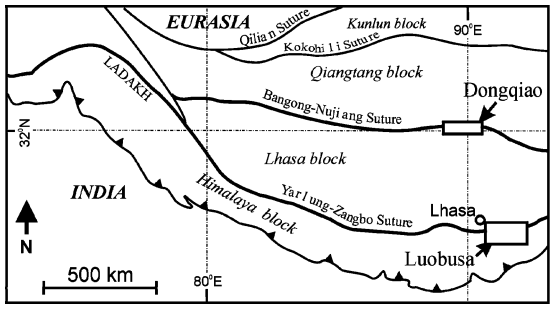
Multiple events in oceanic upper mantle: Ru-Os-Ir alloys in Tibetan ophiolites

R.D. Shi[1], X.C. Zhi[1], S.Y. O'Reilly[2], W.L. Griffin[2], N.J. Pearson[2], W.J. Bai[3], Q.S. Fang[3], O. Alard[2], M. Zhang[2]

[1]CAS Key Laboratory of Crust-Mantle Materials and Environments, School of Earth and Space Sciences, University of Science and Technology of China, Hefei 230026, China
[2]GEMOC ARC National Key Centre, Department of Earth and Planetary Sciences, Macquarie University, Sydney, NSW 2109, Australia
[3]Institute of Geology, CAGS, 26 Baiwanzhuang Road, Beijing, 100037, China

Ru-Os-Ir alloys from podiform chromitites in the Luobusa and Dongqiao ophiolites (see figure) were analysed for PGEs and $^{187}Os/^{188}Os$ (in situ). Most grains are osmiridium or iridosmine (<5% Ru; IMA nomenclature). $^{187}Re/^{188}Os$ is $\leqslant 0.001$; individual grains are isotopically homogeneous ($^{187}Os/^{188}Os$ within 0.1%). In the Luobusa ophiolite, $^{187}Os/^{188}Os$ ratios range from $0.12620 \pm 4(1\sigma)$ to $0.12672 \pm 6(1\sigma)$; the average for all grains ($n = 145$) is $0.12645 \pm 2(1\sigma)$. Re-depleted model ages (T_{RD}) (Enstatite Chondritic Reservoir) range from 197-270 Ma, consistent with the opening of the Neo-Tethyan Ocean. In contrast, $^{187}Os/^{188}Os$ in alloys from the Dongqiao ophiolitic chromitite form two groups, mirroring whole-rock Os data for the chromitites. Group I has $^{187}Os/^{188}Os$ 0.12616 ± 5-0.12664 ± 3 (1σ) and T_{RD} from 208 to 276 Ma. Group II $^{187}Os/^{188}Os$ ranges from $0.12003 \pm 5(1\sigma)$ to $0.12194 \pm 3(1\sigma)$ and the T_{RD} ranges from 871 to 1139 Ma. We suggest: (1) the ophiolitic podiform chromitites originated as mantle-melting residues in the Permian to early Triassic time; (2) the Yarlung-Zangbo and Bangong-Nujiang Neo-Tethyan Oceans opened nearly simultaneously; (3) the $^{187}Os/^{188}Os$ of the Mesozoic upper mantle ranges from $0.12639 \pm 4(1\sigma)$ to $0.12645 \pm 2(1\sigma)$; (4) the Dongqiao ophiolite contains older material, perhaps relict Rodianian subcontinental lithospheric mantle.



Acknowledgment

This work was supported by the National Natural Science Foundation of China (Grant Nos. 40473008, 40572036, and 40610104005).