Do volcanic emissions affect carbon gas fluxes in peatlands?

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Do volcanic emissions affect carbon gas fluxes in peatlands?

Nicola Harrison (1), Pierre Delmelle (1), Sylvia Toet (1,3), Vincent Gauci (2), and Phil Ineson (3)

(1) Environment Department, University of York, York, UK (njh502@york.ac.uk), (2) Department of Earth and Environmental Sciences, Open University, Milton Keynes, UK, (3) Biology Department, University of York, York, UK

Recently, a link has been suggested between volcanic deposition of SO4 and the suppression of CH4 emissions in northern peatlands (Gauci et al., 2008). This link stems from the widely accepted idea that acid rain SO4 additions to peatlands can cause a shift in microbial communities as SO4 reducing bacteria out-compete methanogens for substrates, which results in a suppression of CH4 emission. However, volcanic emissions contain besides S other chemically reactive species that are potentially harmful to the environment. In particular, gaseous and particulate F emissions from volcanoes constitute a steady or intermittent source of F emission and deposition into the environment both close to the source and within fallout range of large eruptions. The objective of this study was to investigate the effect of volcanic depositions of SO4, both alone and in combination with F, on CH4 emission in peatlands. Peat mesocosms collected from Pennine uplands in the UK were treated with weekly pulses of Na2SO4 and NaF over 20 weeks in doses of 74 kg SO4/ ha and 13.5 and 135 kg F /ha. CH4 emissions were measured at regular intervals by taking headspace samples, which were analysed by GC-FID. CO2 fluxes were also measured using a portable Infra Red Gas Analyser (IRGA). No significant differences in CH4 and CO2 emissions were observed for any of the treatments when compared to the controls, which had only received deionised water. These findings are in contrast with previous studies where SO4 reduces CH4 emission in peatlands. The reason for this is unclear but may be due to the heterogeneous nature of peat soils. An alternative explanation relates to the previous history of the soils used in the mesocosms which are known to have been previously exposed to large volumes of anthropogenic S pollution. This may have caused microbial communities to evolve and become acclimatised to high levels of S addition. In either case, the assumption that CH4 suppression in peatlands occurs upon exposure to volcanic depositions is questionable.

Gauci, V., S. Blake, et al. (2008). Halving of the northern wetland methane source by a large icelandic volcanic eruption. JGR, doi:10.1029/2007JG000499