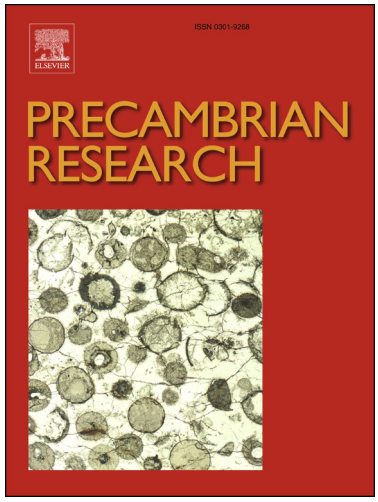

Linking the Windmill Islands, east Antarctica and the Albany–Fraser Orogen: insights from U–Pb zircon geochronology and Hf isotopes

Laura J. Morrissey, Justin L. Payne, Martin Hand, Chris Clark, Richard Taylor, Christopher L. Kirkland, Andrew Kylander-Clark

PII: S0301-9268(16)30138-3
DOI: http://dx.doi.org/10.1016/j.precamres.2017.03.005
Reference: PRECAM 4691

To appear in: *Precambrian Research*

Received Date: 12 May 2016
Revised Date: 27 February 2017
Accepted Date: 6 March 2017

Please cite this article as: L.J. Morrissey, J.L. Payne, M. Hand, C. Clark, R. Taylor, C.L. Kirkland, A. Kylander-Clark, Linking the Windmill Islands, east Antarctica and the Albany–Fraser Orogen: insights from U–Pb zircon geochronology and Hf isotopes, *Precambrian Research* (2017), doi: http://dx.doi.org/10.1016/j.precamres.2017.03.005

Linking the Windmill Islands, east Antarctica and the Albany–Fraser Orogen: insights from U–Pb zircon geochronology and Hf isotopes

Laura J. Morrissey[1*], Justin L. Payne[2], Martin Hand[1], Chris Clark[3], Richard Taylor[3], Christopher L. Kirkland[3], Andrew Kylander-Clark[4]

[1] Department of Earth Sciences, University of Adelaide, Adelaide, Australia.

[2] School of Natural and Built Environments, University of South Australia, Adelaide, Australia

[3] Department of Applied Geology, Curtin University, Perth, Australia

[4] Department of Earth Science, University of California, Santa Barbara, United States

*Corresponding author: email: laura.morrissey@adelaide.edu.au; phone +61418851623

ABSTRACT

U–Pb and Hf isotopic data from metasedimentary and magmatic rocks from the Windmill Islands in Wilkes Land, East Antarctica, confirm age and crustal evolution links between the Albany–Fraser Orogen and this part of East Antarctica. Detrital zircon age data indicate that the protoliths to the metasedimentary rocks of the Windmill Islands have maximum depositional ages of c. 1350 Ma. Metamorphic zircon growth at c. 1300 Ma and a crystallisation age of c. 1315 Ma for the protoliths to an orthogneiss that intrudes the metasedimentary rocks provide a minimum depositional age. Significant detrital zircon age components are identified at 1790 Ma, 1595 Ma and 1390 Ma. The 1350–1300 Ma depositional interval and the detrital age components suggest that the Windmill Islands metasedimentary rocks can be linked to metasedimentary rocks of the Arid Basin in the Albany–Fraser Orogen. The sediment sources were likely to be the West Australian Craton as well as a significant component from the c. 1410 Ma Loongana Arc in the Madura Province. This combination of sources suggests a back-arc setting for the Arid Basin, consistent with the short interval between deposition and high thermal gradient metamorphism. The magmatic rocks in the Windmill Islands have intrusive ages of c. 1315 Ma, 1250–1210 Ma and 1200–1160 Ma. The first phase of magmatism was likely to be derived from melting of Arid Basin metasedimentary rocks, based on abundant inherited zircon with similar ages to the surrounding metasedimentary rocks. The final two phases of magmatism have juvenile $\varepsilon_{Hf}(t)$ values consistent with a greater proportion of mantle melt sources.

KEYWORDS: Wilkes Land; Antarctica; Detrital zircon; Provenance; Lu–Hf

1. INTRODUCTION

Wilkes Land, in East Antarctica (Fig. 1), was a central component in the formation of the Nuna, Rodinia and Gondwana supercontinents (e.g. Boger, 2011; Fitzsimons, 2000, 2003; Payne et al.,