

Mantle sulfides in Penghu peridotites from Taiwan: implication to lithospheric evolution of South China block

Kuo-Lung Wang^{1,2}, Suzanne Y. O'Reilly², William L. Griffin², Norman J. Pearson²,
Ming Zhang²

¹Institute of Earth Sciences, Academia Sinica, Taipei 11529, Taiwan

²GEMOC Key Centre, Department of Earth and Planetary Sciences, Macquarie
University, Sydney, NSW 2109, Australia

Abstract

Major elements and Re-Os isotope ratios were *in situ* analysed on individual sulfide grains in spinel peridotite xenoliths hosted by Miocene intraplate basalts from the Penghu Islands, Taiwan (Pearson et al., 2002; Wang et al., 2003). These sulfides are mixtures of Fe-rich and Ni-rich monosulfide solid solutions (MSS), pentlandite, millerite and chalcopyrite, exsolved from high-temperature (>900°C) MSS bulk compositions. These sulfides have recently undergone three types of disturbance in their Os isotope systematics: (1) addition of Re with no apparent addition of Os, or with only lithospheric Os with low ¹⁸⁷Os/¹⁸⁸Os ratios; (2) addition of Re, and of Os with an isotope composition near the present-day PUM; (3) addition of radiogenic Os, but little or no Re. The highly radiogenic Os in disturbance type 3 could be derived from lithospheric sources such as pyroxenites or subducted basalts, and the transporting medium may have been an oxidizing fluid derived from the Mesozoic subducting slab beneath the area. Despite the Os disturbance, T_{RD} model ages (Shirey and Walker, 1998) of sulfides can still provide minimum estimates for the age of the SCLM. The sulfide Os model ages yield similar peak T_{MA} and T_{RD} ages of 2.3, 1.8, 1.4 and 0.9-0.8 Ga (Fig. 1), indicating significant SCLM formation/melt extraction events at these time periods, which are remarkably consistent with the major crustal accretion events as recorded by the overlying crust. The similarity in the range of crustal U-Pb, Nd and Hf model ages and our sulfide T_{RD} ages suggests that the sulfide ages may actually date these metasomatic events in the SCLM, related to tectonothermal events that affected the overlying crust. The Os age data suggest the Cathaysia block has at least formed since the Paleo-Proterozoic time, some part might exist as early as in Archean.

References

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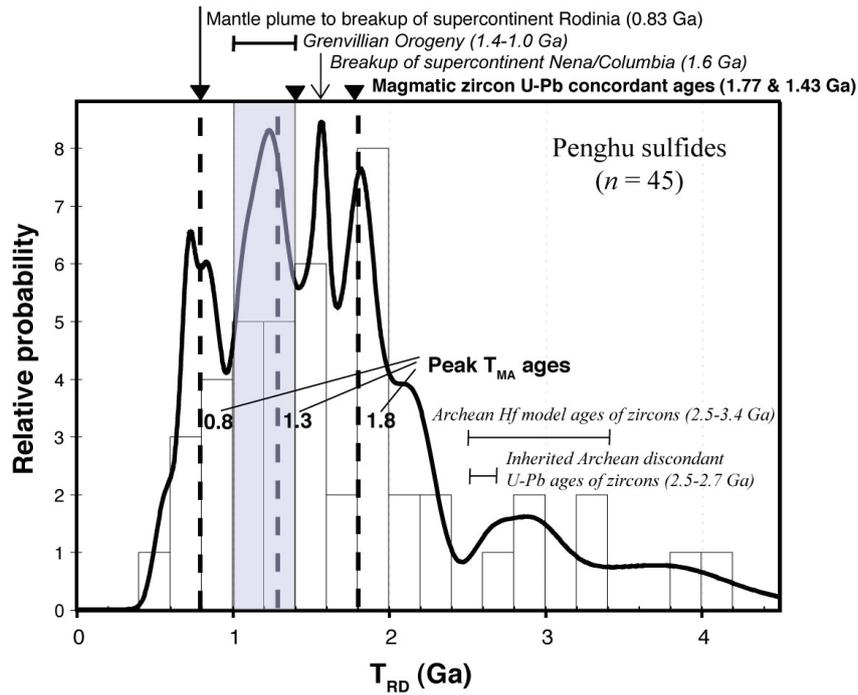


Fig. 1: Cumulative probability diagram (Ludwig, 2000) of T_{RD} model ages of Penghu sulfides. Thick line represents the distribution pattern of ages. The histogram of ages represented by thin line is also shown. The dash lines indicate T_{MA} peak ages from low $^{187}\text{Re}/^{188}\text{Os}$ sulfides. Corresponding crustal events are shown for comparison.