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Trace Elements Systematics in Basalts: A Global Approach

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The simultaneous analysis of 5000 samples of basalts for twenty elements : U, Th, Zr, Hf, Ta, Ba, Sr, Cs, Rb, Sb, Cr, Co, Ni, Fe, Sc, La, Ce, Sm, Eu, Th, Yb by activation analysis and for 1000 samples of also W, As, Mo, Br, Ag, Au, Ir has permitted to constitute the largest cogenetic data bank of trace elements in basalts.

On top of the case-by-case studies, we have tried to do a statistical approach in the view of deriving general laws for geochemistry and magmatic processes. Using the [A/B vs. A] diagrams approach, and following Hoffman's systematics, we have tried to determine a set of bulk partition coefficients for partial melting generating MORB and OIB.

The statistical distributions of the elements clearly show dissymmetry in concentration histograms (linear scale). The distribution is more like a log-normal one. The dispersion and dissymmetry in distribution is directly related with bulk composition coefficients, the more magmatophile the more dissymmetric. But the dispersion is less in OIB than in MORB despite the fact that degree of melting is more variable.

This distribution is explained in terms of incompatibility and residence time into the upper mantle. The origins of OIB are in fact from a less stirred reservoir.

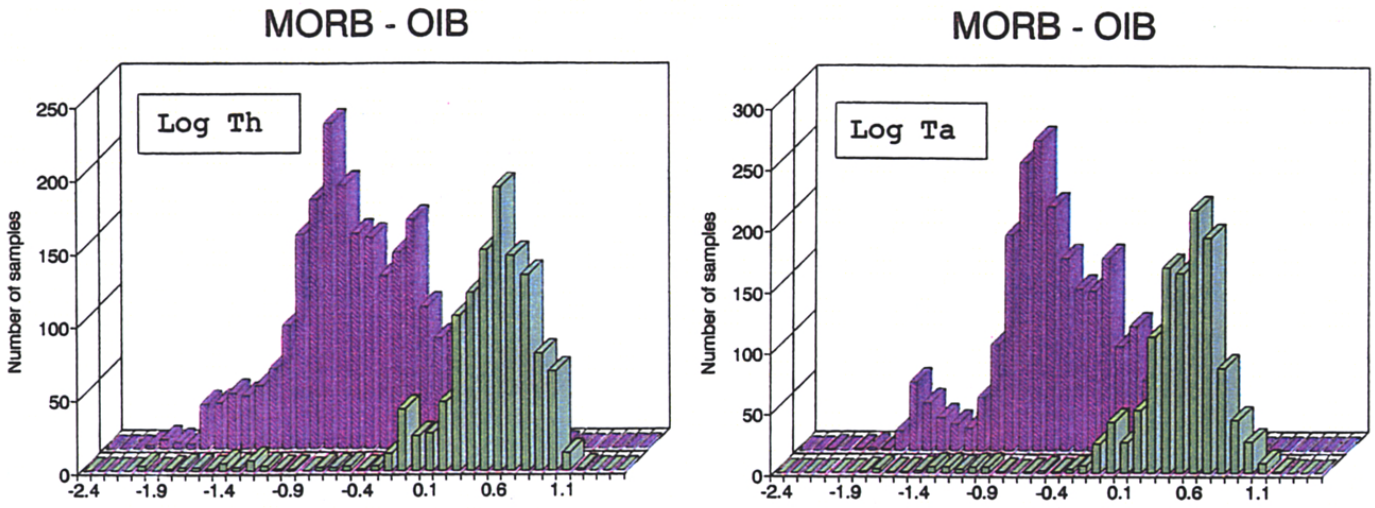

Figure 1: Concentration histograms in MORB and OIB