Incorporating boron isotope compositions in a spatial investigation of the fate of contaminated water

ANGELA T. SLADE AND BRANDON WHITEHEAD

The University of Auckland, 23 Symonds Street, Auckland 1142, New Zealand (a.slade@auckland.ac.nz)

In a dynamic hydrologic area near Kawerau (in the Bay of Plenty) New Zealand, highly porous geologic units lie beneath an unlined pulp and paper landfill that has been in operation for 56 years. Over 400, 000 m^3 of contaminated solid waste has been dumped at this location by the local mill. Due to the nature of the waste, the potential contaminants range from heavy metals to persistent organic pollutants. There is significant concern that leachate from the site has been making its way to the nearby Tarawera River, thus contaminating the water for downstream users. This research provides a preliminary spatial investigation of the shallow groundwater on the waste site and correlates it with the surface water in the area using standard water quality parameters. Further, by incorporating boron isotope composition data into the analysis, a refined pattern emerges revealing more detail about the potential fate of contaminants carried in the water from the waste site to the river. This refinement allows for a more comprehensive assessment of the water moving through the contaminated site.

Multi-scale measurement and monitoring of CH_4 dynamics in peatlands using geophysical methods

L. SLATER[1]*, X. COMAS[2], A. PARSEKIAN[1], JAY NOLAN, A. REEVE[3] AND P. GLASER[4]

[1]Department of Earth and Environmental Sciences, Rutgers Univesity, Newark, NJ 07102 USA (*correspondence: lslater@andromeda.rutgers.edu) (parsekia@gmail.com, jtnolan@pegasus.rutgers.edu)

[2]Department of Geosciences, Florida Atlantic University, Boca Raton, FL 33431 USA (xcomas@fau.edu)

[3]Department of Earth Sciences, University of Maine, Orono, ME 04469 (asreeve@maine.edu)

[4]Department of Geology and Geophysics, University of Minneapolis, MN 55455 USA (glase001@umn.edu)

The production of free phase biogenic gasses (predominantly CH_4) and emissions in peat soils is important for understanding both the atmospheric CH_4 burden and the hydrogeology of peatlands. However, spatiotemporal variability of CH_4 production and CH_4 emissions is poorly constrained due to the difficulty of quantifying CH_4 concentrations *in situ* at appropriate scales. We have applied ground penetrating radar (GPR) and electrical resistivity (ER) to capture dynamics of CH_4 production/emissions at scales ranging from laboratory peat blocks to entire peat basins. We report here recent results of plot scale cross-borehole/surface GPR and ER in a well-studied peatland in Central Maine to non-invasively capture dynamics of CH_4 production and emissions. We also report results of a basin-scale GPR study from a bog in northern Minnesota to non-invasively image the distribution of free phase CH_4 production at an unprecedented scale. These geophysical measurements, made with minimal to no disruption of the internal gas dynamics, yield new insights into the controls on CH_4 production and emissions from peatlands. We find compelling evidence for large spatial variations in free phase CH_4 concentration, with the localized entrapment of CH_4 beneath competent layers of peat fabric (e.g. wood rich layers) at depth (> 2 m) observed at multiple sites and at multiple measurement scales. This entrapment likely regulates emissions of CH_4, particularly via ebullition, to the atmosphere.