Re-Os isotopic systematics of the Taklimakan Desert sands, moraines and river sediments around the Taklimakan Desert, and of Tibetan soils

YUJI HATTORI[1], KATSUHIKO SUZUKI[2], MASATOSHI HONDA[3] AND HIROSHI SHIMIZU[1]

1 Department of Earth and Planetary Systems Science, Hiroshima University, Higashi-Hiroshima 739-8526, Japan (shimizu@geol.sci.hiroshima-u.ac.jp)
2 Institute for Geothermal Sciences, Graduate School of Science, Kyoto University, Beppu 874-0903, Japan (suzuki@bep.vgs.kyoto-u.ac.jp)
3 Institute for Frontier Research on Earth Evolution (IFREE), Japan Marine Science Technology Center, Yokosuka, 237-0061 Japan

We report here the first Os isotopic ratios and abundances of Os and Re for Taklimakan Desert sands and glacial moraines from the Kunlun Mountains. Osmium isotopic data are also reported for river sediments around the Taklimakan Desert, river sediments from the Kunlun and Tianshan Mountains, Tibetan soils and loesses from the Loess Plateau, as well as Sr and Nd isotopic data for these samples. The Taklimakan Desert sands show extremely homogeneous Os isotopic ratios and abundances, with some variation of Re abundances. The $^{187}Os/^{188}Os$ ratio of 1.3 for the Taklimakan Desert sands is close to the average for Kunlun and Tianshan moraines, river sediments around the Taklimakan Desert and Tibetan soils. This result supports the idea that the Taklimakan Desert sands are derived from moraines and river sediments around the Desert and/or from Tibetan soils.

In contrast to the small difference in Os isotopic data between the Taklimakan Desert sands ($^{187}Os/^{188}Os$ =1.3, this study) and loess ($^{187}Os/^{188}Os$ = 1.05; Peucker-Ehrenbrink and Jahn, 2001) from the Loess Plateau, Os abundances and $^{187}Re/^{188}Os$ ratios exhibit large differences: approximately 10 ppt Os with $^{187}Re/^{188}Os$ ratio ranging from 60 to 160 for the desert sands (this study), and approximately 30 ppt Os with $^{187}Re/^{188}Os$ ratio of 35 for loess (Peucker-Ehrenbrink and Jahn, 2001). It is suggested that grain-size sorting during aeolian transport of the Taklimakan Desert sands results in enrichment of the fine fraction, whereby mafic minerals with high Os contents and low $^{187}Os/^{188}Os$ ratios show higher contents in loess. The $^{187}Os/^{188}Os$ ratios ranging from 1.0 to 1.3 and the 1.6 Ga Nd model age of the Taklimakan Desert sands and loess suggest that a reasonable $^{187}Re/^{188}Os$ ratio for the 2.2 Ga upper continental crust is 35. Our Re-Os data for the Taklimakan Desert sand, moraines and river sediment around the Taklimakan Desert and Tibetan soils were compared with those of loess from the Loess Plateau and it was concluded that the Re-Os data of the loess can be used as proxy of the upper continental crust.

D/H and H_2O in Mantle-Derived Basaltic Melt Inclusions

ERIK H. HAURI

Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington DC, 20015 USA <hauri@dtm.ciw.edu>

The hydrogen isotope ratio (D/H) of magmatic glasses places unique constraints on the origin of water in volcanic systems. Many processes exist that can affect the D/H ratio of water incorporated into magmas, including isotope fractionation during mantle melting, addition of seawater or meteoric water during magma transport, degassing of water vapor during eruption, and post-eruptive alteration. If these processes can be understood and unravelled, the hydrogen isotopic composition of various parts of the Earth's mantle can be estimated and used to constrain the origin of water in the interior of the planet.

We have used the ion microprobe to measure the abundances of volatiles (H_2O, CO_2, F, S, Cl), trace elements and hydrogen isotopes in basaltic melt inclusions from mid-ocean ridges (EPR; Saal et al., 2002), hotspots (Hawaii & Iceland; Hauri, 2002; Hauri et al., 2002) and arcs (W. Pacific; Hauri & Wagner, unpublished data). Melt inclusion entrapment pressures inferred from CO_2 abundances pinpoint the formation of most melt inclusions within the crust. Melt inclusions from subaerial eruptions often record the effects of magma degassing, while melt inclusions from submarine eruptions sometimes show elevated Cl abundances and high Cl/Ba ratio indicative of seawater addition. Both degassing and seawater addition have identifiable influence the D/H ratios of melt inclusions

Hydrogen diffusion through host crystals can result in extensive equilibration between melt inclusions and the host magma prior to eruption, resulting in decoupling of H_2O from all other elements in some cases. However, such melt inclusions also record the "average" H_2O and D/H of the enclosing magma, and thus place important volume-composition constraints on the variety of melts that mix to form the host magma. When these effects are identified and understood, the data obtained thus far suggest the presence of variability in the D/H ratio of the terrestrial mantle. This variability is most likely inherited from subduction of surface water into the deep mantle. Preservation of such variability in D/H ratios against the extremely rapid diffusivity of hydrogen in the mantle requires that this variability be either large in scale and/or young in age.

References

Hauri, E.H. (2002) *Chem. Geol.* **183**, 115-141.
Hauri, E.H., Grönvold, K., McKenzie, D.P. and Shimizu, N. (2002), this meeting.
Saal, A., Hauri, E.H., Langmuir, C. and Perfit, M. (2002) *Nature* (in review).