

# New Zealand where did it come from? Provenance of the Rakaia Terrane.

Thesis submitted in accordance with the requirements of the University of  
Adelaide for an Honours Degree in Geology/Geophysics/Environmental  
Geoscience

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November 2013



THE UNIVERSITY  
*of* ADELAIDE

## NEW ZEALAND WHERE DID IT COME FROM? PROVENANCE OF THE RAKAIA TERRANE

### PROVENANCE OF THE RAKAIA TERRANE

#### ABSTRACT

The Rakaia Terrane comprises the majority of the basement of New Zealand, yet, to date, there are competing hypotheses as to its provenance along the Gondwana margin. These range from being adjacent to areas of Antarctica to originating against northern Queensland. To help solve these competing hypotheses, I combined the analysis of detrital zircon U-Pb geochronology with Hf isotope studies and trace element concentrations to constrain the provenance. Detrital muscovites were also dated using the  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  total fusion technique. Detrital zircons yielded age populations at 1100-980 Ma, 580-450 Ma, ca. 320 Ma and ca. 230 Ma.  $\epsilon\text{Hf}_t$  values of these zircons largely range from -6 to +6 and the trace element concentrations suggest that the zircons are primarily sourced from granitoids. The  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  ages yield two ages with the first at ca. 340 Ma and the second at ca. 250-220 Ma. The U-Pb ages and  $\epsilon\text{Hf}_t$  values for the Ordovician and older zircons are most similar to those from the Lachlan Fold Belt while the younger zircons show a close similarity to those from the New England Fold Belt. From multidimensional scaling maps there is a strong association between zircons from the Rakaia Terrane, north eastern Queensland and the Lachlan Fold Belt. The detrital muscovite data, however, is consistent with an exclusive New England source. Combining the data from different isotopic systems and different minerals, I interpret the provenance of the Rakaia Terrane as being derived from the New England, in the Triassic. The presence of Cambrian and Precambrian zircons, but only Phanerozoic muscovites, is interpreted as demonstrating that zircons were recycled in the New England region from older rocks now exposed in the Lachlan Orogen. These data constrain the provenance of the Rakaia Terrane and allows for more detailed reconstructions of the proto-Pacific margin of Gondwana.

#### KEYWORDS

New Zealand, Rakaia, Provenance, Detrital zircons, U-Pb, Geochronology, Hf-isotopes, Trace element,  $^{40}\text{Ar}$ - $^{39}\text{Ar}$

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