Sediment core analysis of a post-glacial lake over a mineral prospect, Eastern Newfoundland

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Geochemical analysis of lake sediment samples is often used in mineral exploration, and high values of key elements are used to identify prospects. However, analyses are usually of only one random sample per lake near the surface. In order to study the geochemical variation of sediment with location and depth, we carried out a Ground Penetrating Radar (GPR) bathymetric survey followed by sediment coring of 1 - 4.5 m core depth on Grassy Pond, a small organic-rich post-glacial lake. This ~1 km long lake lies over a low-sulphidation epithermal style gold-silver system in the Big Easy Prospect, Eastern Newfoundland. Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) geochemical analyses in all four variable-length sediment cores captured from different locations of the lake show very high contents of arsenic (42-277 ppm) and molybdenum (4-23 ppm), presumably associated with the erosion of iron oxide minerals in the surrounding alteration zone. The high contents of arsenic (often used as a proxy for gold) and molybdenum is seen in all samples, indicating random sampling is sufficient as a first pass to identify a mineral prospect; however, the enrichment of these two elements is highly variable with both depth and location in the lake, suggesting detailed sampling could be a valuable next step. In particular, the down-core geochemical and radiocarbon analysis of our longest sediment core show a major enrichment peak of several key elements (Fe, Mn, As, Mo and V) at 2.5 m depth, which could be related to the transition to a dry period – and hence higher erosion rates – about 5 Ka ago in this region. Thus, climate variations could strongly influence lithic input into the lake, and the best indications of key element enrichment may not necessarily be seen at the shallow depths of random sampling.