



The Sperrgebiet Domain, Aurus Mountains, SW Namibia: A ~2020–850 Ma window within the Pan-African Gariep Orogen



Robert J. Thomas^{a,*}, Paul H. Macey^a, Christopher Spencer^b, Taufeeq Dhansay^a, Johann F.A. Diener^c,
Christopher W. Lambert^a, Dirk Frei^d, Anna Nguno^e

^a Council for Geoscience, Bellville, Western Cape, South Africa

^b The Institute of Geoscience Research, Department of Applied Geology, Curtin University, Perth, Australia

^c Department of Geological Sciences, University of Cape Town, South Africa

^d Department of Geology, University of Stellenbosch, South Africa

^e Geological Survey of Namibia, Windhoek, Namibia

ARTICLE INFO

Article history:

Received 31 May 2016

Accepted 16 September 2016

Available online 21 September 2016

Keywords:

Namibia

Sperrgebiet geochronology

Namaqua

Pan-African

ABSTRACT

The Aurus Mountains in SW Namibia form a tectonic inlier (Sperrgebiet Domain) within the Neoproterozoic Gariep belt. We document the geological history from field mapping, whole-rock geochemical, metamorphic and U-Pb zircon isotope data. The calc-alkaline granodioritic orthogneisses of the Wasserkuppe Suite, dated at ~2020 Ma, are the predominant, oldest rocks, which are interpreted to form part of a ~2 Ga “Sperrgebiet arc”; the tectono-magmatic equivalent of the ~250 km wide Richtersveld arc to the southeast, but ~100 Ma older. ~2 Ga detritus is common throughout the western Namaqua belt, but its source was hitherto unknown. The suite intruded synchronously with amphibolite facies metamorphism and deformation, considered an early phase of the Palaeoproterozoic Orange River Orogeny. The Wasserkuppe Suite is intruded by alkali granite and microgranodiorite dated at ~1885 Ma, interpreted as equivalents of the Violsdrif Suite (Richtersveld arc). The Sperrgebiet Domain is thus seen as an early phase of a process of Palaeoproterozoic island-arc development at the margins of the Archaean Kaapvaal Craton/Rehoboth Province. It was cannibalised by the later Richtersveld arc which dominated the palaeogeography of this part of southern Africa 100 m.y. later, and which forms the crustal infrastructure of much of Western Namaqualand.

The Palaeoproterozoic arc rocks are overlain by a clastic metasedimentary sequence; the Aurus Schist. Detrital zircon geochronology indicates that these rocks were predominantly derived from both arcs, with minor Archaean and younger ~1800 Ma detritus, of unknown source(s). Bodies of latest Mesoproterozoic (~1000 Ma) Warmbad Granite and pegmatite are mapped throughout the area and represent the only Namaquan rocks definitively identified. Evidence for Namaquan metamorphic or tectonic imprints are lacking, apart from a garnet-clinopyroxene metabasic inclusion in a quartz-feldspar leucogneiss which gave a typical “Namaquan” P-T estimate of ~700–750 °C at 6–7 kbar. The leucogneisses, distributed throughout the area, were dated at ~840 Ma and are interpreted as metamorphosed felsic igneous rocks of the Richtersveld Suite, formed during early rifting of the proto-Gariep basin. The Sperrgebiet rocks are variably deformed by the Pan-African Gariep Orogeny that produced regionally-pervasive fabrics, predominantly partitioned into discrete high-strain shear zones in a NW-trending sinistral transpressive tectonic regime.

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

The study area, within the Sperrgebiet National Park, lies in the former diamond-rich “Sperrgebiet” (German: “Prohibited area”) of southern Namibia. It extends from some 35 km NW of Rosh Pinah,

approximately 70 km to the NW in an elongate, NW-SE trending conical-shaped sliver, covering just less than 1000 km², between 27.81°S/16.48°E in the SE and 27.36°S/15.98°E in the NW (Figs. 1 and 2). It includes the renowned Roter Kamm impact crater, an annular topographic feature some 2.5 km across with a rim rising ~200 m above the surrounding sandy plains. The rugged Aurus Mountain range and subsidiary ridges along with various isolated “satellite” outcrops culminates at 1084 m at Aurus peak. The main

* Corresponding author.

E-mail address: bthomas@geoscience.org.za (R.J. Thomas).