

Microbial controls on CH₄ cycling in water-saturated mineral soils

K.L.H. LIM¹, P.J. MAXFIELD¹, E.R.C. HORNIBROOK²,
R.D. PANCOST¹, R.P. EVERSLED^{1*}

¹Organic Geochemistry Unit, School of Chemistry, University of Bristol, Cantock's Close, Bristol BS8 1TS, UK
(*correspondence: R.P.Evershed@bristol.ac.uk)

²School of Earth Sciences, University of Bristol, Wills Memorial Building, Queen's Road, Bristol, BS8 1RJ, UK

Mineral soils are generally regarded as methane (CH₄) sinks however those which experience regular water saturation, although not always fully anoxic, may host significant methanogenic communities and even act as CH₄ sources [1]. It is evident that the balance between methanogenesis and methanotrophy in such soils, termed 'transitional soils', may be disrupted by marginal increases in water-content. Hence, internal CH₄ production may be underestimated, potentially causing a 'tipping-point' to occur which may increase the capacity of the soil to act as a net CH₄ source.

CH₄ cycling in soils susceptible to frequent seasonal water-logging was investigated using a combination of CH₄ flux measurements, ¹³C-stable isotope probing and biomarker analyses [2]. In particular the use of archaeol as a potential proxy to assess methanogenic archaeal communities, determined using gas chromatography/mass spectrometry (GC/MS), was explored. The results indicate for the first time in UK mineral soils an increased population of methanogenic archaea at depth due to the anoxic conditions induced by increased water content. Significantly, >90% of the total archaeol was present in 'bound' glycolipid and phospholipid forms, indicating an origin from living archaeal biomass. We are now using these techniques to assess the true 'sink'/'source' capacity of mineral soils subjected to frequent water saturation.

[1] Teh *et al.* (2005) *Glob. Change Biol.* **11**, 1283–1297.

[2] Maxfield *et al.* (2006) *Appl. Environ. Microb.* **72**, 3901–3907.

Multipurpose geochemistry project of CPRM in the Pernambuco State, Brazil – Current stage of work

E.A. M. LIMA*, M. FRANZEN, R. CAVALCANTE
AND F.G. CUNHA

CPRM – Geological Survey of Brazil

(*correspondence: enjolras.lima@cprm.gov.br,

melissa.franzen@cprm.gov.br,

rogerio.cavalcante@cprm.gov.br,

fernanda.cunha@cprm.gov.br)

The work of environmental geochemical mapping and prospective low density are being developed in Pernambuco State, includes Fernando de Noronha Archipelago. We completed work to collect samples of soil, drainage and public water supply as well as stream sediment, with the aim of generating data that can configure the geochemistry of the physical landscape and explain the areas of chemical species impoverished or enriched relative to normal background values of global and regional. Aimed at diagnosing the quality of soils, sediments and water and identify metallogenetic areas looking targets that will be consequential studies involving greater detail.

Results

The phase of interpretation and evaluation of analytical data was started, having achieved the following results of collected samples: 1178 stream sediment samples, 212 soil samples, 338 samples of drinking water, 209 samples of drainage water. Through this regional geochemical mapping of low density at the drainage of the Pernambuco State, is being demonstrated knowledge of the distribution of trace elements. It is being made a database from the results of chemical analysis of collected samples and analytical information. Will also be provided some additional information such as the extent of the contamination plume in surface waters, and indications of anomalous concentrations of metals, indicative of possible mineral deposits.

Thus, the Project was set up not only by geochemical evidence, which could target prospective metallogenetic investigations of greater accuracy, but mainly to be used as an efficient tool to diagnose the quality of the environment sampled, and their relationship to public health and the surrounding biota.