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Geochemical ratios as a potential method for mapping peatlands

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A methodology for determining the extractability of elements from soil has been developed using a regional scale geochemical data set. The Tellus data set contains geochemical data which covers Northern Ireland, approximately 13,800 square kilometres, with almost 8000 sample locations. Shallow soil samples were taken between 5 and 20 centimetres depth and were analysed by two different methods; x-ray fluorescence (XRF) and inductively coupled plasma following an aqua regia digestion (ICP). As the ICP concentration is dependent on the preceding acid extraction, this research compares the 'total' XRF concentration to the 'partial' ICP concentration to gain insight into the extractability of the element from the soil at a particular sample location. Concentrations measured by XRF are generally greater, but where the ratio of XRF concentrations over ICP concentrations is less, the elements are expected to be relatively more easily extracted from the soil.

A key output from this research has been the spatial indications of how extractability of these elements changes across the region, gained by mapping the ratios of XRF over ICP concentrations. A key factor, showing varying results for a number of different elements is peatland. In particular, molybdenum and antimony have been identified as elements which show diverse patterns of behaviour in varying areas of peat. Some areas of peat show more easily extracted concentrations of these elements, while some show similar extractability to the surrounding soils. It is likely that how well the peat is functioning, and the level of anthropogenic impact, will influence how the different elements behave in different peatlands. This suggests that a geochemical ratio, showing element extractability, is a potential method for mapping peat health. As peatlands are known to store huge amounts of organic carbon in their natural state, they play an important role as a carbon sink. Draining of peatlands is a common form of anthropogenic activity, and this disturbance could change peatlands into carbon sources. Any method which can determine peatlands acting as a carbon source from those acting as a carbon sink will greatly inform the debate surrounding the future emission of greenhouse gases to the atmosphere.