

DFG Schwerpunktprogramm 1158 "Antarktisforschung": Geodynamic evolution of Proterozoic supracrustal rocks from the northern Shackleton Range, East Antarctica

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Summary

The overall aims of this project were to distinguish different crustal components in the Shackleton Range, East Antarctica, to infer their source, age and tectonic evolution and to document how the individual basement components are related to other terranes of the East Antarctic Craton, and whether they provide evidence for supercontinental formation during the Meso- and/or Neoproterozoic/Cambrian. Towards these aims it was intended to:

1. determine the pressure-temperature conditions of various rock types,
2. characterize the geochemical signature of (predominantly) mafic igneous rocks via major, minor, trace and rare earth element geochemistry,
3. ascertain the source region (juvenile mantle, reworked crust, tectonic affinities of metabasic rocks) of felsic and mafic orthogneisses through whole rock isotope and Lu-Hf in-situ zircon analyses,
4. establish the timing of various tectonothermal events by combined U-Pb and Lu-Hf zircon isotope analysis, grt-whole rock Sm-Nd and Ar-Ar dating.

With the help of detailed geochronological analysis, combined with Hf isotope data on single zircon domains, numerous litho-geochemical and bulk rock isotopic (Sr, Nd, Pb isotopes) as well as mineral-chemical analyses for thermobarometric calculations, three different terranes could be identified within the Shackleton Range. For each of these terranes, a series of distinct magmatic and metamorphic events could be recognized and the likely tectonic setting for these events reconstructed.

Publications

Schmädicke, E., Will, T.M. (2006): First evidence of eclogite-facies metamorphism in the Shackleton Range, Antarctica: Tracer of a suture between East and West Gondwana? - *Geology*, 34, 133-136.

Will, T.M., Frimmel, H.E., Zeh, A., Le Roux, P., Schmädicke, E. (2010): Tectonic and crustal evolution of the Shackleton Range, East Antarctica: geochemical and isotope constraints. - *Precambrian Research*, 180, 85-112.

Will, T.M., Zeh, A., Gerdes, A., Frimmel, H.E., Millar, I.L., Schmädicke, E. (2009): Palaeoproterozoic to Palaeozoic magmatic and metamorphic events in the Shackleton Range, East Antarctica: Constraints from zircon and monazite dating, and implications for the amalgamation of Gondwana. *Precambrian Research*, 172, 25-45.

Zeh, A., Gerdes, A., Will, T.M., Frimmel, H.E. (2010): Hafnium isotope homogenisation in metasedimentary rocks under amphibolite-facies conditions (>650°C): examples from the Shackleton Range (Antarctica). - *Geochimica et Cosmochimica Acta*, 74, 4740-4758.