. This will be the first geophysical study completed over Robin Hood Bay, although such studies are common practice for other landfills. Our study area covered 2.7 km^2. The area has not been infilled with new waste since the 2006 renovation and therefore became an optimal location for a characterization study, especially because the cobblestone landfill cap in active areas made it unfeasible for our surveys. However, even in our area which is flat and otherwise grassy, a thick layer of crushed stone resulted in unreadable results from our ground-penetrating radar survey. The subsequent studies measured apparent conductivity, magnetic susceptibility, magnetic field, spontaneous potential, induced polarization, and direct current resistivity. All are noninvasive geophysical studies which are an excellent way to interpret the subsurface environment for water flow patterns and any environmentally concerning anomalies such as past disposal of large metal objects. The objective of these studies is to provide an image of Robin Hood Bay's subsurface that may identify any possible environmental concerns and provide a baseline study to compare results with in any future geophysical studies showing changes over time. [Oral presentation]

Winner of the Canadian Society of Exploration Geophysics Award for best presentation of a geophysics-related paper

Cordierite-bearing rocks as a tool to explore the extent of the Low-Pressure Belt in the Central Grenville Province, Quebec, Canada

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The Central Grenville province located in Quebec is recognized as the exhumed orogenic roots of the Grenville orogen, which offers a view of the results of crustal metamorphic processes included in mountain building. Multiple studies provide evidence of several metamorphic

phases accompanied by different thermal regimes during active orogenesis spanning from 1090 to 980 Ma, as the southwestern margin of Laurentia was sutured with another paleocontinent to form Rodinia. The metamorphic terrains are accompanied by a major spatial boundary, dubbed the Allochthon Boundary Thrust. The spatial and temporal separations create first-order tectonic divisions which are known as the Parautochthonous belt, located in the northwestern part of the orogenic margin, and the Allochthonous Belt, composed of the accreted orogenetic core in the center and southern parts of the Grenville province. Reworked Laurentian crust amalgamated with accreted terranes and plutons now exhumed in the hinterland compose the Manicougan-Escoumins transect, located within the Allochthonous Belt of the Central Grenville, that can be seen as representing the orogenic framework from metamorphosed lower crustal structures to the orogenic lid. It is recognized that the exhumed rocks within the Manicougan-Escoumins transect pertain to different burial depths during the Grenville orogeny, and can be divided into a High-Pressure Belt, Mid-Pressure Belt, and Low-Pressure Belt. The Low-Pressure Belt is composed of cordierite-bearing, high-grade, aluminous, metapelitic gneiss. A recently proposed extension of the Low-Pressure Belt has been made, which places the belt margins farther south within the Escoumins Supracrustal Belt. This study serves to investigate the validity of the proposed extension using the samples collected from metapelitic rocks composing the supposed expanded Low-Pressure domain. This will be accomplished by investigating petrography, mineral chemistry, and phase equilibria modelling of mineral assemblages. The results will be interpreted by way of P-T paths using P-T pseudosections. [Poster presentation]

Microanalysis of quartz- and carbonate-hosted fluid inclusions associated with polymetallic mineralization (Fe-Co-Ni-Cu-As-Ag-Sb-Au-Pb) of the Cape St. Marys, Lansdowne, and Nictaux Falls dam occurrences in the Meguma terrane, Nova Scotia, Canada

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Quartz-hosted fluid inclusions (FI) of three metasediment-hosted polymetallic occurrences [Nictaux Falls (Co-Ni-As-Au-Bi), Lansdowne (Zn-As-Ag-Sb-Au-Pb), and Cape St. Marys (Co-Ni-Cu-Zn-Ag-Sb-Au-Pb-Bi)] in the southwestern Meguma terrane, Nova Scotia, are currently under investigation. Similarities in host-rock type, alteration, and metallic mineralogy suggest a possible genetic link; therefore, this work will establish the P-T-X of fluids associated with all hree sites to confirm their genesis. Lansdowne FI are classified into three types: type-1 inclusions are single-phase liquid inclusions and exhibit elongate, subhedral shape; type-2 inclusions are liquid-rich, two- or three- phase (liquid+vapour or liquid+liquid+vapour), and exhibit an array of shapes (negative crystal, rounded elongate, irregular); type-3 inclusions contain a single vapour phase and also exhibit varied habits. All inclusion types may occur in the same assemblage, suggesting fluid mingling or boiling. Cold cathodoluminescence confirms that FI are hosted in secondary quartz that surrounds euhedral/subhedral primary quartz grains and is coeval with mineralization. Confocal Raman microspectroscopy determined that type-1 inclusions are H_2O-dominant, with trace CH_4; type-2 FI contain H_2O liquid with a carbonic (CH_4 and/or CO_2) vapour phase; and type-3 inclusions contain predominately CH_4. Microthermometry of Lansdowne FI yield final ice melting temperatures (T_{Mice}) for type-1 and -2 inclusions, and homogenization temperatures (Th; to single-phase) for type-2 and -3 inclusions. Type-1 inclusions show T_{Mice} between -20 and -24 °C (n = 17), suggesting a high salinity aqueous fluid, at or near halite saturation, and high divalent cations such as Ca^{2+}. Type-2 inclusions show T_{Mice} between -8 and -4 °C (n = 35), suggesting a low-salinity fluid (12 - 6 wt% NaCl equivalent). Most type-2 inclusions decrepitated upon heating except for some CH_4-poor inclusions, which exhibited Th from 229 – 261 °C (n = 7). Type-3 inclusions homogenized to CH_4 vapour by dew point transition between -110 and -92 °C (n = 8), suggesting entrapment at extremely low pressure. This preliminary work suggests mingling between a low-salinity brine and CH4 near surface during Lansdowne mineralization. Ongoing and future work will continue to characterize samples from Lansdowne, as well as Nictaux Falls and Cape St. Marys, using the methods listed above. Decrepitate mound analysis will also characterize the cation and anion chemistry of the paleofluid associated with mineralization. [Oral presentation]

Winner of the Science Atlantic Presentation and Communication Award for best overall presentation

Epithermal gold mineralization and associated alteration at the Golden Ridge deposit, Poplar Mountain Volcanic Complex, southwestern New Brunswick, Canada: analysis of the role of pyrite and arsenopyrite during mineralization

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The Poplar Mountain Volcanic Complex, in southwestern New Brunswick, consists of three main volcanic phases: porphyritic rhyodacite, rhyodacitic volcaniclastic rocks, and basaltic volcanic rocks. Previous U–Pb zircon dating indicates that the volcanic rocks formed at 459.0 ± 3.0 Ma. Gold mineralization was discovered in 1994 and is associated with illitic alteration which was also dated using $^{40}Ar/^{39}Ar$ methods. The age of mineralization was determined to be 411.0 ± 3.7 Ma, thus suggesting it to be considerably younger than the Middle Ordovician volcanic sequence. Based on gold assay data from archived assessment file reports and relogging available drill core, gold mineralization is mainly confined to the porphyritic rhyodacite. The presence of gold appears to be restricted to areas containing arsenopyrite, and to a lesser extent pyrite, as well as in areas of multiple quartz-carbonate vein stockworks and areas of hydrothermal brecciation. Selected samples were analysed using Instrumental Neutron Activation Analysis, Inductively Coupled Plasma-Emission Spectrometry, and Mass Spectrometry. Paragenetic examination of the complex veining helped select various pyrite- and arsenopyrite-bearing assemblages for microX-Ray Fluorescence (uXRF) - Energy Dispersive Spectrometry mapping; certain pyrite grains were chosen based on their size, as well as the Au grades of the samples. Using uXRF, two electrum grains were found within a sample containing 10.2 g/t Au. There is also evidence of some arsenic zoning in pyrite within a few samples, as well as S-As zoning in arsenopyrite overprinting some earlier pyrite that occurs as disseminations. The purpose of this research is to determine if gold is refractory within pyrite and arsenopyrite or if it is present as free gold or electrum. If the gold is saturated during crystallization of pyrite and/or arsenopyrite, there should be a geochemical association between As, S, and Au, which is evident in the bulk geochemical analyses. Laser Ablation Inductively Coupled Plasma - Mass Spectrometry (LA-ICP-MS) analysis and elemental mapping is planned. Other future work will include $^{40}Ar/^{39}Ar$ dating of illite from the northeast zone discovered in 2011. Although rare, hydrothermal apatite has been identified in several stockwork veins, which may be dated by LA-ICP-MS U–Pb methods to confirm the ages of mineralization. [Oral presentation]

Winner of the Frank S. Shea Memorial Award for best economic geology-related presentation

Analysis of various types of surficial geochemical data from the Tennycape area, Nova Scotia, Canada: examining methodologies to help locate potential silver-rich base-metal ore

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The Tennycape area in Nova Scotia is located along strike of the former Walton Mine (Zn-Pb-Cu-Ag and Ba) and is thought to host similar Carboniferous SEDEX and MVT-like ore bodies to that of the former mine. The redox transport model, which describes the structure of redox chimney cells that form in overburden above sulphide deposits, has helped identify possible chimneys in the area. This model, combined with the presence of haloes of Fe and Mn enrichment that are also found around the historic Walton Mine, suggest Tennycape may host a significant base-metal deposit. The area is characterized by complex thrust faulting and is overlain by a thick layer of clay and other regolith, which makes diamond drilling both complicated and expensive. Tennycape has undergone karst mapping, trenching over an area showing weakly mineralized float, a gravity survey (1.2 km^2), and soil samplings with 190 samples collected at 100 × 100 m spacing across the region. These soil samples underwent three advanced soil geochemistry partial extraction techniques. Portable X-Ray Fluorescence (pXRF) analysis was performed on the soil samples. This study examines the partial extraction data and the pXRF analyses using multivariate statistical comparisons with each of the datasets. Possible methods of analysis include: (1) exploratory data analysis, (2) target and background populations that can compare multiple populations, and (3) image processing to produce maps to show variations. Early analysis of the pXRF data has revealed that while Ag may be present in the soil, there was none detected, possibly related to the envelopes in which the samples are held. Several samples have been shown to display significantly higher concentrations of the elements of interest. One sample has been found to contain high concentrations of Zn, Pb, Fe, Mn, and Ba and will be examined to determine if these elements are co-related. The detection limit of the pXRF data may be increased with longer beam exposure and further analysis is needed for the sample with the high element concentration. Over the region the elements of interest range as follows: Zn 10–202 ppm, Pb 5–22 ppm, Cu 3–64 ppm, and Ba 137–935 ppm. [Oral presentation]

Survey of potential syngenetic occurrence of the Archaeal Lipid Biphytane from lower greenschist facies, Late Achaean (2.65 Ga) metamorphic argillite of the Abitibi Sub-province, Timmins, Ontario, Canada

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Molecular fossils (i.e., biomarkers) from ancient rocks are not expected to be preserved if subsurface temperatures reach above 200 °C. This makes the reconstruction of the microbial diversity of life using biomarkers highly tricky for rocks older than the Paleoproterozoic Era (i.e., 2.5 Ga) where all known rocks have undergone at least some degree of metamorphism. Nonetheless, the oldest reported Archaeal lipid biomarker – biphytanes - were detected in lower greenschist facies meta-argillite from the Abitibi sub-province, Timmins, Ontario, Canada. This work has been highly controversial with many researchers favoring alternative sources for the reported lipids that are significantly younger than their host rock. We hypothesize that by using different extraction techniques some of the sources of organic matter contamination can be reduced and and it may be possible to pinpoint from where exactly these biphytanes came to enter these rocks. For this study all equipment was either carefully solvent-washed (Methanol: DCM 1:1), baked, or acid treated to remove environmental sources of contamination. To remove drill mud contamination, the drill core sample was solvent-washed and sonicated thrice. Next, starting from the outside, each layer of the rock was consecutively removed. In between, each layer of the rock was again solvent-cleaned. Upon reaching the (assumed) uncontaminated inside layer, the sample was rolled into baked foil and hammered into little fragments. These rock fragments were ground to a powder with an acid-cleaned mortar and pestle. Once the rock was completely powdered, the sediment sample and the outer layer powder fractions were solvent-extracted using a Mars 6 Microwave (method- "US EPA 3546-115C"). It is hoped that these improved extraction methods can significantly reduce potential sources of contamination in the resulting extracts to further help to constrain the age and origin of the biphytane biomarkers. [Poster presentation]

Physical stratigraphy and provenance of Middle Jurassic to Lower Cretaceous Adventdalen Group sandstone, central Spitsbergen, Svalbard, Norway

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Laser ablation split-stream detrital zircon U–Pb-Hf isotope studies are used to test and constrain paleogeographic reconstructions and depositional models for Adventdalen Group strata in central Spitsbergen, Svalbard. Samples from the Agardfjellet, Rurikfjellet, and Carolinefjellet formations yielded 144, 3, and 96 detrital zircon grains, respectively. Preliminary results show Agardfjellet Formation zircon age distributions of 401–459, 907–2054, 2476–2559, and 2616–2906 Ma, supporting the hypothesis of a marked provenance shift from easterly to westerly sources in the Jurassic. Zircon grains from the Carolinefjellet Formation yielded age distributions of 144–165, 233–274, 277–321, 412–459, 1765–2107, 2242–2251, 2529–2769, and 2784–2832 Ma. Renewal of Uralide-age zircon grains within the Carolinefjellet Formation support paleogeographic models indicating a shift to northeasterly sources during the Early Cretaceous, where sediment supply from the west is restricted by a seaway connecting the Barents Shelf with the Amerasian Basin. Stratigraphic logs, petrographic observations, and Hf-isotope geochemistry methods will compliment U–Pb zircon analyses to further constrain sediment composition/texture and potential sources. [Poster presentation]

Winner of the Canadian Society of Petroleum Geologists Award for the best petroleum geology-related presentation

Characterizing organic-walled dinoflagellate cyst communities preserved in surface sediment along a transect across Smith Sound, northern Baffin Bay, Canada

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Resting cysts of planktonic dinoflagellates (dinocysts) are commonly found in modern marine sediments as fossilized remains. Dinocysts are typically composed of refractory organic matter, with a few exceptional taxa being composed of calcium carbonate. During the dormancy period of a dinoflagellate, the organism spends its time in the benthic

zone. The cysts allow survival during unfavourable environmental conditions. Because the composition of the dinocyst assemblages preserved in sediment reflects sea-surface conditions, they are widely used as a tool for paleoenvironmental and paleoecological reconstructions. In this study, six samples collected along a transect in Smith Sound will be used to investigate the influence of ocean currents with different physical and chemical signatures on the dinocyst assemblages. Located in northern Baffin Bay, Smith Sound is influenced by the warm and relatively salty waters of the West Greenland Current that up well in the eastern sector, and the cold fresh polar waters that flow south and are mainly contained in the western sector. Diversity indices will be calculated to study biodiversity gradients in this region. [Poster presentation]

Tracking water masses in the North Atlantic Ocean over the last 2000 years

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Ocean circulation is essential for transporting heat, dissolved CO_2, and nutrients all around the globe. The strength of ocean circulation, therefore, has a major influence on climate and vice versa. Over time, ocean currents can change causing climate to vary on local, regional, and indeed global scales; in turn, changing climate can affect the strength and location of ocean currents. Recent studies suggest that freshwater addition to the western North Atlantic from melting Arctic and Greenland ice is causing the Atlantic Meridional Overturning Circulation, which encompasses the northward flow of warm saline water and the return flow of colder deep water, to weaken. This results in surface ocean temperatures offshore of Atlantic Canada to rise faster than in the rest of the global ocean. The objective of this study is to assess past changes in ocean currents in the western North Atlantic, based on sea surface temperature reconstructions from alkenones preserved in sediments on the Scotian Shelf. Alkenones are long-chain carbon molecules uniquely synthesized by a certain group of phytoplankton that change in composition depending on surface water temperatures. This study will provide a higher spatial and temporal resolution than previous studies giving us insight into the local effects of the interplay between the weakening warm Gulf Stream and the cool Labrador Current as well as perturbations due to anthropogenic warming. Ocean warming is detrimental to a wide variety of marine species, impacting both the environment and the local economy. By studying past changes in ocean circulation, we can gain a better understanding of the changes we are seeing now and more reliably predict what is to come. [Oral presentation]

Benthic and planktic foraminifera distribution around Southampton Island, Hudson Bay, Canada

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Hudson Bay is Canada's largest ocean watershed with one of the country's largest aggregations of Arctic marine mammals. Yet, there are large gaps in scientific knowledge regarding the impact of climate changes on its oceanography and biological productivity. Preserved foraminifera are one of the most common proxies used in paleoceanographic studies, as their distribution and abundance is strongly linked to water mass properties. This study focuses on the analysis of foraminifera preserved in five sediment samples (1 cm depth), collected in 2018 and 2019 on the research vessel William Kennedy, which travelled around Southampton Island, situated in the northwestern part of Hudson Bay. This work includes the analysis of both planktic and benthic species to gain a better understanding of their present-day distribution. Planktic foraminifera provide information regarding sea-surface conditions whereas benthic foraminifera provide sub-surface and deep-water mass property information. This will be done by extracting, identifying and counting the foraminifera using a Stereomicroscope, as well as taking high quality images using a Scanning Electron Microscope. The modern distribution of foraminifera as well other proxies, including geochemical and biomarker tracers, will be linked to environmental parameters such as sea-surface temperature, salinity, sea ice, and nutrient availability. The development of this modern reference database will be instrumental to the subsequent interpretation of tracer variations from long sedimentary cores from around Southampton Island and will allow to better understand the response of this ecosystem to long-term climate fluctuations. [Oral presentation]

Winner of the Atlantic Geoscience Society Environmental Geoscience Award for the best Environmental Science-related presentation

Effects of the East African Rift System on the deep-water depositional systems offshore Tanzania, western Indian Ocean

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The East African Rift System has been intensively investigated during the last decades to understand how continental rifting forms and evolves. Recent studies have proposed the existence of an offshore branch of the East African Rift System in the western Indian Ocean offshore Tanzania. To date, a clear picture of the effects of rift tectonics on margin evolution, particularly on slope channel systems, is still missing, and many questions dealing with the relation between tectonic and sedimentary processes are outstanding. The purpose of this study is to investigate how the East African Rift System has affected the evolution of deep-water depositional systems in a portion of the continental slope offshore of Tanzania, east of the Rufiji Delta. To reach this goal, I will use high-resolution bathymetric data extracted from a 3D seismic reflection cube to identify depositional elements (such as channels and mass-transport deposits) and main fault lineaments. Preliminary data analysis shows that instances of channel avulsion driven by tectonism are apparent, expanding the understanding of tectonic activity from the East African Rift System's influence on depositional processes offshore east Africa. [Oral presentation]

Black smoker fluid fluxes at the Niua South seafloor hydrothermal vent field, Tofua-Kermadec arc

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Submarine tectonic boundaries (e.g., mid-ocean ridges, volcanic arcs) produce magma bodies that are emplaced in upper oceanic crust. Heat generated from these magma bodies drives the circulation of seawater through oceanic crust forming seafloor hydrothermal systems. This process is an important mechanism for the transfer of heat and metals from the crust to the seafloor and overlying oceans. Niua South, a submarine arc volcano near Tonga in the South Pacific Ocean, contains a crater-hosted seafloor hydrothermal system, resulting in formation of black smoker vents and seafloor massive sulfide deposits. In 2016, scientists onboard the R/V Falkor visited Niua South and, over two weeks, surveyed the crater with a high definition video camera mounted on a remotely operated vehicle (ROV), and collected rock samples from the hydrothermal vents. In this study, the chemical mass balance of the hydrothermal system at Niua South is investigated. The amount of fluid circulated by the system is determined from the analysis of the dive videos recorded by the ROV. Ocean floor observation protocol (OFOP) software is used to link the videos to a high-resolution bathymetric map of the crater. The velocity and volumetric flux of discharging fluid is determined from the extracted videos using specialized MATLAB code. Through these calculations, the total flux of hydrothermal fluid at Niua South will be determined. This information will be combined with vent fluid composition, and the age, composition, and size of the sulfide deposits to calculate the proportion of metals mobilized by the hydrothermal system that are deposited on the seafloor. This research will address longstanding questions about the depositional efficiency of metals at the seafloor, which has implications for understanding rates of formation of volcanogenic massive sulfide (VMS) deposits. [Oral presentation]

Hello, is anybody there? The search for deep subsurface life in ultrabasic springs using lipid biomarkers

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Serpentinization is known to occur at mid-ocean ridges, ophiolites, terrestrial planets, and icy moons. Sites of serpentinization result in extreme aqueous conditions of high pH (>11), low nutrients, and an insufficient amount of inorganic carbon. Studying springs discharging from continental serpentinization provides scientists with the opportunity to understand subsurface environments that we cannot yet reach. In this study, the goal is to extract, detect, and identify organic biosignatures (i.e., lipids and isotopes) in subsurface samples taken from an ultrabasic spring at a site of serpentinization to determine the microbial community composition and its carbon substrate. The samples were taken from the Tablelands Ophiolite in Gros Morne National Park which is analogous to subsurface Mars and Saturn's Moon Enceladus. Lipids make up the cellular membranes in all living organisms on Earth. A specific type of lipid, called phospholipid fatty acids, will be extracted in this study. Phospholipid fatty acids degrade quickly after the cell death, therefore, any phospholipid fatty acids that are extracted from the subsurface sample will be indicative

of current life at the site at the time of sampling. A modified Bligh-Dyer extraction method will be used to extract phospholipid fatty acids. The phospholipid fatty acids will be derivatized to be identified using a gas chromatograph mass spectrometer detector, quantified using a gas chromatograph flame ionization detector, and finally, the phospholipid fatty acids' stable carbon isotope values will be measured using a gas chromatograph in line with a combustion oven and an isotope ratio mass spectrometer. [Poster presentation]