

Preliminary Zircon Geochronology Results from the Denman Glacier Nunataks, Bunger Hills, East Antarctica

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1. INTRODUCTION

The assembly of East Antarctica was a multistage process. Several Archean blocks became enclosed within an extensive network of Proterozoic to Lower Paleozoic mobile belts. The formation of these orogens is generally associated with amalgamation of two supercontinents – Rodinia, *ca.* 1 Ga, and Gondwana approximately 0.7–0.5 Ga. Major provinces produced by regional scale tectono-metamorphism include the Rayner Province (Enderby Land – Kemp Land – Mac Robertson Land – Princess Elizabeth Land) and Wilkes Province (Bunger Hills and terranes further east). These provinces have their counterparts in India (the Eastern Ghats) and Western Australia (the Albany-Fraser Orogen and Leeuwin Complex; Boger 2011; Fitzsimons 2000; Harley et al. 2013; Wilde and Nelson 2001).

These complicated tectonic relationships left fragments of older continental crust both inside and between mobile belts. In Antarctica, the original associations between continental blocks are largely obscured by the icecap. However, small continental fragments exist in the vicinity of Bunger Hills and the Denman Glacier (BH/DG), although their precise correlations are debated (Sheraton et al. 1992; Tucker et al. 2018). These Archean and Proterozoic basement lithologies have been variously correlated with continental blocks that surrounded Antarctica within Rodinia or Gondwana. For Australia, this includes the Yilgarn Craton (Tucker et al. 2017) and/or the Mawson Craton (Liu et al. 2018). However, correlations with terranes in India have also been proposed, which include the complex mobile belts separating cratonic areas,

such as the Central Indian Tectonic Zone and/or the Eastern Ghats (Bhowmik et al. 2012). Furthermore, the Indian terranes may have possible links with the Pinjarra Orogen, the Leeuwin Complex, and the Northampton Block in Western Australia (Wilde 1999).

Samples

For this preliminary study, four gneiss samples from the western part of Denman Glacier were selected: Possession Rock, Cape Harrison, Delay Point, and Cape Kennedy (Fig. 1). Samples were collected by MAK during an expedition in 2021/2022: these results have not yet been published.

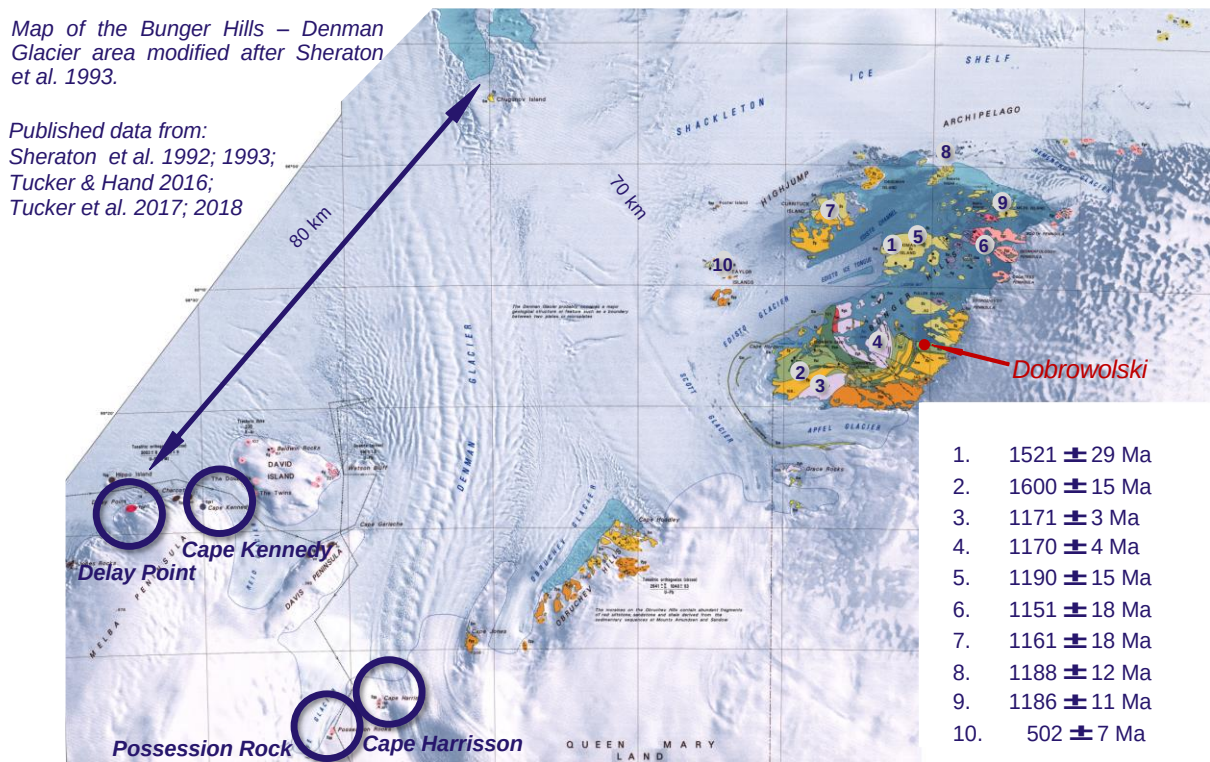


Fig. 1. Bunger Hills – Denman Glacier Map (after Sheraton et al. 1993) with sample areas in the circles.

2. RESULTS

For the U-Pb geochronology, zircon (ZrSiO_4) grains were separated from the samples using standard techniques in the GeoBeLa laboratory of the IG PAS in Belsk. Further, zircon grains were analysed utilizing SHRIMP (Sensitive High Resolution Ion Microprobe) at the KBSI (Korea Basic Science Institute) in Ochang. In samples from Cape Harrison (A22103) and Cape Kennedy (A22122), grains reveal internal magmatic growth zoning in cathodoluminescence (CL) images and have U contents up to a few hundred ppm. Zircon grains from Delay Point (A22114) and Possession Rock (A22101) are black in CL images due to their very high U contents, commonly 1000–2000 ppm. Despite the high U content of the latter, geochronological data from all samples are uniform. A well-defined concordia age of 521 Ma was obtained from the most western samples (Delay Point and Cape Kennedy), whereas Possession Rock yielded an age of 553 Ma, but with a few analyses recording an age of ca. 1170 Ma. Results from Cape Harrison do not give a concordia age and they spread from about 700–600 Ma.

3. DISCUSSION

Published geochronological data are only available for Bunger Hills, with the majority recording an age of *ca.* 1.17 Ga (Fig. 1). Tucker and Hand (2016) analysed monazite (CePO₄) grains from 3 samples (spots 7–9 on Fig. 1) and these data confirm the results obtained from zircon. Hence, our new results do not conform to the earlier published data, but they are in agreement with a sample from Taylor Island (spot 10 on Fig. 1). These preliminary results support paleomagnetic data by Daczko et al. (2018) and the possibility of a “cryptic” Gondwana-forming orogen. Their paleomagnetic results were interpreted as movement between Indo-Antarctica and Australo-Antarctica between *ca.* 750 Ma and *ca.* 500 Ma and implied that orogenesis reflects ocean closure of an Ediacaran-Cambrian plate boundary. Nonetheless, more complete dataset is needed to understand the paleogeographic position of Denman Glacier / Bunger Hills area during this time period.

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