Tracking Permian magmatism in Patagonia

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The North Patagonian Massif (NPM) of southern Argentina is a major site of Permian magmatism in southwest Gondwana. Magmatism commenced in the earliest Permian and reached a climax after the main deformation of the Sierra de la Ventana fold and thrust belt, located north of Patagonia [1]. New SHRIMP U-Pb zircon ages for granites from the basement of Tierra del Fuego Island (Chile) record the first evidence of inferred southerly prolongation of this magmatism and warrant revision of current tectonic reconstructions. In order to fully evaluate the Permian crustal evolution in Patagonia and also to place constraints in the tectonic activity, we have combined in-situ U-Pb zircon age data, with zircon O and Hf isotopes for these granites using the SHRIMP II and LA-ICP-MS at ANU.

Previously unstudied granites from the basement of the Tierra del Fuego Island have weighted mean $^{206}Pb/^{238}U$ ages of 253±2, 254±3 and 258±3 Ma; and inherited Cambrian cores. The Permian igneous rims have negative initial εHf values, ranging from -1 to -7, and $\delta^{18}O$ >7.4‰, indicating a strong sedimentary influence on the magma source. Granites of similar age from the NPM and the Sierra de la Ventana basement have comparable negative initial εHf values; however they yield variable $\delta^{18}O$ values of >6.0‰ in two samples, and mantle-like values in a third. Mid and early Permian granites also occur within the NPM [1]. They yield a wide range of zircon Hf-O compositions: samples with juvenile signatures have $\delta^{18}O$ of 4.9 to 6.5‰ and positive initial εHf values; and crustally derived granites have $\delta^{18}O$ of 5.9 to 8.8 ‰ and negative initial εHf values.

Together, these isotopic data indicate a mostly crustal late Permian magmatism in the Tierra del Fuego Island, the North Patagonian Massif and the Sierra de la Ventana. However, negative initial εHf values in zircon are not always correlated with high $\delta^{18}O$ as may normally be expected. This indicates a variable tectonic history in the NPM during the Permian and supports a parautochthonous origin.

[1] Pankhurst et al. (2006). *Earth-Science Reviews* **76**, 235-257.