

Water-isotope evidence of a persistent plume observed in snow and ice samples at Erebus volcano, Antarctica

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A volcanic $\delta^2\text{H} / \delta^{18}\text{O}$ signature is present in snow samples and cores through the walls of fumarolic ice towers on the flanks of Erebus volcano, Antarctica. Of 213 samples analyzed, 61% plotted outside the field of all isotopic measurements of snow recorded for the entire continent of Antarctica. The isotopic data for Erebus samples are shifted from isotopically light Antarctic snow towards a typical magmatic water box.

The signature is thought to result from the release of magmatic water from Erebus' persistently degassing lava lake. Ice crystals may nucleate and fall from the plume directly, or plume vapor may mix with storm fronts and enrich meteoric snow. Fumarolic release of water from the volcano's flanks may also contribute to the signature. Samples from ice towers above fumarolic vents do not show a significantly higher enrichment than other snow samples, indicating that the plume is the main source of volcano water.

S, Cl, and F concentration was measured for the majority of the snow samples. Notably, there is poor spatial correspondence between the anionic volcanic signature and the water isotope volcanic signature. The transport and deposition mechanisms for plume water appear to be decoupled from those of gaseous aerosols in the plume.