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EVIDENCE FOR MAGMA EVOLUTION WITHIN THE COMPOSITE DIKES OF CAT COVE, SALEM, MA

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Located just south of Cape Ann, the igneous rocks exposed at Cat Cove appear to be part of the Cape Ann Plutonic Series (CAPS). The CAPS is believed to have formed during Paleozoic rifting of the Avalon plate, resulting in three distinct lithologies and geochemistries: a felsic/granitic phase, a mafic fractionate phase, and an intermediate or mixed phase (Paige and Hon, 1989). At Cat Cove, nepheline syenite dikes enclose basaltic pillows and intrude gabbro-diorite country rock. Similar rare-earth element (REE) signatures suggest a genetic relationship among these three rock types and their geochemistry places them within the CAPS 'mafic fractionate' group of Paige and Hon (1989). Major-element Pearce diagrams of new, whole-rock geochemical data support their proposal of fractional crystallization, indicating that pyroxene and plagioclase were removed from the basalt as the syenite and gabbro-diorite crystallized. Differing textures and chemistries among the syenite samples seem to indicate that the syenitic magma also differentiated within itself. Fine-grained, medium-grained and pegmatitic textures are observed, and these distinctions are reflected in both REE and trace element profiles. The pegmatite is REE-poor but large-ion lithophile element (LILE)-rich, suggesting that it consists of early-formed crystals within the syenitic magma. The fine-grained syenite is comparatively REE-rich and LILE-poor, with a negative Eu anomaly and correspondingly less plagioclase than the pegmatite. This suggests that the fine-grained syenite was formed after the removal of the pegmatitic material. The medium-grained syenite chemistry generally plots with the chemistry of one or the other textures, or simply in between them. In the field, the three textures generally appear in elongate zones or lenses within a dike, but veins of the fine-grained syenite are seen to intrude the other two. This physical observation suggests that the fine-grained syenite was more fluid than the other textures, a further indication that fractional crystallization was occurring within the syenitic magma.

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General Information for this Meeting

Session No. 155--Booth# 53
Igneous Petrology (Posters)
Hynes Convention Center: Hall D
8:00 AM-12:00 PM, Thursday, November 8, 2001