

Geochemical Correlation Between Metasediments of the Mfongosi Group of the Natal Sector of the Namaqua-Natal Metamorphic Province, South Africa and the Ahlmannryggen Group of the Grunehogna Province, Antarctica

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Abstract

The whole-rock geochemistry of metamorphosed greywackes, arenites and arkoses within the Mesoproterozoic Namaqua-Natal-Maudheim Province is interpreted with the aim of establishing geochemical correlations and defining common sediment source terrains. Metasediments of the Mfongosi Group of the Natal Sector of the Namaqua-Natal Metamorphic Province were sampled from their type area in the Mfongosi Valley. Metagreywackes from the northern limits of the Mfongosi Valley, directly adjacent to the Kaapvaal Craton, show ocean island arc signatures while metagreywackes from the southern limits of the Mfongosi Valley, near the contact with the Madidima Thrust of the Natal nappe zone, show mainly active continental margin signatures. Interleaved, geochemically distinct low-Ca+Na, high-K metamorphosed arkoses to lithic arkoses indicate a minor passive margin sediment component. Geochemical classification of low-grade Ahlmannryggen Group greywackes, arenites and arkoses of the Grunehogna Province, Antarctica, indicates both active and passive continental margin sediment sources. An oceanic island arc signature is not evident in Ahlmannryggen Group data. The active continental margin signature in both Natal Sector and Grunehogna Province metasediments potentially provides for a common link between these terranes. Discriminant Function Analysis, using three pre-defined provenance sub-sets within the Mfongosi Group and two pre-defined provenance sub-sets within the Ahlmannryggen Group, indicate that metasediments with active continental margin signatures from both groups are geochemically identical, implying that the active continental margin of the Grunehogna Province shed immature sediments westwards (African azimuths) into the developing, narrow or restricted Mesoproterozoic 'Mfongosi Basin.' This was accompanied by minor sediment influx from a stable continental platform, potentially the Kaapvaal Craton. Oblique and diachronous collision, initiated in the southwestern portions of the combined Natal Sector/Grunehogna Province system produced a laterally variable Mfongosi Group, which formed in the 'Mfongosi Basin'. Coarse-grained sediments dominated in its eastern portions while basalts with thin sapropelite units dominated in its western portions.

Key words: South Africa, Antarctica, Mfongosi Group, Ahlmannryggen Group, metasediment geochemistry.

Introduction

Mesoproterozoic mobile belts preserved mainly in South America, Africa, Antarctica and Canada formed a significant part of the supercontinent of Rodinia (Fig. 1). Several researchers (e.g., Groenewald et al., 1991; Moores, 1991; Jacobs et al., 1995; Dalziel et al., 2000) have emphasized the central role of the Namaqua-Natal-Falkland-Maudheim belt in the formation and break-up of Rodinia (Fig. 1). The Namaqua-Natal

Metamorphic Province (NNMP), which was laterally continuous with the Grenvillian terranes of Laurentia and East Antarctica, represents this collisional event in southern Africa between 1250 Ma and 950 Ma (e.g., Moores, 1991; Dalziel et al., 2000). The NNMP, which formed between the southern margin of the Archaean Kaapvaal Craton and a plate or sub-plate to the south (Matthews, 1959, 1972, 1981a, b), is typically subdivided into a western Namaqua Sector and an eastern Natal Sector.