**Iceland: A case of continental cannibalism?**

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**Introduction**

Iceland is mainly composed of a primitive rock called basalt. This is the same rock that makes up most of the surfaces of rocky bodies in our solar system. Only on Earth do we have large expanses of more evolved continental crust which is thought to have been instrumental to the evolution of complex life.

But confusing is the tangle prosthesis recent that an ancient slab of continent may lie beneath east Iceland and be contaminating the overlying granites. Those authors used geophysical and isotopic evidence to set out to investigate further with the aid of field observations, bulk rock chemistry, and magnetic susceptibility.

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**Methods in the field...**

During a fortnight of fieldwork, approximately 30kg of rock was collected from across Iceland, both from above the hypothesised continental silver and from localities distal to it. Details of geological context were recorded at every locality visited, including those unsuitable for sampling. The freshest, most representative pieces of rock were targeted for sampling, which was done using a hammer and chisel. The original aim was to sample only granite. However due to the scarcity and inaccessibility of many outcrops, some rhyolites and silicic tuffs were also sampled in order to obtain a useful size of dataset.

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**...and in the lab:**

**Microscopy**

Samples were first cut with a diamond saw then ground and polished down to a 30µm slice glued to a glass slide. These were examined using a polarising microscope to describe fine scale textures and mineralogy.

**X-Ray Fluorescence**

Before any geochemical analysis could be undertaken the samples first had to be sledgehammered into fist-sized chunks, crushed to gravel in a jaw crusher, and pulsed to powder in a TEMA mill.

Elemental compositions were obtained using X-Ray Fluorescence (XRF). A hydraulic press with a 15-ton load was used to make pellets for trace element analysis. Glass discs for major element analysis were prepared by melting the samples in a furnace.

**Magnetic susceptibility**

Magnetic susceptibility measures the response of a sample to an applied magnetic field. In this case the result mainly indicates the sample’s magnetic content, as it raises bulk susceptibility. This is useful because magnetic-ilmenite speciation depends on oxygen fugacity, which may be sensitive to continental contamination.

Bulk magnetic susceptibility was measured on cut and polished sample surfaces, using an MS2E surface scanning sensor and Bartos software. Depending on the size of each sample, 6 to 20 measurements were taken and averaged.

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**In the west**

Large well-exposed granite bodies are rare in western Iceland. In some cases the bodies on the official map did not appear to exist. At Hvammstangi only tuffs and rhyolites were found, but fine-grained intrusions were found in coastal outcrops at Kolgrafir and Setegb.

Knorr featured a coarser intrusion with excellently exposed contacts, showing that true granites do occur in the west.

**In the east**

There is a cluster of large granite intrusions in southeast Iceland, including Austurhorn and Vesturhorn which were sampled for this project, and Storauldur from which data was gathered from previously collected samples.

Further north is Sandfell, a rhyolite laccolith, and the subvolcanic Njardvik silicic complex which was sampled at Borg.

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**Results**

**Magnetic susceptibility**

Despite being chemically (fig. 9 & 10) and petrologically (fig. 6 & 7) similar to those elsewhere in Iceland, the granites in the far SE have a higher magnetic susceptibility (fig. 8). This is not a typical continental signature, which would generally have lower values. However it is a substantial enough anomaly that there is likely to be a common cause. This may be a subsurface continental sliver with unusual chemistry, or a heterogeneity in the underlying mantle plume, perhaps caused by upwelling of previously subducted material. Further work is needed to investigate these options.

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**Summary**

Granites are the building blocks of continents, and this project examined how they form. I travelled to Iceland to study some of the youngest granites in the world, to establish whether they are forming fresh from more primitive crust, or whether some of them are cannibalising an ancient piece of continent hidden under eastern Iceland, as has been suggested by previous authors. I found an anomaly in the SE of Iceland which could indicate that the source of the granites there is different to elsewhere in Iceland. However further work would be required to determine definitively whether it is an ancient hidden continent.

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References:
-Vernon, S., Becker, R., Schueller, V., Faure, M. and Becker, H., 2014. The ideal granular Earth: most texturally important phase transitions are explained by Fig. 6 - (a) Glass powder XRF. A hydraulic press with a 15 ton load was used to make pellets for trace element analysis. Glass discs for major element analysis were prepared by melting the samples in a furnace.