The compositional zonation in mafic dykes of the Kestiö Island, Finland

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Detailed sampling across three dolerite dykes of different size (small, 7 cm; middle, 75 cm; and thick, 675 cm) of the Åland-Åboland dyke swarm [1] has revealed an internal zonation of an anomalous nature. The small, almost glassy dyke exhibits a systematic inward decrease in whole-rock MgO and Mg# (indicating a normal fractionation trend) together with a simultaneous increase in normative An and decrease in whole-rock Zr, Y, TiO_2 (indicating a reverse fractionation trend). The middle dyke shows similar compositional trends across its narrow margins, but in the more crystalline interior whole-rock MgO and Mg# gradually but steadily increase inwards. The thick, almost totally crystalline dyke exhibits an internal zonation similar to that of the middle dyke, with fractionation trends becoming only much more pronounced in the centre of the dyke. The almost glassy nature of small dyke suggests that its anomalous compositional zonation most likely resulted from temporal changes in the composition of magma as it formed the dyke. The mechanism(s) responsible for such systematic changes in composition of inflowing magma remains, however, unknown. The margins of middle and thick dyke form in a similar way whereas their interiors formed by *in situ* cumulate growth against dyke sidewalls. The compositional zonation of these dolerite dykes is thus produced by two independently operating mechanisms: successive changes in composition of inflowing magma and an *in situ* cumulate growth on dyke sidewalls.

[1] Ehlers & Ehlers (1977) *Bul. Geol. Surv. Finland* **289**, 31.

Determination of the ^{10}Be half-life by Multi Collector ICP-mass spectrometry and liquid scintillation counting

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Over the past decades the number of studies using the rare cosmogenic nuclide ^{10}Be have increased, mainly for geologic, oceanographic, and climate studies. Yet no consensus exists on a reliable value for half-life of ^{10}Be. Several determinations of this half-life have been done in the past, leaving a discrepancy of 14% between different measurements, and splitting the community of users. While some studies used 1.34 My the others used 1.51 My (see Granger [1] and Nishiizumi *et al*. [2] and references therein).

One fundamental requirement of this determination is an accurate mass-spectrometric measurement of the ^{10}Be/^{9}Be ratio, where the unknown number of atoms of ^{10}Be present in a sample can be calculated from such a ratio and from the known amount of ^{9}Be added gravimetrically. However, the unknown instrumental mass discrimination inherent to most isotope mass-spectrometric methods prevented all previous estimates to measure precisely this ratio. We used a new approach, based on MC-ICP-MS. A ^{10}Be-rich solution obtained from G. Korschinek at TU München was spiked with various additions of a carefully prepared ^{9}Be solution The mass bias produced by the so-called space charge effect of the ICP source was well-constrained by bracketing the Be ratio measurement with stable isotope ratio measurements of other elements of well known isotope ratio. The ^{10}Be/^{9}Be ratio of the mother solution has been precisely determined as well as the total Be concentration. The activities of several dilutions have been measured by LSC. The ^{10}Be amount of the solution measured via isotope dilution has then been combined with the results on activity to calculate a ^{10}Be half-life of 1.39My with an analytical error of roughly 1%. This new half life agrees with that determined at TU München by ERD [3].

[1] Granger (2006) *Geol. Soc. Of America*, special paper **415**, 1-16. [2] Nishiizumi *et al*. (2007) *Nuc. Instr. And Methods in Phys. Res. B* **258**, 403-413. [3] Korschinek *et al*. (2009) *GCA*, this volume.