Geochemistry of ancient Kilauea volcano: Implications from Hilina bench lavas

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Lava samples recovered from the Hilina bench off-shore of Kilauea volcano during the 1998, 1999, and 2001 JAMSTEC cruises were analyzed for major and trace elements, and Nd-Sr isotopes. Clasts of alkali and transitional basalt were recovered from debris-flow breccias on the scarp below the Hilina bench (~3000 m bmsl), but tholeiite basalt of modern Kilauea type was absent (Sisson et al., 2002). In 2001, a succession of in-place alkali basalt pillow lavas was found in relatively shallow water along a well-exposed rib on the slope above Hilina bench (dive K208). These in-place alkalic lavas provide a critical link between modern-day and ancestral Kilauea. The rib is part of the ancient Kilauea volcano that has remained in place, whereas the Hilina Bench contains slide/slump material from Kilauea (Lipman et al., 2002).

Major element, trace element, and isotopic characteristics of transitional basalts from the slope above the Hilina bench differ only slightly from historical Kilauea tholeiites. Alkali basalts from both the lower flank of the Hilina bench and the upper rib are more Ti-rich than the transitional basalts, and have elevated abundances of light-rare-earth and large-ion-lithophile elements. Data for historical Kilauea tholeiite, the transitional basalts, and the Hilina alkalic pillows form well-defined linear trends on binary plots using highly incompatible trace element pairs, suggesting a common mantle source with different degrees of partial melting. Nd-Sr isotopes of lavas from these differing chemical suites are identical, further supporting the common mantle source. However, HFSE chemistry of these basalts differs from that of more alkalic basanite and nephelinite lava clasts from the lower flank (Sisson et al., 2002), even though they have similar Sr and Nd isotopic values. Pb isotopic values of alkali basalt, nephelinite, and basanite glass grains, measured by SIMS, also differ significantly from modern Kilauea tholeiite values (Shimizu et al., 2001). Differences in Pb isotopes and in HFSE suggest that early Kilauean alkalic magmas were derived from slightly different mantle sources than those of today, perhaps from closer to the perimeter of the Hawaiian mantle plume. Pb isotope values of lava samples are being measured to explore this possibility.

References

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Contribution of rice straw carbon to IC, DOC, and methane in percolation water from a submerged paddy soil: A microcosm experiment using ^{13}C-enriched rice straw

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Introduction

Application of organic matter causes increased microbial activities in soils. In this study, contribution of rice straw carbon to IC, DOC, and methane in percolation water in submerged paddy fields was estimated by a microcosm experiment using ^{13}C-labeled rice straw to examine direct and indirect effects of organic matter application on carbon metabolims.

Methods

Percolation water from columns of a submerged paddy soil treated with ^{13}C-enriched rice straw (del^{13}C, 188 ‰) at the rate of 6 gkg^{-1} soil was periodically collected for 111 days, and concentrations and carbon isotopic compositions of IC, DOC, and methane were determined.

Results & Discussion

Application of rice straw resulted in markedly increased concentrations of IC and DOC in percolation water in the first month and increased methane concentration during the experimental period. Total amounts of leached IC, DOC, and methane were enhanced by rice straw application with factors of 2.3, 2.6, and 2.9, respectively. Contribution of rice straw carbon to IC estimated by a two-source model using the isotopic compositions was larger than apparent increase, while that of DOC was smaller. The results indicated that the decomposition of soil organic matter was suppressed by rice straw application, and that leaching of soil DOC was enhanced by rice straw probably due to promoted soil reduction (Maie *et al.* 2001). Contribution of rice straw carbon to methane estimated by the two-source model was comparable to the apparent increase.

References

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