

## Impact of climatic changes on organic carbon dynamic in wet tropical watersheds of Guadeloupe (FWI)

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To better understand the global carbon cycle and the impact of changing climatic conditions, it is important to constrain the different sources, sinks and fluxes of carbon. The soil organic matter ( $\approx 1500$  Gt [1]) is a major pool of carbon at the Earth surface, it is therefore important to understand its dynamic. If the increase of the frequency and/or intensity of extreme meteorological events (storms, cyclones) is confirmed [2, 3], it could lead to an increase of the export of dissolved and suspended material derived from soils. Volcanic provinces under wet tropical climate present optimal conditions for the weathering [4], including high temperature and high runoff, and account for 30% of the total soil organic carbon [5] and could be disrupted by climatic changes. Guadeloupe is selected for its geographical and geological settings and high rates of chemical weathering and mechanical denudation [4, 6, 7]. High-temporal resolution sampling of three small watersheds was performed since 2007 and a biannual sampling, during low water level and floods, was made in rivers of the Basse-Terre island. We quantified concentrations and fluxes of dissolved and particulate organic carbon (DOC, POC) as well as dissolved inorganic carbon (DIC). Organic carbon was also characterised by its isotopic composition ( $\delta^{13}\text{C}_{\text{DOC}}$ ) and its Specific UV Absorbance at the wavelength 254 nm ( $\text{SUVA}_{254}$ ). DOC values range from 0.4 to 5.0 mg/L and increase with increasing rivers discharge.  $\delta^{13}\text{C}_{\text{DOC}}$  varies between -32.8 ‰ and -26.2 ‰ for whole rivers which emphasized different carbon input according to the type of hydrologic events. Similarly,  $\text{SUVA}_{254}$  values vary between 2 and 6. Indeed, the high  $\text{SUVA}_{254}$  values are observed during floods and indicate that the aromaticity of organic matter increases during flood events. The less negative  $\delta^{13}\text{C}$  values and the high aromaticity for flood event samples are interpreted as the result of an increase of SOM inputs during these events.

[1] Gregory *et al.* (1999) *Inter. Geosph.-Biosph. Prog. Book*, **4**. [2] Emmanuel (2005) *Nature*, **436**. [3] Webster *et al.* (2005) *Science*, **309**. [4] Dessert *et al.* (2003) *Chem. Geol.*, **202**. [5] Batjes (1996) *Europ. Journ. of Soil Science*, **47**. [6] Louvat (1997) *PhD*. [7] Rad *et al.* (2006) *Journ. of Geoch. Explo.*, **88**.

## Microbial reduction of toxic metals: From pristine to extreme

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The ability to reduce and detoxify metals is widespread throughout the microbial world and can be linked to energy-requiring detoxification systems e.g. encoded by the *mer* and *ars* operons that detoxify Hg(II) and As(V) respectively, or dissimilatory energy-yielding processes that result in reductive bioprecipitation e.g. the conversion of U(VI) to insoluble U(IV). In addition, indirect mechanisms resulting in the formation of reactive biomineral phases can also play a critical role in controlling the bioavailability of toxic metals in the environment. Driven primarily by concerns about water quality there have been rapid advances in the understanding of these processes in sediments and soils with relatively low natural abundances of transition metals, metalloids and radionuclides, while more recent attention has focused on sites with much higher levels of contamination, with the added impetus of developing bioremediation options.

The microbial reduction of Fe(III) can play a major role in controlling toxic metal speciation via direct and indirect mechanisms. The influence of Fe(III)-reducing bacteria and biogenic Fe(II) minerals on toxic metal speciation will be discussed in a range of environments, including those with extremes of pH and temperature. Case studies including the interactions of acidophilic Fe(III)-reducing bacteria with key acid mine drainage minerals and associated toxic metals and metalloids will be discussed. Of particular interest here will be the environmental fate of arsenic, and microbial interactions with this element and other metalloids (including Se and Te) will also be discussed in a wide range of environmental settings with contrasting metal loadings. Finally the abilities of metal-reducing bacteria to tolerate and transform toxic transition metals (e.g. Hg(II) and Ag(I)) and radionuclides (including Tc(VII) and transuranics) will also be addressed, illustrating the wide range of toxic environments that can harbour microbial life, and the surprising diversity of electron transfer pathways that underpin the bioreduction of toxic metals.