

## <sup>34</sup>S tracer study of pollutant sulfur behaviour in a lowland peat bog

SIMON BOTTRELL<sup>1\*</sup>, JON COULSON<sup>1</sup>,  
REBECCA BARTLETT<sup>1</sup>, JOANNA CLARK<sup>2</sup> AND  
PIPPA CHAPMAN<sup>2</sup>

<sup>1</sup>School of Earth and Environment, University of Leeds,  
LEEDS LS2 9JT, UK

(\*correspondence: simon@earth.leeds.ac.uk)

<sup>2</sup>School of Geography, University of Leeds, LEEDS LS2 9JT,  
UK

Six mesocosms were isolated in a lowland peatland with historically high pollutant S inputs (Thorne Moors, UK). A regular supplement of <sup>34</sup>SO<sub>4</sub> tracer was added to the surface of each mesocosm and mesocosms were sacrificed in pairs at 12, 24 and 48 week intervals to determine distribution of tracer in solid phase components. The tracer budget of surface water and pore-water sulfur (SO<sub>4</sub> and H<sub>2</sub>S) was also analyzed in the 48-week mesocosms.

The <sup>34</sup>S tracer was rapidly removed from surface waters (always <1% of tracer sulfate added remained in the surface waters before next addition). Tracer content in sulfate and H<sub>2</sub>S in pore-water from 25-35 cm depth shows near continuous increase over the 48-week monitoring period, though total amounts of tracer in these pools is tiny (always <0.2% of tracer added). Sulfate in pore-waters from 45-55 and 67-75 cm depth exhibit a similar magnitude of tracer incorporation to that at 25-35 cm, but both show peaks in tracer content at 36 weeks. These deeper pore-waters show little or no migration of tracer into dissolved H<sub>2</sub>S.

The most significant uptake of <sup>34</sup>S tracer (5.7 to 33% of tracer added, mean 17.6%) was into vegetation, which occurs rapidly as there is no increase in tracer content of vegetation with time during the experiment. There was also significant tracer uptake into organic sulfur of the shallowest (<20 cm) peat layers (up to 25.6% of tracer added at 48 weeks). No measurable incorporation into the peat organic fraction occurred below 20 cm depth, despite penetration of tracer in sulfate to 65-75 cm depth. Incorporation of tracer into inorganic forms in the solid phase (FeS, FeS<sub>2</sub>, S<sup>0</sup>) was negligible in most cores.

The tracer test allows a detailed but qualitative model of sulfur cycling to be established. The majority of <sup>34</sup>S tracer was taken up by vegetation or into the organic fraction of shallow peat, presumably following bacterial reduction to sulfide in the shallowest peat layers. Despite penetration of labelled sulfate to deeper pore-waters, there is no significant reduction to H<sub>2</sub>S or incorporation into organic or inorganic fraction at these depths. These deep S reservoirs remain unreactive on timescales of ~1 year.

## Isotopic tracing of organic carbon weathering in the Amazon River

J. BOUCHEZ<sup>1\*</sup>, J. GAILLARDET<sup>1</sup>, C. FRANCE-LANORD<sup>2</sup>  
AND V. GALY<sup>3</sup>

<sup>1</sup>IPGP, Paris, France

(\*correspondence: bouchez@ipgp.jussieu.fr)

<sup>2</sup>CRPG-CNRS, Vandoeuvre-lès-Nancy, France

<sup>3</sup>WHOI, Woods Hole, MA, USA

Continental erosion acts on atmospheric CO<sub>2</sub>, through silicate weathering, burial of organic carbon (C<sub>org</sub>) in marine sediments, and oxidation of fossil C<sub>org</sub> contained in rocks. The efficiency of terrigenous C sequestration is related to the preservation of riverine particulate C<sub>org</sub> during fluvial transport and after deposition in sedimentary basins, and ultimately to the form of riverine organic matter (OM) and its possible interactions with various inorganic materials. It is then necessary to study OM relationships with the whole spectrum of solid products transported by rivers ([1]).

We measured the total C<sub>org</sub> content (TOC), organic δ<sup>13</sup>C and Δ<sup>14</sup>C of Amazon Basin rivers' suspended sediments, collected along depth profiles. Grain size distribution, mineralogy, specific area and chemical composition of the mineral phase have also been determined.

TOC range from 0.05% in bed sediments to more than 2.0% in surface suspended sediments. δ<sup>13</sup>C values are also variable, from -26.5 to -28.9‰ respectively. For a given sampling site and date, TOC and Al/Si ratio define a rather good positive relationship, reflecting the preferential association of organic matter with fine-grained phyllosilicates.

As TOC defines a poor relation with sediments specific area, we state that TOC is rather controlled by a combination between (1) hydrological sorting of individual organic matter particles (2) mineralogy of silicates. Local production (either phytoplanktonic or in adjacent floodplains) seems to heavily influence the organic δ<sup>13</sup>C.

Madeira River suspended sediments have an important content of fossil carbon (extinct Δ<sup>14</sup>C), as high as 20%. However, highland tributaries of the Madeira River such as the Rio Beni can contain even higher proportions of fossil C<sub>org</sub> (up to 50%). This implies a weathering of ca. 30.10<sup>4</sup> tons of fossil C per year (40% of the fossil C supplied by the Rio Beni) during riverine transport through a 2000 km-long reach, and its subsequent release to the atmosphere, to be added to the oxidation of young organic matter ([2]).

[1] Galy *et al.* (2008, in press) *GCA*. [2] Mayorga *et al.* (2005) *Nature* **436**.