



SHRIMP dating of titanite from metasyenites in the Central Zone of the Limpopo Belt, South Africa

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ARTICLE INFO

Article history:

Received 18 May 2010

Received in revised form 26 July 2010

Accepted 30 July 2010

Available online 10 August 2010

Keywords:

Limpopo Belt

SHRIMP

Titanite

Geochronology

Palaeoproterozoic

ABSTRACT

SHRIMP dating of titanite from metasyenites in the Central Zone of the Limpopo Belt yields a mean $^{207}\text{Pb}/^{206}\text{Pb}$ age of 2010.3 ± 4.5 Ma calculated from 23 analyses. This age, combined with petrographic and field observations, suggests the metamorphism in the syenites occurred during Palaeoproterozoic event.

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1. Introduction

A unique body of (meta)-syenite intrudes the Alldays Gneiss and outcrops in an elongate, 6.25×1.25 km body WNW of Alldays within the Central Zone of the Limpopo Belt, South Africa Fig. 1a and b. A recent study by Rigby et al. (2008a) reveals the metasyenites underwent a metamorphic evolution characterized by a maximum pressure of 7–8 kbar and ~ 770 °C. The subsequent retrograde path involved a simultaneous P–T decrease along a decompression-cooling path to 4 kbar and ~ 550 °C. These P–T estimates are ‘intermediate’ between the high-grade conditions reported by Zeh et al. (2004) and Rigby (2009) for metapelites near Messina and the amphibolite-facies conditions reported by Zeh et al. (2005a,b) and Chudy et al. (2008) for rocks from the Venetia area. Collectively, this data led Rigby et al. (2008a) to postulate the existence of a metamorphic field gradient. However, there are two main tectono-metamorphic episodes known in the Central Zone of Limpopo Belt, one in the Neoproterozoic (e.g. McCourt and Armstrong, 1998; Kröner et al., 1998; Bumby et al., 2001; Bumby and van der Merwe, 2004; Zeh et al., 2007, 2009; Millonig et al., 2008; Perchuk et al., 2008; Van Reenen et al., 2008; Gerdes and Zeh, 2009) and one in the Palaeoproterozoic (e.g. Jaeckel et al., 1997; Holzer et al., 1998; Kröner et al., 1999; Zeh et al., 2004; Rigby et al.,

2008b, 2010; Chudy et al., 2008; Eriksson et al., 2009, 2010; Gerdes and Zeh, 2009; Millonig et al., 2010) and without robust geochronological constraints it is not clear in which event the metasyenites were metamorphosed. Additionally, due to this uncertainty, the existence of the proposed metamorphic field gradient by Rigby et al. (2008a) is, at present, mere speculation. In this short communication we present new U–Pb SHRIMP data obtained from titanite in the metasyenites to delineate their age and support the metamorphic field gradient hypothesis.

2. Geological context

2.1. Regional

The Limpopo Belt of southern Africa Fig. 1a is a predominantly high-grade terrane composed of three distinct zones, each with a distinctive geological history and tectono-metamorphic evolution. The Southern Marginal Zone (SMZ) represents a high-grade equivalent of the granite-greenstone successions that prevail in the adjacent Kaapvaal Craton (KC). The SMZ is separated from the KC by the inward-dipping strike-slip ductile Shear Zone known as the Hout River Shear Zone. Similarly, the Northern Marginal Zone (NMZ) is a high-grade equivalent of the Zimbabwe Craton, which is separated from the NMZ by the North Limpopo Thrust Zone. Conversely, the Central Zone (CZ) forms a unique and distinct supracrustal block, which is bound to the north and south by the Magohapote and Triangle Shear Zone and Zoefontein-Palala Shear

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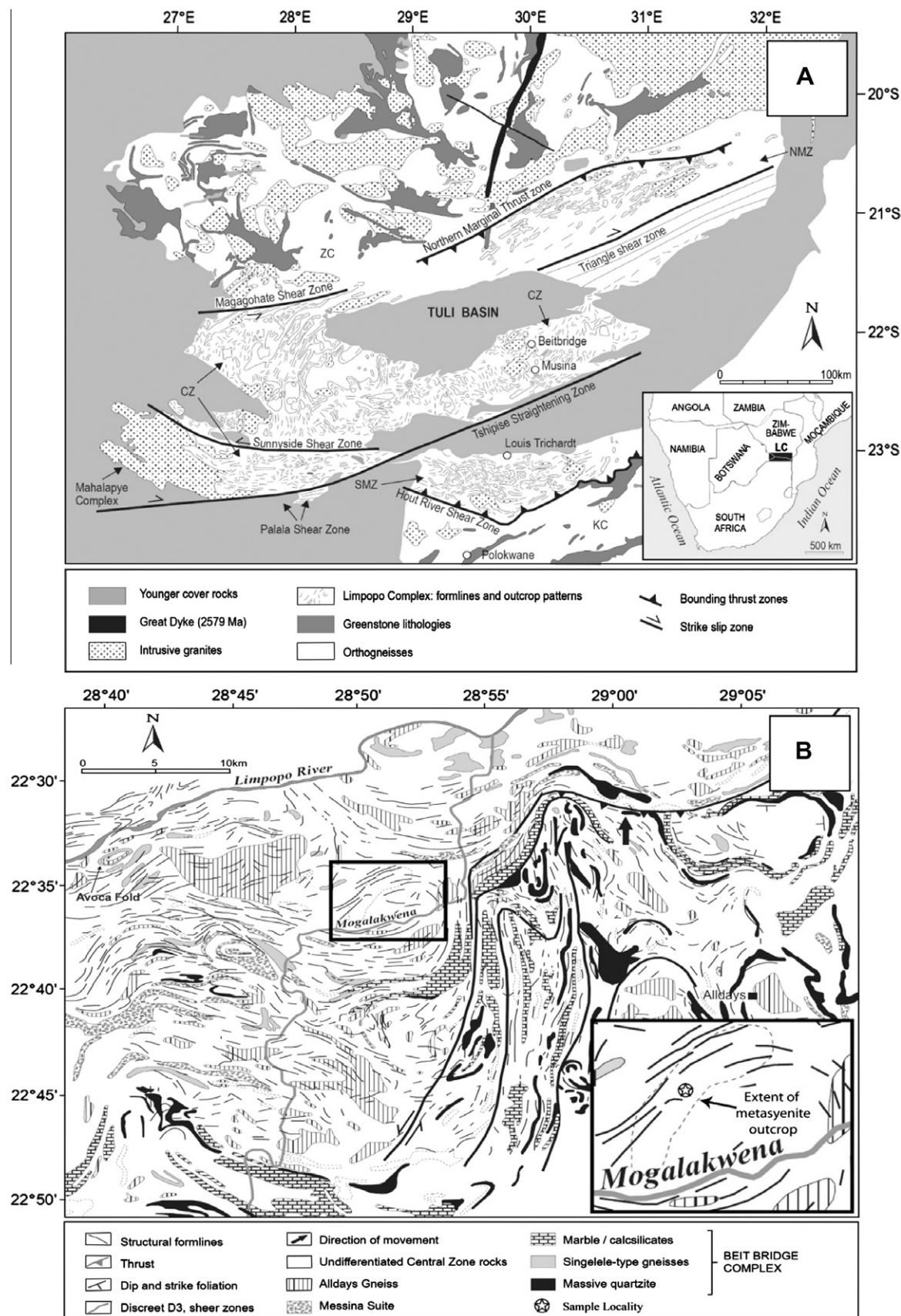


Fig. 1. (A) A map of the Limpopo Belt (after Boshoff et al. (2006)). (B) A detailed geological map of the field area (after Boshoff et al. (2006) and Rigby et al. (2008a)).

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