



2H and 18O Freshwater Isoscapes of Scotland

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Scotland's freshwater lochs and reservoirs provide a vital resource for sustaining biodiversity, agriculture, food production as well as for human consumption. Regular monitoring of freshwaters by the Scottish Environment Protection Agency (SEPA) fulfils legislative requirements with regards to water quality but new scientific methods involving stable isotope analysis present an opportunity combining these mandatory monitoring schemes with fundamental research to inform and deliver on current and nascent government policies [1] through gaining a greater understanding of Scottish waters and their importance in the context of climate change, environmental sustainability and food security.

For example, 2H and 18O isoscapes of Scottish freshwater could be used to underpin research and its applications in:

- Climate change – Using longitudinal changes in the characteristic isotope composition of freshwater lochs and reservoirs as proxy, isoscapes will provide a means to assess if and how changes in temperature and weather patterns might impact on precipitation patterns and amount.
- Scottish branding – Location specific stable isotope signatures of Scottish freshwater have the potential to be used as a tool for provenancing and thus protecting premium Scottish produce such as Scottish beef, Scottish soft fruit and Scottish Whisky.

During 2011 and 2012, with the support of SEPA more than 110 samples from freshwater lochs and reservoirs were collected from 127 different locations across Scotland including the Highlands and Islands. Here we present the results of this sampling and analysis exercise isotope analyses in form of 2H and 18O isoscapes with an unprecedented grid resolution of 26.5×26.5 km (or 16.4×16.4 miles).

[1] Adaptation Framework - Adapting Our Ways: Managing Scotland's Climate Risk (2009); Scotland's Biodiversity: It's in Your Hands - A strategy for the conservation and enhancement of biodiversity in Scotland (2005); Recipe For Success - Scotland's National Food and Drink Policy (2009); Scottish Planning Policy Environmental Report (2009); Scottish Planning Policy (SPP) 15 Planning for Rural Development (2005); National Planning Policy Guideline (NPPG) 14: Natural Heritage (1999).