Chemical & Physical Sciences
UNIVERSITY OF TORONTO
MISSISSAUGA

Colloquium Seminar Series
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3:10pm in KN L1220

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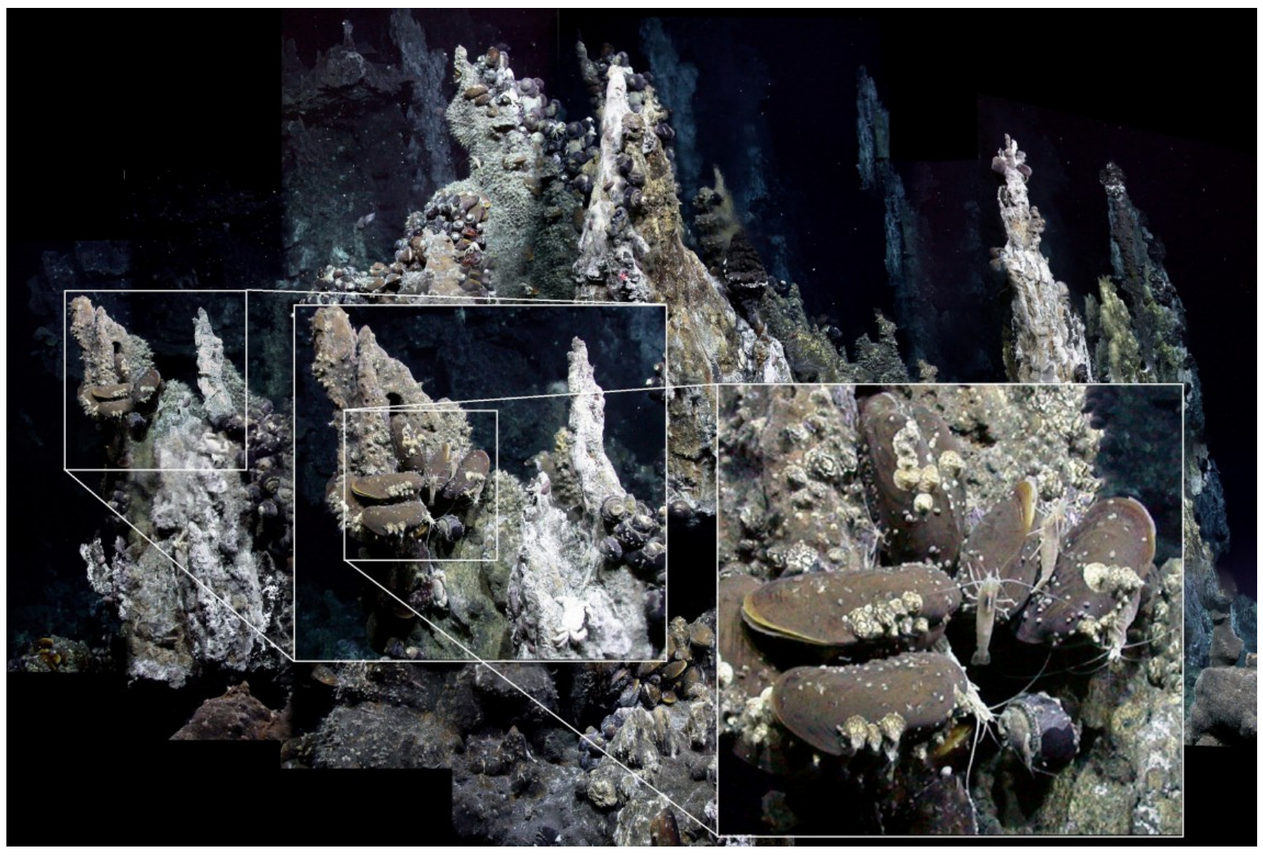
Recent advances in deep-sea exploration for hydrothermal vents: Where tectonics, volcanism, and biology meet



Increasing demand for base and precious metal resources has led to renewed interest in mining on the seafloor. These resources include: manganese (Mn) nodules on sediment-covered abyssal plains, cobalt (Co)-rich crusts on the flanks of seamounts, and seafloor massive sulfides (SMS) associated with hydrothermal venting along tectonic plate boundaries. Mn-nodules and Co-rich crusts offer a vast resource, and mining them may have a profound impact on global metal markets. The resource potential of SMS deposits, however, remains largely unknown due to the lack of information regarding their size, distribution, and composition. In addition, SMS deposits associated with active hydrothermal venting are colonized by unique chemosynthetic ecosystems that should be protected. Despite the strong incentive to explore for inactive vent sites with lower environmental risk, these deposits cannot be detected with current exploration methods that rely on water-column surveys to detect hydrothermal plumes.

Exploration for SMS deposits is driving advances in marine technology, including autonomous underwater vehicles and seafloor lander-type drilling platforms. Geophysical and geochemical data collected at the deposit-scale is integrated with new global datasets, such as satellite altimetry, to provide new insights into the fundamental geodynamic controls on ore formation. This knowledge is critical for developing exploration strategies for finding inactive vent sites that cannot be detected by traditional surveys, and for understanding the diversity of massive sulfide deposits in the geologic record.