Re-Os isotopic systematics of the Neo-Tethys Dongqiao Ophiolite Complex, Northern Tibet: First data

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The Dongqiao ophiolite complex (DOC) is located in the eastern Neotethys Bangong-Nujiang suture zone (BNSZ) in Tibet, and extends for 60 km as dismembered fragments of a complete ophiolite complex. DOC blocks near Dongqiao include mantle peridotites and podiform chromitites, ultramafic and mafic cumulates, and mafic volcanics.

Re and Os concentrations of the podiform chromitites varies from 82-184ppt and 281-373ppb. Their $^{187}Os/^{188}Os$ varies between 0.12318-0.12346, averaging 0.12336. Podiform chromitites are characteristic of Phanerzoic suprasubduction zone ophiolites, and often contain isotopic and chemical records of mantle source conditions extant during ophiolite genesis. The DOC mantle source is depleted compared to the chondritic primitive upper mantle. DOC mantle peridotites comprise mainly serpentinized harzburgite and secondary dunite, with Re and Os concentrations between 3-71ppt and 1.193-6.033ppb. The $^{187}Os/^{188}Os$ is 0.12107-0.12612, average of 0.12362 is almost the same as the podiform chromitites. But one harzburgite has much lower value of 0.11582 indicating old SCLM is involved in the ophiolite melange. Ultramafic and mafic cumulates include olivine pyroxenites, pyroxenites, layered and isotropic gabbros and diabases, with Re and Os concentrations between 6-116ppt and 97-823ppt. The $^{187}Os/^{188}Os$ is 0.12979-0.14015. All data of mantle and cumulate blocks fall near a 150Ma reference isochron with initial $^{187}Os/^{188}Os$ of 0.12336. The Re and Os concentrations of pillow basalts varies from 0.314-0.716ppb and 0.049-0.430ppb. The$^{187}Os/^{188}Os$ is 0.20414-0.34484 fall above the isochron of 150Ma, showing the effects of sea water contamination and seafloor alteration in the ophiolite's history.

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Radiometric dating of eclogite xenoliths from kimberlites

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Unlike orogenic eclogites, those brought up from the Earth's mantle in kimberlites often consist only of clinopyroxene, garnet and rutile. Phases that would be especially interesting for dating purposes such as zircon (e.g. Heaman et al. 2002) are very rare. Sm-Nd age determinations of eclogite xenoliths based on garnets and clinopyroxenes (internal ages) yield results that scatter over several orders of magnitude between 4 Ga and ages in the future and are not easy to interpret. The eclogite whole-rock system, however, often gives reliable age information (e.g. Jagoutz et al., 1984; Pearson et al., 1995; Jacob and Foley, 1999). Re-Os isotopes can be applied to bulk eclogites, but may give ages with high uncertainty, whereas Sm-Nd and Lu-Hf isotopic systems require reconstruction of the whole rock composition based on mineral analyses to avoid erroneous results due to infiltration of the xenoliths by kimberlitic material. However, reconstruction of a "clean" bulk eclogite requires knowledge of the rock's exact modal composition which strongly depends on the sample size. In the case of Lu-Hf it can be shown that reconstructed whole rock eclogite ages can be too young if rutile occurs as an accessory whose exact modal amount is unknown (Jacob et al. 2005). Applying the U-Pb and Pb-Pb systems to eclogite silicates is probably the best method, because partitioning of Pb strongly favours cpx over gt (Dcpx/gt = 16 for Udachnaya eclogites, Jacob and Foley, 1999) so that bulk rock reconstructions are not necessary. In the case of eclogite xenoliths from the Udachnaya pipe, it could be shown that the Pb-Pb isochron age on cpx was within error of the Os age on whole rock eclogites (Jacob and Foley, 1999; Pearson et al., 1995). Pb contents in eclogitic minerals, however, are generally below 1 ppm so that this method requires low-blank chemistry procedures.

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