

# OCGC Seminar

## Mining-related or Natural? An Isotopic approach to understanding sources and fates of the organic contaminants in Canada's oil sands region

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Chambre 233

With around 165 billion barrels, Northern Alberta's oil sands represent the third largest proven oil reserves in the world. The development of this resource, however, has raised concerns regarding its impact on the surrounding environment.

One of the principal issues in assessing environmental impacts and making informed policy decisions regarding oil sands mining activities is the need to discriminate sources of contaminants. In particular, this comes down to the search for techniques that have the potential to separate "anthropogenic" (i.e., mining related) from naturally occurring constituents. Under the framework of Natural Resources Canada's Environmental Geosciences Program, several novel approaches in isotope geochemistry developed and/or fine-tuned at the Geological Survey of Canada (GSC-Quebec) have demonstrated great value in oil sands "environmental forensics" studies.

The first part of this presentation will discuss the application of a novel technique to quantify mining-related naphthenic acids in surface waters and groundwater, and isotopic methods used to determine their fate in the subsurface. These compounds, found naturally in bitumen, become concentrated in oil sands process-affected waters (OSPW) and pose a threat to aquatic ecosystems by seepage from tailings ponds.

The second part will focus on the application of compound specific stable carbon ( $\delta^{13}\text{C}$ ), hydrogen ( $\delta^2\text{H}$ ) and radiocarbon ( $\Delta^{14}\text{C}$ ) isotope analysis to delineate and quantify sources of polycyclic aromatic hydrocarbons (PAHs) in lake sediment cores and snow. PAHs, found naturally at high levels in petrogenic sources such as bitumen, are also produced pyrogenically during the incomplete combustion of organic matter, including wildfires – frequent occurrences in Canada's boreal region.

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