Geophysical Research Abstracts
Vol. 20, EGU2018-18660, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Extent of Eoarchean crust in Enderby and Kemp Lands, east Antarctica

Piotr Król (1), Monika Kusiak (1), Dan Dunkley (1,2), Keewook Yi (3), Shinae Lee (3), and Sookju Kim (3)

(1) Institute of Geological Sciences, Polish Academy of Sciences, Warsaw, Poland (piotr.krol@twarda.pan.pl), (2) Faculty of Earth Sciences, University of Silesia, Sosnowiec, Poland, (3) Korea Basic Science Institute (KBSI), Ochang Campus, Republic of Korea

The Napier Complex constitutes part of the East Antarctic Shield, which was formed from several terranes amalgamated at the end of the Proterozoic [1]. It consists predominantly of ca. 2.5 Ga granulite to UHT-facies gneisses, of two main types: 1) pyroxene-quartz-feldspar gneiss with minor mafic to ultramafic intercalations, and 2) layered garnet-quartz-feldspar gneiss with minor mafic granulite, pyroxenite, and various metasediments.
Amongst the protoliths of the gneisses are found some of the oldest rocks on Earth, with zircon ages approaching 4.0 Ga in orthogneisses from Mount Sones and Gage Ridge in the eastern Tula Mountains [1,2,3]. Gneisses with Eoarchean protoliths are known only from one other locality to the east, in Kemp Land [4]. Dates of ca. 3.8-3.9 Ga have been interpreted as the emplacement of granitoids in relatively juvenile crust, whereas ca. 3.6 Ga ages from charnockitic and enderbitic gneisses were interpreted as magmatism during a granulite-facies event [4]. Other studies of gneisses in the Amundsen Bay area suggest a major component of Mesoarchean crust [5].
The relationships between protoliths of widely different ages across the Napier Complex remains unknown, having been obscured by the intensity of ca. 2.5 Ga orogenesis. As an initial step towards the characterisation of crustal domains across the Napier Complex, three samples of orthogneiss from the western Tula Mountains were examined. Two samples are of trondhjemite and tonalite from Mount Jewell. A third sample from Budd Peak is of granitic orthogneiss that belongs to the Y-REE depleted group of Sheraton et al. (1988), whereas the Mount Jewell samples are undepleted. The term “depleted” refers to rocks depleted in Y and HREE, interpreted as deriving from hydrous melting of juvenile mafic crustal rocks. In comparison, “undepleted” forms by melting of pre-existing felsic crust during subsequent orogenic events [6].
All samples contain magmatic zircon with ca. 3.6-3.7 Ga ages and metamorphic zircon with ca. 2.5 Ga ages. Both depleted and undepleted protoliths formed in Eoarchean indicating the evolution of continental crust during this period. This finding extends the known portion of the Napier Complex that is founded on Eoarchean crust, and, along with the isolated occurrences found in Kemp Land, raises the possibility that such ancient crust is widespread. Research into the isotopic geochemistry of further regions within the Napier Complex is ongoing, with the aim of shedding new light into the development of crust in the early Earth crust.
References:
[1] Harley, Kelly (2007) Developments in Precambrian Geology, 15, 149-186.
[2] Kusiak, Whitehouse, Wilde, Dunkley, Menneken, Nemchin, Clarc (2013) AJS, 313, 933-967.
[3] Hiess, Bennett (2016) Chemical Geology, 427, 125-143.
[4] Belyatsky, Rodionov, Antonov, Sergeev (2011) Doklady Earth Sciences, 438(2), 770-774
[5] Hokada, Misawa, Yokoyama, Shiraishi, Yamaguchi (2004) Contr. to Min. and Petr., 147(1), 1-20.
[6] Sheraton, Black, (1988) Lithos, 21, 37-52.