Lead Isotopes as Tracers of Particulate Contamination in Lakes

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Lead isotopic signatures vary greatly in nature and in different anthropogenic sources due to in growth of daughter Pb isotopes from radioactive decay of U and Th isotopes. Because sources of Pb to the environment have changed dramatically in the last two centuries, so has the concentration and isotopic signature of Pb entering the environment. Because Pb isotopes are not signficantly fractionated, they are useful as tracers of sources of Pb and other particulate contaminants to the environment. Pb isotopes may also be useful as a chronostratigraphic marker in sediments in regions where the Pb isotopic record is well known.

An elevation in $^{206}Pb/^{207}Pb$ is observed in several watersheds in eastern North America as well as corals in Bermuda deposited circa 1850 (Lima *et al* 2005, Kelly *et al* 2009, Gobeil *et al* 2013). This peak is attributed to Pb ore smelting in the Upper Mississippi Valley and may provide a much needed chronological marker in older lake sediments. Thus, it is important to determine the regional extent of where this peak is observable so that Pb isotopes could be used as an independent sediment dating technique.

Lead isotopes and concentration profiles will be presented from several stratified lakes from the Northern USA and Canada. For example, Siskiwit Lake (48ºN) has a Pb concentration profile consistent with the Bermuda coral record showing a large peak due to the use and phasing out of leaded gasoline in North America. Another lake at 49.2ºN, which is mostly affected by winds from more northern regions, has a Pb concentration profile with much lower concentrations that increases to present. Pb isotopes will determine the northerly extent of the mid-nineteenth century $^{206}Pb/^{207}Pb$ peak and will help constrain the current and historical sources of lead and other particulate contaminants to these lakes.