Biased chemical Range of Icelandic and oceanic Basalt Analyses: The Result of different sampling Methods and compositionally selective kinematic Evolution within Rift Zones

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ABSTRACT

Over 50% of the rocks produced in the rift zones of Iceland are of the primitive MORB-type tholeiites. The remaining 50% consist of more evolved tholeiites, some FETI-enriched tholeiitic basalts and a small amount of intermediate and silicic rocks. The more evolved part of this suite is produced in central volcanoes, while the primitive part is the product of the fissure swarms in early stages of evolution. In the non-rifting volcanic zones, no primitive tholeiites are produced, but the bulk of the production is of the FETI-basalt type and enriched in alkalies. The relative share of intermediate and silicic rocks in these zones is much greater than in the rift zones, but the total rock production is much lower. Compared to the ocean floor, the Icelandic rift zones produce identical rock types but in greater relative volume. There is a close resemblance between the non-rifting zone production and the poorly defined off-ridge rocks of the oceans. The Tertiary rocks of Iceland which show low abundance of the most primitive tholeiites are the flank products of the main rift zones. This same low abundance characterizes the ridge flanks and older parts of the sea floor. This harmonizes with the kinematic evolution of the spreading centers and its compositionally selective nature. The idea behind the "Iceland geochemical anomaly" results from: 1) different data-banks and totally different information on samples of the different data-banks, which result from the different sampling methods in use on the ocean floor and in Iceland, and 2) compositionally selective nature of the kinematic evolution of the rift zones.

INTRODUCTION

In the literature on the petrochemistry of the oceanic rocks, one frequently meets with the idea of an "Iceland geochemical anomaly". This phrase is poorly defined but highly suggestive regarding the petrochemical difference between Iceland and the ocean floor. In the article, this idea will be examined. The data used is of three types: 1) general knowledge of the volcanology of Iceland and the evolution taking place on and within its volcanic zones (largely summarized by *Saemundsson* 1979), 2) available data on the chemistry of the Icelandic rocks and their distribution in relation to composition (summarized by *Imsland* 1978 and in press), and 3) for comparison, data from articles summarizing the petrochemistry of the ocean floor rocks (e.g. *Cann* 1971 and *Hart* 1976).

VOLCANO-TECTONICS AND PETROCHEMISTRY VERSUS SAMPLING METHODS

The methods used in collecting the rock samples from the ocean floor and from Iceland lead to fundamentally different background information on the samples.

In Iceland the samples are hand-picked after being selected on basis of general geological and volcanological information. The data-bank on Icelandic rock chemistry thus allows the correlation of the petrochemistry to a diversity of volcanic phenomena and other relevant features.

Both the dredge sampling- and drilling methods used in the case of the ocean floor sampling give samples without precise geological and volcanological information. The chemistry of the ocean floor rock samples can thus not be correlated to volcanotectonic origin in any detail. Only gross correlations or hypothetical deductions can be made.

On the basis of information gained in this way the present general ideas on the evolution of the rifting