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Petrogenesis of the Sólheimar Ignimbrite (Katla, Iceland): implications for tephrostratigraphy

E.L. Tomlinson (1), T. Thordarson (2), C.S. Lane (3), V.C. Smith (3), C.J. Manning (1), W. Müller (1), and M.A. Menzies (1)

(1) Department of Earth Sciences, Royal Holloway University of London, Egham, U.K., (2) School of GeoSciences, University of Edinburgh, Edinburgh, U.K., (3) Research Laboratory for Archaeology and the History of Art, Oxford, U.K.

The Sólheimar ignimbrite was one of the largest eruptions from the Katla caldera (Iceland) and is important from the perspective of tephra correlation studies. Sólheimar tephra compositions extend from rhyolite to basaltic-Icelandite, a trend that defines a coherent magma mixing line. Mixing is evident both texturally and as binary mixing trends in major and trace element and 87Sr/86Sr compositions of volcanic glasses. The rhyolite component is the product of partial melting of alkali basalt crust. Major and trace element modelling indicates that 30-40% melting of basalt generated a dacitic magma which underwent subsequent fractionation to form rhyolite. The eruption of the Sólheimar ignimbrite was triggered by the intrusion of basaltic-icelandite magma, which mixed with resident rhyolite magma during eruption. It has been linked to the Vedde Ash (Lacasse et al., B. Volcanol 57,1995), a compositionally bimodal tephra layer used to link sedimentary records in the North Atlantic and Northern Europe. Despite the importance of the Vedde ash in late Quaternary studies, its provenance remains equivocal. The Vedde rhyolite glasses share the same major and trace element chemistry as the Sólheimar rhyolite, indicating that these deposits may be from the same eruption. However, the Sólheimar Ignimbrite lacks the basaltic component that is sometimes associated with rhyolitic shards in the distal Vedde Ash, therefore this correlation cannot be confirmed.