DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Our knowledge of the conditions on Earth during the first half a billion years of its 4.5 billion year history is severely limited by a lack of geology preserved from this time, known to geologists as the Hadean eon. There is evidence, in a few ancient places, that land masses and continental crust existed as far back as 4.4 billion years ago, based on the ages of crystals of the mineral zircon found in younger rocks in the Jack Hills of Western Australia. The oldest actual rocks found on Earth are from the Acasta Gneiss in northern Canada, which are 4.03 billion years old, and here there is also evidence that these rocks recycled older crust, as far back as 4.2 billion years ago.

The evidence of ancient rocks, and of recycling of older, now lost crust, mostly comes from tiny crystals of the mineral zircon, which hosts radioisotopes that allow us to not only measure the age of the mineral crystals, but also the age of sources of the magma, whether it be from the mantle or from older crust. There are several places on Earth with rocks of Eoarchean age (>3.6 billion years ago), and it is these places that are the focus of international scientific efforts to find more evidence of the nature of Earth in its infancy. One area that awaits further exploration is the Napier Complex in Enderby Land and Kemp Land, a 400 km wide section of coastal East Antarctica (Fig. 1) which has yielded some of the oldest rocks known on Earth.

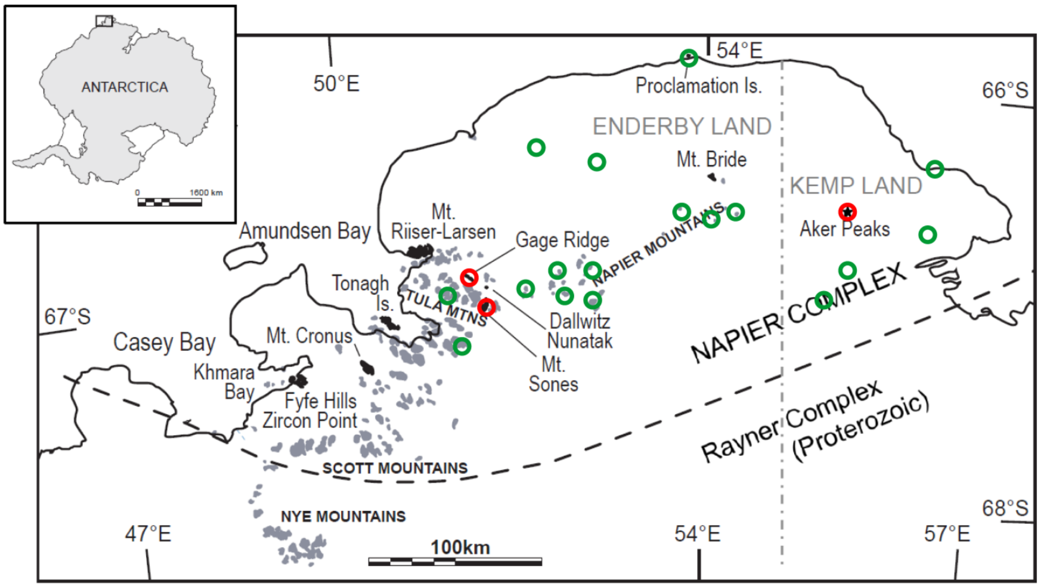

Fig. 1. Sketch map of the Archean Napier Complex in Enderby Land and Kemp Land, east Antarctica. Red circles identify three localities where orthogneisses have yielded protolith ages >3.6 Ga. Green circles identify localities where similar rocks might be found.

At the moment, rocks that formed from magmas older than 3.6 billion years ago are known only from three localities in two areas, the Tula Mountains on the eastern side of the Napier Complex, and at Aker Peaks on the eastern side. Charnockites with 3.7 billion year old ages contain zircon as old as 4.0 billion years, showing that even such ancient rocks were produced by the recycling of older crust. The wide separation of the two areas, and the common occurrence of similar rocks of unknown age in many localities between them, opens up the possibility of the presence of a large terrane of Eoarchean crust, which in itself contains the evidence of even older crust. If these separate localities are connected, it would represent the largest area of Eoarchean crust preserved on Earth. It is the purpose of this project to discover if this is truly the case.

The project involves the analysis of samples collected across the Napier Complex by many expeditions to Antarctica. Zircon will be extracted from these samples and analysed by Secondary Ion Mass Spectrometry, a technique that allows the scientist to measure isotopes in parts of minerals as small as 10 microns across. Uranium-lead isotopes will provide the age of the zircon grains, and therefore the age of the rocks that enclose them. Some grains are expected to also contain remants of older zircon, preserved from recycled older crust. Isotopes of hafnium will also be measured by microanalysis, and these provide evidence of the age and composition of older crust that was recycled the form the magmas in which zircon grew. From a systematic study of zircon isotopes in samples across the Napier Complex, an ‘age map’ will be developed that will provide insight into the origins of this most ancient part of Antarctica, and into the nature of the early Earth as a whole.