What is Under the Antarctic Ice: A U-Pb, O and Lu-Hf Isotopes Investigation?

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Antarctica is the driest, coldest and highest continent. It is also the most remote and inhospitable continent with over 98% of the continent covered by ice. Limited areas of exposed rocks at the surfaces has frustrated earth scientists' efforts to understand the geology of Antarctica. Antarctica is the central link between the southern continents (e.g. Australia, India and Africa) and understanding its geology will shed the light on the formation, evolution and break-up of Gondwana supercontinent.

We present an integrated study of U-Pb, O and Lu-Hf isotopes from detrital zircons separated from several International Ocean Drilling Program (IODP) holes drilled around Antarctica. U-Pb ages show distinct age differences between East Antarctica and West Antarctica, consistent with a sharp contrast between them as previously suggested from stratigraphical and structural evidence (Tingey, 1991). Unlike previous studies based on $^{40}Ar/^{39}Ar$ dating of hornblende and biotite (e.g. Pierce et al., 2014; Roy et al., 2007), the U-Pb zircon dates show a significant peak at ca. 80 Ma in detrital zircons from West Antarctica, which relates to an extensive late Mesozoic arc magmatism along the Pacific margin of West Antarctica. Furthermore, the O isotopic data, for zircons younger than 100 Ma, have a relatively low $\delta^{18}O$ mean of 4.53 ‰, comparing with those from age groups at ca. 250, 500, 1100 and 1750 Ma. Lu-Hf isotopes of detrital zircons from Antarctica will be compared with those from the Australian continent and used to constrain the geological correlation between the Antarctica and Australia, and the rate of crustal growth of the two continents.

This investigation provides the first integrated study of U-Pb, O and Lu-Hf isotopes of detrital zircons from Antarctica to constrain the evolution of Antarctic continent, highlight the close relationship between Antarctica and Australia, and pave the way to investigate the nature of supercontinent cycles especially the Gondwana supercontinent.

[1] Pierce *et al.* (2014) *Earth-Sci. Rev* **138**, 156-178.
[2] Roy *et al.* (2007) *Chem. Geol* **244**, 507-519.
[3] Tingey (1991) *Oxford University Press*.