Reviewed research article

Geochemistry of igneous rocks in Iceland: a review

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Abstract — *Two important large-scale geochemical trends are observed in Iceland and the adjoining spreading ridges, one along the ridges and active rift zones, and the other between the rift zones and off-rift areas of recent volcanism. Along the ridges, basalt compositions are increasingly enriched in incompatible elements (i.e. elements which preferentially partition into melts) towards Iceland, reflecting enhanced melting of fusible, fertile components of a heterogeneous mantle. These heterogeneities may be garnet pyroxenites that are derived from recycled oceanic lithosphere. Recent basalts erupted outside the rift zones are more enriched in incompatible elements than those of the rift zones. These two trends reflect variations in mantle temperature, compositional structure and flow field as well as the role of tectonics. Mantle melts move rapidly from their deep source regions towards the surface in porous channels or dykes. These melts mix and cool in lower-crustal magma chambers before eruptions. The limited basalt production rate away from the rift zones results in a relatively low crustal thermal gradient, facilitating the production of silicic magmas by fractional crystallization of incoming basalts. However in the hot rift zones, where hydrothermal activity is plentiful, crustal anatexis may result to produce silicic melts. Thorough mixing of crustal melts and solid crustal material with basalts may account for the compositional features of large fissure eruptions such as Laki.*