ZHANG YING TAO

V 106 INVITED PAPER

GEOGRAPHIC VARIATION OF RARE EARTH ELEMENTS IN HYPERSTHENE SYENITES AND REE IN DIAGENETIC MELTING OF GABBROIDS

L. Peter Granet

Klemm F. Silver, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena California 91125

Rare earth element patterns of plutonic rocks (chondrite-normalized) across the Peninsular Ranges batholith vary systematically west to east, transgressive to the axial zones and structural trends and parallel to known syn-metamorphic and tectonic provinces. Changes are most evident near the western margin of the Peninsular Ranges where large variations are seen between the southern and northern parts of the batholith. For REE in particular, negative Eu anomalies and high La/Yb(<1) are used as a proxy for the metamorphic stage of the plutons. Patterns are consistent with a meta-chondrite source region for the REE fractionation. Geochemical constraints of a meta-chondrite source region suggest that the Peninsular Ranges batholith may have developed along major tectonic boundaries in the sublithospheric mantle.

V 107 INVITED PAPER

RUBIDIUM-STRONIUM FRACTIONATION DOMAINS IN THE PENINSULAR RANGES BATHOLITH AND THEIR IMPLICATIONS FOR MAGMATIC ARC EVOLUTION

L. Peter Granet

Klemm F. Silver, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California 91125

Thomas O. Early, Salisbury State College, Salisbury, Maryland 21801

The northern 600 km of this Cretaceous batholith, comprised of hundreds of diverse plutons, appears to consist of 12-15 domains. Each domain is a region where rocks of all types (within our limited sampling) show a regular linear correlation of Rb and Sr concentrations. This regularity displays different concentration levels and a different slope and is accompanied by a distinct set of isotopic signatures in each domain. The geographic trends do not disturb the normal variation of total Sr ratios in the batholith (Early and Silver, 1972). No independent field or petrographic recognition of the Rb-Sr event has been noted. Very similar rock types occur in adjacent domains. Domains are as yet unassigned or NNNV, up to 200 km long and 30 km wide, parallel to regional tectonic grain. Each domain is interpreted as a region of magmas sampled or differentiated from one reservoir possessing characteristic trace element and Sr isotopic properties. An apparent age of reservoir formation and isolation prior to and following Rb-Sr and Sr isochron establishment of an apparent initial Sr ratio at the time of reservoir isolation can be derived for each domain. There is no strong correlation between Rb-Sr and Sr isotopic variations and age of crystallization. Regional variations in average crustal thickness of the Peninsular Ranges are probably of limited importance in explaining the variation of Rb-Sr and Sr isotopes in the Peninsular Ranges batholith.

V 110 INVITED PAPER

THE FINGER BAY PLUTON, ADAK, ALASKA AND MAGNIFICATION OF THE AEOLIAN ARC

S. Muhlbir Kay

E. R. Kay (both at: Dept. of Geological Sciences, Cornell University, Ithaca, N.Y. 14853)

B. Broecker (Queens College, Flushing, N.Y. 11367)

As a study of a pattern of petrologic evolution in the Aeolian arc, magnetic rocks of differing ages from Adak Island have been investigated. The present and probable future major results are presented for the 10 km Finger Bay Pluton complex (10US) that includes Finger Bay sediments and volcanics and belongs to an early plutonic episode in the arc. Major and trace element lineations and analyses of the Finger Bay Pluton, which ranges from gabbro to syenite to diorite in composition (48-80 REE), are consistent with differentiation by crystal fractionation. The principal minerals are clinopyroxene (Wo43En33Fs24), plagioclase (An93 to An55) and titanomagnetite. Clinopyroxene is present in the gabbro. Lower greenstone metamorphism has affected both plagioclase and country rocks and has resulted in alteration of mafic phases (olivine, olivine, biotite, and perhaps hypersthene) to chlorite, actinolite, and epidote oxides. Seven analyzed samples have Sr f86/f87 ratios of >-0.709, which correlate with Nb/Sr ratios defining a young isochron of 120 My. A considerably older than a published 87Sr/86Sr date of 0.74 and the Encone (=S8) age of the Finger Bay Group. The isotopic, mineralogical, and genetic relations of the Finger Bay Pluton are very similar to those of Pilo-Pluton, Tupper-Saranac gabbroic rocks from Mt. Moffett, Adak Island. Pb isotopic analyses by Sun (1973) are slightly lower in Pb 206 in the Finger Bay Pluton. Magmas of the Wisconsin plutomorphic episode, Adak Island are different from the Finger Bay and Mt. Moffett rocks. Magnetic variations on Adak Island do not imply a simple evolutionary path of Aeolian magmas over time.

Trace Elements and Isotopes I

Madison, Thursday 0900H

F. A. Frey (Massachusetts Institute of Technology) and A. Hofmann (Department of Terrestrial Magnetism, Presiding)

119

RARE EARTH ELEMENT EVIDENCE FOR DIFFERENTIATION IN A PLUTONIC IGNEOUS ROCK

Mark F. Smith

Karl E. Seifert (both at: Dept. of Earth Sciences, Iowa State U., Ames, Iowa 50011)

Instrumental neutron activation analysis of rare earth element (REE) abundances in the Upper-proximate magmas from the Adirondack Mountains indicates that the mangerite body is internally differentiated. A lower mafic-rich portion of the mangerite has textural REE abundances and positive Eu anomalies whereas an upper quartz-rich portion has higher textural REE abundances and negative Eu anomalies. Between these two units a thin zone of mangerite intrudes the intermediate REE abundances and zero Eu anomalies. At the base of the mangerite a thin fresh crustal REE abundance zone and zero Eu anomalies plus SmNi ratios diagnostic of differentiation lavas. The base of the mangerite is regarded as the parental magma for the Upper-proximate mangerite. The Cence (=S8) age of the mangerite is not concomitant with the adjacent Mangerite.

V 111

GENETIC IMPLICATIONS OF THE RARE EARTH ABUNDANCES OF THE LARIMAR ANORTHOSITE COMPLEX,

J. L. Fischer, D. S. Dodge and R. Snyder (Department of Geology, University of New York at Buffalo, Amherst, MA 04228)

In the REE abundances of the various rock types of the Larimar anorthosite complex, a strong local and fractional crystallization dominated the initial magmatic evolution followed by interaction of the residual magma with country rock. The complex includes, among others, plagioclase-feldspar, noritic-anorthosite, norite, hypersthene syenite and hornblende syenite. The isotopic data and the age relationships of the complex (Saunders, in press) suggest that the anorthosites, norites and hypersthene syenites are comagmatic but that the hornblende syenites are not. The rare earth element abundances were determined by isostatic mass spectrometry and the results are characterized by low total rare earth abundances (-10 ppm) and large positive Eu anomalies. The norites by much higher abundances (200-1200 ppm) without large Eu anomalies, and the hornblende syenites by extremely high REE abundances (100-150 ppm). The hypersthene syenites vary in both major element composition and REE content, near the anorthosite-syenite contact the hypersthene syenites have low REE abundances (80-25 ppm) with large Eu anomalies, abundances increase and the Eu anomalies decrease with increasing distance from the contact. The rare earth element abundances are consistent with the pattern produced by accumulation of plagioclase from a parental feldspar-anorthosite magma, without large Eu anomalies. The rocks have no correlation with metal infiltration.

The REE abundances of the Larimar anorthosite complex are not concomitant with the anorthosites, norites and hypersthene syenites.

V 112

RARE-EARTH ELEMENT GEOCHEMISTRY OF THE RONDA HIGH-TEMPERATURE PERIODOTITE

C. J. Bure

F. A. Frey (both at: Department of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139)

Eight peridotites (lherzolites and harzburgites) samples from the Ronda high-temperature peridotite massif were analyzed for REE to test the grading metamorphism their mineralogy suggests from epsilon values of almost 500. As characteristic of high-temperature peridotites, the chondrite normalized REE patterns have a peak at Yb of about 5X and are roughly correlated with modal mineralogy. The REE patterns of the Ronda peridotites are even more strongly correlated with modal mineralogy. There is no correlation with meta-morphic grade. Detailed modelling of REE fractionation during melting shows that the peridotites may represent residues from small degrees of melting (~10%) except for the very depleted

532