Sr and Nd isotopic signature of late Cenozoic alkali basalts from Kibi-Sera and northern Hyogo areas in Chugoku district, Japan

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Trace element and Sr and Nd isotopic compositions were determined for Cenozoic alkali basalts from Kibi-Sera plateaus (KSP) and northern Hyogo Prefecture (NHP). The variations in Sr and Nd isotopic compositions for NHP basalts (ε_{Sr}=–9.6 to +42.3 and ε_{Nd}=–4.5 to +3.6) are remarkably large compared to those for KSP basalts (ε_{Sr} =–7.0 to +9.9 and ε_{Nd} =+1.0 to +2.2). It is noted that ε_{Nd} and ε_{Sr} values for NHP basalts are strongly correlated to each other, forming a linear array on an ε_{Nd}-ε_{Sr} diagram. We consider that the large variations in Sr and Nd isotopic ratios probably indicate isotopic heterogeneity in the mantle source rather than a binary mixing trend. Figure 1 gives a relationship between ε_{Nd} and longitude of sample location. Data for Cenozoic basalts from other areas in the Chugoku district (Fujibayashi et al., 1988, 1989; Morris & Kagami, 1989; Morris & Itaya, 1997) and Mesozoic rhyolites in the district (Terakado & Nakamura, 1984), which could be of lower crust origin, are also plotted. The results shown in the diagram suggest an intimate relation between lithospheric mantle and overlying lower crust materials in the district, that is, ε_{Nd} values for both of them decrease eastward. The large fluctuation of ε_{Nd} values for NHP basalts may suggests that the lithospheric mantle in the district is layered in terms of isotopic compositions.

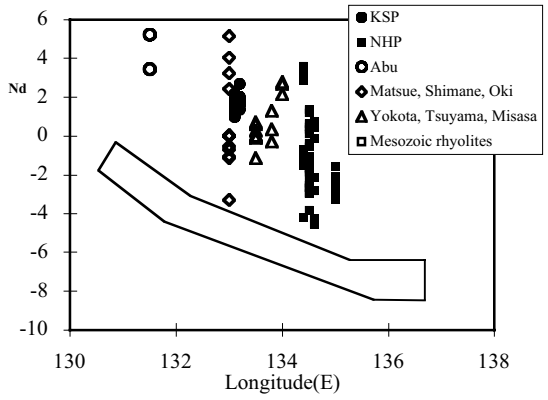

Fig. 1: Diagram showing a relationship between ε_{Nd} and longitude of sample location.

High-resolution stable isotopic analyses of an annually laminated tufa, Southwest Japan

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Material

Stable isotopic compositions of a tufa, a carbonate deposited in a cold freshwater, were analyzed with a high resolution in order to confirm the availability for a paleoclimatological tool. The objective tufa of this study collected from Shimokuraida (Okayama Prefecture, Southwest Japan) is annually laminated owing to regular air-water temperature changes. Chemical and isotopic compositions of the tufa-depositing water were monthly monitored from the locality.

Results

Results of every 0.2mm analytical intervals parallel to the laminae indicate cyclic seasonal changes in stable isotopic values, which correspond to the mm-scale lamination pattern. Both $\delta^{18}O$ and $\delta^{13}C$ values represent high in winter and low in summer. Since $\delta^{18}O$ value of the water has been stable throughout the years, tufa $\delta^{18}O$ variation indicates water temperature change at the sampling site. $\delta^{13}C$ variation mainly follows to the changes in the value of water dissolved inorganic carbon.

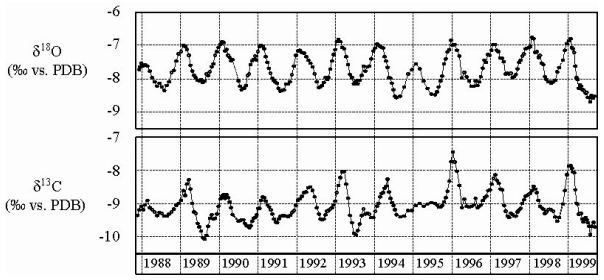

Figure 1: $\delta^{18}O$ and $\delta^{13}C$ variations of an annually laminated tufa deposit from Shimokuraida, SW-Japan.

Conclusions

The $\delta^{18}O$ and $\delta^{13}C$ variations of the tufa deposit clearly reflect seasonal changes in water and air temperature. These results were mostly identical to the values obtained from the previously analyzed tufa (Matsuoka et al., 2001). Therefore, this seasonal pattern can be largely applied to other laminated tufa deposits.

References

Matsuoka, J., Kano, A., Oba, T., Watanabe, T., Sakai, S. and Seto, K., (2001), *Earth Planet. Sci. Lett.* **192**, 31-44.