New in situ Re-Os isotope data for sulfides in spinel lherzolite xenoliths from the Cainozoic Chudleigh and Atherton Volcanic Provinces, and the existing U-Pb and Hf-isotope data for detrital zircons and zircons from granitoids are used to correlate mantle events and crustal magmatism in the northeast Australian craton and adjacent Tasman orogenic belt.

About fifty percent of analysed sulfide grains yielded sub-chondritic 187Os/188Os (0.1130-0.1252) and 187Re/188Os (0.0214-0.2061). Rhenium-depletion model ages of sulfides may roughly define asthenospheric melt/fluid infiltration events in the mantle lithosphere beneath the Chudleigh Province in the craton at ~ 1.82 Ga, 1.23 Ga, 0.81 Ga and 0.35 Ga, and Atherton Province in the orogenic belt at ~ 1.75 Ga, 1.23 Ga and 0.44 Ga. These events most likely occurred during lithosphere rifting, but during lithosphere suturing beneath both Provinces at ~ 1.23 Ga.

An overlap between the sulfide model ages and the major (350-325 Ma) including few minor episodes of granitoid magmatism demonstrates a close temporal linkage between melt/fluid infiltration events in the mantle lithosphere and crustal magmatism in the craton. The model ages of sulfides in the Atherton samples may imply rifting of the edge of cratonic mantle lithosphere, which was infiltrated by melts/fluids at ~1.75 Ga and 1.23 Ga, during a younger event (~ 0.44 Ga?); its fragments were embedded in the mantle lithosphere beneath the Atherton Province. A minor Ordovician-Silurian granitoid magmatism occurred in the north Tasman orogenic belt and a close temporal linkage between mantle events and crustal magmatism cannot be established.