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How to cite:

Harrison, Nicola; Delmelle, Pierre; Toet, Sylvia; Gauci, Vincent and Ineson, Phil (2010). Do volcanic emissions affect carbon gas fluxes in peatlands? In: European Geophysical Union General Assembly 2010, 2-7 May 2010, Vienna, Austria.

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Version: Not Set

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Do volcanic emissions affect carbon gas fluxes in peatlands?

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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