1 INTRODUCTION

The Limpopo belt (LB) of South Africa, characterized by a long lasting polyphase tectono-metamorphic evolution, extending from ± 3700 Ma to ± 2000 Ma, is regarded as one of the oldest orogenic belts in the world (Van Breemen & Dodson, 1972; Key, 1977; Fripp, 1983; Watkeys et al, 1983). This east-northeast trending zone of granulite facies tectonites has an outcrop area of about 700 km in length and about 300 km in width (Van Reenen et al. 1987) and is situated between the Archaean Kaapvaal Craton (KC) in the south and the Archaean Zimbabwe Craton (ZC) in the north (Figure 1). The LB is divided into the Southern Marginal Zone (SMZ), Central Zone (CZ), and Northern Marginal Zone (NMZ) by ~ 2000 Ma inward dipping mylonitic, strike-slip shear zones: the Palala Shear Zone in the south, and the Tuli Sabi/Triangle Shear Zone in the north (e.g. McCourt & Vearncombe, 1992) (Figure 1). Major dip-slip thrust zones bound the SMZ (Hout River Shear Zone, Smit et al., 1992) and the NMZ (North Marginal Thrust Zone, Blenkinsop et al., 1995).

The LB contrasts remarkably in style and scale of deformation compared with the adjacent granite-greenstone terranes of the Kaapvaal and Zimbabwe Cratons (e.g. Smit et al., 1992; Roering et al., 1992b) (Figure 1). The granulite facies gneisses of the LB are deformed into complex fold patterns, some with sheath-like geometry, and ductile shear zones are commonplace (Coward, 1976; McCourt & Vearncombe, 1992; Smit et al., 1992; Smit & Van Reenen, 1997). The greenstone belts on the craton, on the other hand, occur as large mappable ENE-trending schist belts (10 – 30 km in length) that share a common style of deformation including south plunging to oblique stretching lineations and low-angle northward verging thrust stacking (de Wit et al., 1992a, b). Primary features (e.g. bedding) can still be recognized and faults rather than ductile shear zones define structural breaks.

The two Marginal Zones comprise of granitoid greenstone lithologies (quartzo-feldspathic, mafic, and ultramafic gneisses) at granulite grade that have been correlated with similar lower-grade successions on the adjacent cratons (Van Reenen et al., 1990; Kreissig et al., 2000). These two zones are therefore regarded as lower crustal high-grade equivalents of the adjacent cratons which have been exhumed mainly in the late-Archaean (Barton et al., 1992; Berger et al., 1995) along the inward dipping dip-slip thrust zones: the North Limpopo Thrust Zone in the north (Blenkinsop et al., 1995; Mkweli et al., 1995) and the Hout River Shear Zone in the south (Smit et al., 1992). In the SMZ, granulite facies metamorphism with a

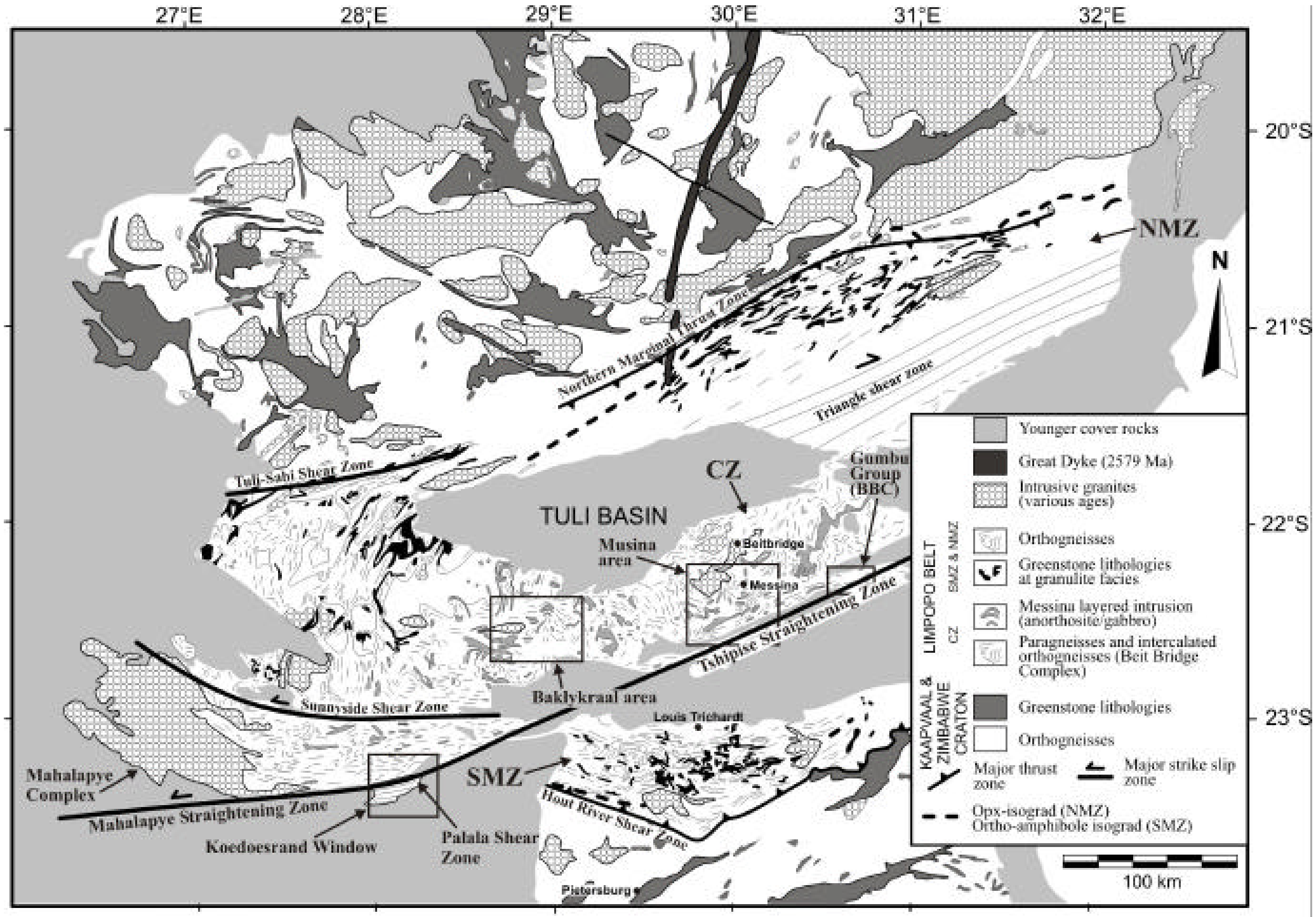

Figure 1: Regional geological map of the Limpopo Belt (Modified after Van Reenen et al., 1990) showing the subdivition into a Central Zone (CZ), Southern Marginal Zone (SMZ) and Northern Marginal Zone (NMZ). Also shown is the Mahalapye-Tshipise Straightening- and Triangle-Tuli-Sabi Shear Zones that bound the CZ, and the Hout River Shear Zone and North Marginal Thrust Zones. The locations of the Musina area and Baklykraal area, as well as that of the Koedoesrand Window and Gumbu Group are also shown.

clockwise *P-T* evolution, occurred shortly after 2700 Ma (Van Reenen et al., 1990). Kamber & Biino (1995), Kamber et al. (1995a) and Rollinson, (1989) proposed that the granulites in the NMZ are characterized by anticlockwise *P-T* evolution with a late thermal peak reached at 2580 Ma. The CZ consists of high-grade metasediments (Beit Bridge Complex), various grey gneisses (including the Sand River Gneisses and the Alldays Gneisses) as well as mafic and felsic plutonism of various ages (the Messina Layered Intrusion, Singelele Gneiss and Bulai Pluton) (e.g. Watkeys, 1984; Van Reenen et al., 1990; Holzer, 1995).

There is no consensus among different workers on a general geological model for the evolution of the LB. While most workers agree that the two marginal zones preserve evidence for single high-grade tectono-metamorphic events in the late-Archaean, there is little agreement on the geologic evolution of the CZ. Most authors agree that the high-grade rocks of the CZ have experienced three distinct high grade events at about 3200 -3100 Ma, 2650 – 2520 Ma and 2000 ± 0.05 Ma, all corresponding to a tectonic episode of distinct character (e.g. Barton & Key, 1981; Horrocks, 1980, 1983, Fripp, 1982, Watkeys et al., 1983; Barton et al., 1990b; McCourt & Vearncombe, 1992; Barton & Van Reenen, 1992b; Rollinson 1993; McCourt & Armstrong, 1998; Holzer et al., 1998; Kröner et al., 1998; Hofmann et al., 1998; Schaller et al., 1999). One school of thought (e.g. Schaller et al., 1999) is of the opinion that the major tectono-metamorphic event occurred in the Paleoproterozoic, while the late-Archaean event was mainly magmatic. Other workers (e.g. Hofmann et al., 1998) showed that the major fabric-forming event occurred in the late-Archaean, supporting a late-Archaean tectono-metamorphic evolution.