PETROLOGY OF THE OCEANOGRAPHER FRACTURE ZONE (35°N35°W)

by

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Abstract of a Dissertation

Submitted to the State University of New York at Albany

in Partial Fulfillment of

the Requirements for the Degree of

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ABSTRACT

During a geological and geophysical survey of the Oceanographer Fracture Zone (35°N,35°W), seventeen dredge hauls containing a variety of rocks were obtained. Petrographic study shows that these rock samples can be classified into six main rock types: fresh basalt, weathered basalt, metabasalt, gabbro, metagabbro, and serpentinite. Most of the dredge hauls were positioned on the steep, southern wall of the fracture zone, and an inference from the dredging results suggests that basalt is the most abundant rock type which outcrops at the junction between the rift valley and the fracture zone; however, as we move away from the junction, metabasalts and metagabbros apparently become more abundant in the outcrops on the wall of the fracture zone.

Fresh basalts from the Oceanographer Fracture Zone are characterized by the petrography, mineralogy, and major element chemistry typical of abyssal tholeiites, but are somewhat enriched in large ion lithophile elements (K, La, etc.). The major constituent minerals observed in these fresh tholeiitic basalts are olivine, plagioclase, clinopyroxene, and opaque minerals. Compositional variation of olivine within a given specimen is small, and fayalite contents steadily increase as FeO* (total iron as FeO)/MgO in the host basalt increases. Clinopyroxenes of these tholeiitic basalts are mostly augites, and no Ca-poor pyroxene is observed. Plagioclase including those that occur in the groundmass show an overall compositional range from An_{86} to An_{44}. There is a positive correlation between albite content and Fe/(Fe + Mg) in these plagioclases; i.e., Fe/(Fe + Mg) increases as plagioclase becomes more sodic.

Major element analyses of tholeiitic basalts from two adjacent

dredge hauls (RD 7 and 8) show that these tholeiitic basalts are closely related chemically and that they apparently represent points on a continuous liquid line of descent. This compositional variation can be ascribed to fractional crystallization of phenocryst phases observed in these tholeiites.

Metamorphic rocks from the Oceanographer Fracture Zone range in metamorphic grade from zeolite to greenschist facies. Metabasalts are massive and show no evidence of deformation; metagabbros are to some degree deformed. Petrographic study of these metagabbros indicates that plagioclase grains are commonly strained, bent, and ruptured, whereas pyroxene and hornblende grains are replaced by a metamorphic mineral assemblage made up mainly of actinolite and chlorite. Apparently, plagioclase responded differently than the mafic minerals to these tectonic and metamorphic conditions.

The Oceanographer rock collection is characterized by abundant rocks with the hornblende plus plagioclase assemblage. It is suggested that this rock type must be considered as one of the potential candidates for the constitution of oceanic crust.

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