

Fractionation of a hydrous arc magma: The origin of adakitic and alkaline signatures at Savo volcano, Solomon Islands

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Savo, Solomon Islands, is a historically active volcano dominated by sodic, alkaline lavas and pyroclastic rocks with up to 7.5 wt % Na₂O, and high Sr arc-like trace element chemistry. The petrogenetic history of the erupted suite suggests high water contents in the parental melts, favouring: a) the early fractionation of oxides; b) early, abundant crystallisation and differentiation of hornblende; and c) limited extraction of feldspar. Instead, it shows pseudo-closed system crystallisation; plagioclase forms but does not fractionate, so although crystals record formation in a melt of decreasing Sr, whole rock Sr increases with magmatic evolution [1].

Early amphibole fractionation and limited plagioclase fractionation contribute to an adakite-like geochemical signature of the Savo suite. Previous authors have noted this [2], but in the case of Savo, the adakite signature is a consequence of the fractionation history. The sodic, alkaline nature can also be attributed to feldspar; whole rock Na increases with SiO₂ as albite is retained. Na/K increases by biotite fractionation.

Much of the magma's water load appears to be released prior to eruption; Savo's eruptive style is that of dome formation, and pyroclastic rocks are all crystalline and non-vesicular. Fluids are released to a hydrothermal system [3] with the potential to form economic mineralisation. The oft-made linkage between 'adakitic' magmatism and economic copper and gold mineralisation (see [4] for review and criticism) may instead be an association between mineralisation and hydrous parental magmas.

[1] Smith, Petterson, Saunders, Millar, Jenkin, Toba, Naden & Cook (2009) *Contrib. Mineral. Petrol.* **158**, 785–801.

[2] Schuth, Munker, Konig, Qopoto, Basi, Garbe-Schonberg & Ballhaus (2009) *J. Petrol.* **50**, 781–811. [3] Smith, Jenkin, Naden, Boyce, Petterson, Toba, Darling, Taylor & Millar (2010) *Chem. Geol.* **275**, 35–49. [4] Richards & Kerrich (2007) *Econ. Geol.* **102**, 537–576.

Understanding bioavailability of iodine in soils of Northern Ireland

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The impact of soil-iodine dynamics on the availability of iodine to plants has been investigated, with a focus on uptake to grass as pasture from a range of soil types in Northern Ireland. The aim of the work was to determine how the availability of iodine to plants is dependent on soil properties. A predictive model of iodine behaviour based on the findings will take into account location, soil type and seasonal changes within Northern Ireland as a case study. The model may ultimately be useful in predicting human and animal populations at risk of iodine deficiency diseases.

The transformations and dynamics of ¹²⁹I added as either ¹²⁹I⁻ or ¹²⁹IO₃⁻ to soils have been followed. Results indicate rapid transformation of inorganic iodine into organic forms, with ultimate incorporation into soil organic matter via formation of intermediates e.g. HOI or I₂. Rates of incorporation are highly dependent on physico-chemical parameters including soil pH, organic matter content and major oxide composition. Rate of transformation to organic forms depends upon initial iodine speciation. Iodide is lost more rapidly (minutes-hours) than iodate (hours-days), especially in soils with high organic matter. In all cases initial incorporation has been demonstrated by size exclusion chromatography to be in the low molecular mass humic substances.

The ultimate speciation and location of iodine in soil will affect the amount potentially available to plants, which therefore depends strongly on both the speciation of iodine and soil properties.