# Mechanism of lithosphere extension beneath the eastern margin of the South China Block

K.-L. WANG, S. Y. O'REILLY, W. L. GRIFFIN, N. J. PEARSON and M. ZHANG
GEMOC Key Centre, Department of Earth and Planetary Sciences, Macquarie University, NSW 2109, Australia

The Os isotope compositions of sulfides in mantle xenoliths from Miocene intra-plate basalts on Penghu Islands, Taiwan Strait, reveal the presence of Proterozoic subcontinental lithospheric mantle (SCLM) beneath the highly extended southeast margin of the South China block. Both $T_{RD}$ model ages for individual sulfides and model ages estimated from the initial $^{187}Os/^{188}Os$ ratios of Re-Os mixing lines require that some volumes of the SCLM formed prior to 2.3–1.9 Ga. These data require that parts of the SCLM beneath the Taiwan Strait have been segregated from the convecting mantle since at least Middle Proterozoic time. Later events in the SCLM may be recorded by $T_{RD}$ model ages of 1.5–1.2 Ga and ca. 0.9 Ga. The events recognized in the SCLM are consistent with those known in the crust of the mainland South China block. The results show that depleted parts of the underlying mantle retain mid-Proterozoic ages, while other, less depleted parts are much younger. The mixture of ages and rock types, in good consistency with observation from geophysical observation, suggests that during the stretching of the lithosphere, the ancient continental root was partly disrupted and replaced by younger material, but stayed attached to the lower crust. The oldest mantle ages for the lithosphere beneath the Taiwan Strait are similar to those of the upper crust near the Chinese coast, and ages from the mainland interior. This implies that some ancient mantle beneath the South China block survived the extensive Mesozoic Yanshanian magmatism on the continental margin and has not been delaminated even during the severe lithospheric extension that led to the subsidence of the Taiwan Strait. The results are directly relevant to current debates about the geodynamics of the continents, and the long-term evolution of the upper mantle. A model involving diapiric upwelling of the asthenosphere in a small-scale convection mode with pre-existing weaknesses in mantle lithosphere, or failure of the lithosphere during extension, with upwelling of asthenospheric material into tensional zones, could explain the juxtaposition of ancient and new lithospheric domains observed here. Delamination mechanisms may be most relevant to regions with denser Phanerozoic SCLM.