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Qualifications

- 2005 - PhD Geochemistry - University of Leeds
- 2002 - MSc Environmental Geochemistry - University of Leeds
- 1999 - BSc Geological Sciences - University of Leeds

Biography

Rebecca was awarded her first degree in Geological Sciences from the School of Earth and Environment, University of Leeds (1999). After two years out of academia, Rebecca continued her interest in geochemistry and research at Leeds, completing an MSc (with distinction) in Environmental Geochemistry (2002), followed by a PhD in Biogeochemistry, (2005). As a Postdoctoral Research Fellow, Rebecca joined the School of Geography at the University of Leeds (2006), facilitating collaborative research across the science disciplines. Her research in biogeochemistry has brought together geologists, chemists, geographers, soil scientists and microbiologists and allowed her to develop a multidisciplinary approach to environmental systems and global change. Rebecca joined the School of Geography, Earth and Environmental Sciences at Birmingham in September 2009.

Research

Research groups

- Water Sciences
- Geosystems

Research interests

- Biogeochemistry of peat, soil and sediment environments (bio-catalysed redox reactions)
- Subsurface chemical and biological response to long-term (global) changes to the environment
- Environmental recovery from acidification (microbial sulphur cycling)
- Geo-microbial influence on nutrient cycling and water chemistry (carbon, sulphur, nitrogen cycles)
- Sediment-water and mineral-nutrient interactions (e.g. manganese-oxides in the nitrogen cycle)
- Stable isotope techniques

Recent Research

Sulphur Cycling: The behaviour of sulfur during peat diagenesis



Peatlands comprise <30% of the world's land surface and represent an accumulation of organic matter and a vast store of carbon. The biogeochemistry of these fragile ecosystems is largely driven by bacterial sulphate reduction (BSR) which converts sulphate (SO₄²⁻) to sulphide (HS⁻). This sulphide product is highly reactive and can combine with inorganic and organic fractions of the peat to produce sulphide minerals (eg FeS₂) or carbon bonded sulphur. This can be an important sink for pollutant sulphur in peatland environments, potentially buffering acid rain; however cycling processes are complex and have important implications for redox and pH of the environment. The intense cycling of sulphur through a range of oxidation states, is usually coupled to isotopic fractionation whereby microbes will discriminate against the heavier isotope (³⁴S) in favour of the lighter isotope (³²S) which forms shorter bonds. Hence, sulphur is cycled in the environment so that the oxidation state, form and isotopic composition of the sulphur present can be an indication of biogeochemical

processes.

This work comprises a range of field and laboratory experiments using compound specific isotopic techniques, artificial tracers and pore-water monitoring to constrain the sulphur cycle in peats and organic soils, and its control on the release of carbon, and the fate of pollutants.

Carbon Cycling: Influence of recovery from acidification on dissolved organic carbon dynamics

Increasing Dissolved Organic Carbon (DOC) is turning our upland rivers darker. The causes of this increase are debated. Changing climate can increase DOC productivity through rising temperatures and plant growth and increased drought severity; yet recent work suggests recovery from acidification may be increasing DOC solubility. This work addresses the influence of chemical changes to atmospheric deposition (acid rain) on the solubility and release of DOC in organic soil and peatlands.



Long-term laboratory and field experiments using state of the art isotopic techniques provide the first empirical evidence of the complexity and importance of seasonality and sulphur cycling for the fate of carbon in soils and surface waters. This work is fiercely debated and has shown that previous assumptions about the impacts of recovery from acidification in the UK need to be reassessed.



Nitrogen Cycling: Nitrogen-manganese interactions in marine and estuarine sediment diagenesis



The conventional pore-water nitrogen cycle comprises microbially mediated oxic nitrification and anoxic denitrification. Recent advances in understanding of the nitrogen cycle include the discovery of the annamox reaction and more recently anoxic nitrification. This work investigates the potential significance of anoxic nitrification reactions in sediments whereby microbes couple ammonia oxidation to manganese reduction.

Field and laboratory incubation results offer unique evidence for this reaction, with production of NO_3^- , NO_2^- and N_2 under anoxia, coincident with Mn^{2+} production. This novel mineral-nutrient link appears to be significant after physical or chemical disturbance, especially where manganese minerals are redistributed or recently precipitated, creating a new non-steady state redox cycle.

Other activities

As part of the Royal Society Pairing Scheme, Rebecca spent a week in Westminster gaining an insight into the life of Gisela Stuart, MP for Birmingham Edgbaston. She wrote a blog of her experiences. See her ['Week in Westminster' blog \(/research/impact/perspective/blogs/week-westminster.aspx\)](#).

Publications

Clark, J. M., Bottrell, S. H., Evans, C. D., Monteith, D., **Bartlett, R.**, Rose, R., Newton, R. J., Chapman, P. J. (2010) The importance of the relationship between scale and process in understanding long-term DOC dynamics. *Science of the Total Environment* **408** 2768-2775

Bottrell, S. H., **Bartlett, R.**, Margeson, K., Thornton, S., Fielding, I. D., Hatfield, W. D., (2010) Lithological controls on biological activity and groundwater chemistry in Quaternary sediments. *Hydrological Processes* **24** 726-735

Bottrell, S. H., Hatfield, W. D., **Bartlett, R.**, Spence, M. J., Bartle, K. D., Mortimer, R. J. G., (2009) Concentrations, sulfur isotopic compositions and origin of organosulfur compounds in pore waters of a highly polluted raised peatland. *Organic geochemistry* **41** 55-62

Bartlett, R., Bottrell, S. H., Coulson, J. P., Lee, J., Carlton, G., Forbes, L., (2009) ^{34}S tracer study of pollutant sulfate behaviour in a lowland peatland. *Biogeochemistry* **95** 261-275

Bottrell, S. H., and **Bartlett, R.**, (2008) Stable isotope methods in environmental and groundwater engineering. *Water Management* **161** 357-365

Bottrell, S., Tellam, J., **Bartlett, R.**, Hughes A., (2008) Isotopic composition of sulfate as a tracer of natural and anthropogenic influences on groundwater geochemistry in an urban sandstone aquifer, Birmingham, UK. *Applied Geochemistry* **23** 2382-2394

Bartlett, R., Mortimer, R. J. G., Morris, K. M., (2008) Anoxic nitrification: evidence from Humber Estuary sediments (UK). *Chemical Geology* **250** 29-39

Bartlett, R., Mortimer, R. J. G., Morris, K. M., (2007) The biogeochemistry of a manganese-rich Scottish sea loch: implications for the study of anoxic nitrification. *Continental Shelf Research* **27**, 1501-1509

Bartlett, R., Bottrell, S., Coulson, J., (2005) Behaviour of sulfur during diagenesis of a maritime ombrotrophic peat from Yell, Shetland Islands, UK. *Applied Geochemistry* **20**, 1597-1605