Study of electrical potential, remote sensing, and preservation of bio-signatures at sites of serpentinization (SERP)

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Serpentinization is a water rock reaction that generates enough chemical potential energy and abiotic organic matter to support a subsurface chemo-lithotrophic biosphere on Mars. Detecting the presence of such extinct or extant life requires the ability to find active or inactive serpentinization sites and the analtyical means to detect the presence of any biosignatures. We are studying the potential to detect surface expressions of serpentinization and the associated biosignatures of life in the Bay of Island (BOI) Ophiolite Complex, NL, CAN, which is an analogue of serpentinization on Mars. We began developing geophysical, spectral, and remote sensing methods to detect groundwater springs associated with subsruface serpentinization at the Tablelands massiff (i.e., the Training Site).

Thus far we have mapped the subsurface serpentinized groundwater flow through electrical potential and magnetic measurements, verified spectral methods for detecting carbonates associated with serpentinization, collected drone and satellite images using multiple wavelengths and resolutions, and sampled for isotopic and molecular biomarkers. We will soon apply our methods to unexplored massiffs within the BOI complex to verify our methods.

Our expected outcomes include knowledge of: i) spectral signature(s) for serpentinized springs, ii) remote sensing methods for satellites and drones for detecting serpentinized springs, iii) life's biosignatures at active serpentinized springs and preservation of life's biosignatures in inactive serpentinized springs, and iv) subsurface groundwater flow in relation to regional geology and serpentinized spring locations. The knowledge gained can be applied to searching for serpentinized springs, and life within these springs, on Earth, and other planets and moons.