

## Coupling of nitrogen inputs and losses during the Permian-Triassic biotic crisis

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We report coupling of dinitrogen (N<sub>2</sub>) fixation and denitrification in oxygen deficient waters in the Sverdrup Basin, Arctic Canada, during the Permian-Triassic biotic crises. Sediments deposited prior to the latest Permian extinction (LPE) event are characterized by positive δ<sup>15</sup>N values of ~9 ‰ associated with the presence of lycopane implying upwelling of denitrified waters from an expanded oxygen minimum zone (OMZ). The data show anoxic bottom water conditions were not developed in northeastern Panthalassa during the Late Permian. Promoted by dispersing coal ash from Siberian Traps volcanic, as marked by abrupt rise in C/N ratios (>20) prior to the LPE event, euxinic conditions first developed at the LPE. Nutrient-induced anoxia was likely prevalent during the Early Triassic in the aftermath of the LPE, however, the nutrient N pool was predominantly fuelled by N<sub>2</sub>-fixing cyanobacteria.

## Tellus: Regional-scale baseline geochemical mapping of soil, stream sediment and stream water for the island of Ireland

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Systematic geochemical surveying of the northern region of the island of Ireland, comprising Northern Ireland (NI) and the northernmost counties of the Republic of Ireland (RoI), is now complete. The Geological Survey of Ireland recently conducted regional-scale surveying of soils, stream sediments and stream waters geochemistry across the northern region of Ireland under the Tellus Border project. A survey of neighbouring Northern Ireland was completed in 2007 under the Tellus project by the Geological Survey of Northern Ireland. Multi-element analytical data for the entire region are currently being integrated to provide seamless cross-border mapped datasets. These surveys also took place alongside multiparameter low-level airborne geophysical surveys collecting magnetic field, electromagnetic and radiometric data; resulting in a high-quality and comprehensive geo-environmental database.

There are challenges in merging these data; with two ground survey designs conducted at differing densities. However the same general field collection, sample preparation and analytical methodologies have been utilised. Topsoils (c.5–20 cm) have undergone *aqua regia* ICP analyses, stream sediments (<150 μm wet-sieved fraction) by XRF and stream waters analysed by IC, ICP-MS and for DOC.

Legacy and new data have been combined and are being assessed using multivariate statistical techniques (*e.g.* factor analyses) to characterise and map factors which help to define geochemical signatures; to understand sources and processes at play. They reveal broad geogenic controls and influence of agricultural practices that overprint the rural geochemical baseline.

The region now has a rich geochemical dataset with improved detail across this geologically diverse region. Elements of interest to agricultural applications are compared to results from prior national soil surveys and the European-wide GEMAS study.