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Título do Trabalho: INVESTIGATING P-T CONDITIONS OF METAMORPHISM AT THE BASE OF LIBERDADE NAPPE: A QUANTITATIVE COMPOSITIONAL MAPPING AND ITERATIVE THERMODYNAMIC MODELLING APPROACH

Forma de apresentação: Oral

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Resumo do trabalho:

The Liberdade Nappe, a component of the Andrelândia Nappe System located in the southern portion of the Brasília Belt, formed during tectonic collision during the Neoproterozoic. This study investigates an outcrop of partially melted metasediments at the base of Liberdade Nappe in the Arantina-MG region. The two metatexites examined were derived from distinct parent rocks (metapelite and metagraywacke) and underwent partial melting at different stages. This work elucidates the Pressure-Temperature paths and conditions of peak metamorphism in these samples. Samples were characterised petrographically in thin section, and chemically through WDS mapping on an electron microprobe. Quantitative compositional maps were produced by processing electron microprobe data using the program XMapTools. These maps were used to identify relationships between minerals' textures and compositions, critical for determining a peak metamorphic paragenesis. Two thermodynamic modelling approaches were applied: (i) Forward modelling, using the program Theriak-Domino and whole-rock compositions, and (ii) Iterative modelling, using the program Bingo-Antidote and local bulk compositions extracted from the compositional maps. Sample 1 is a garnet-biotite-muscovite porphyroblastic metatexite with staurolite and kyanite, derived from a pelitic protolith, and the following peak metamorphic mineral assemblage Grt+Bt+Ms+Ky+Pl+Qz+Ilm+Rt+melt. Snowball garnet porphyroblast show complex compositional zoning patterns related to deformation-growth stages. Garnet composition is essentially almandine-rich and the zoning is characterised by increasing almandine and low grossular content in the core (Grt-core: Alm78-72Prp15-13Sps4-3,5Grs10-7). Garnet mantle is enriched in grossular content and depleted in almandine content (Grt-mantle: Alm70-65Prp18-12Sps5-4Grs18-12). Garnet-outermost rim has similar composition to the inner core (Grt-rim: Alm76-72Prp15-13Sps3-1,5Grs10-7). Forward modelling constrains the beginning of partial melting to 680 °C, and the metamorphic peak to 680-780 °C and 9.5-11.0 kbar. Iterative modelling returned similar conditions for peak metamorphic of 700 °C at 10.8 kbar. Sample 2 is a kyanite-garnet-biotite-muscovite metatexite with staurolite, derived from a graywacke protolith, and the following peak metamorphic mineral assemblage Grt+Bt+Ms+Ky+Pl+Qz+Ilm+Rt+melt. In comparison to sample 1, sample 2 has a higher mode of quartz, plagioclase and kyanite. Forward modelling constrains the beginning of partial melting to 690 °C, and the metamorphic peak to 690-790 °C and 9.5-11.5 kbar. Iterative modelling returned an optimal solution 700 °C and 9 kbar. P-T paths obtained for both samples based on the best stability fields for each mineral phase composition overlap, indicating progressive metamorphism at upper amphibolite facies conditions and retro-metamorphism in the staurolite zone. Metamorphism at the base of Liberdade Nappe reached peak conditions of 680-750 °C at 10 kbar. The result is consistent with the normal metamorphism expected for Liberdade Nappe, which records decreasing temperature and pressure gradients towards the top, as described in previous works.

Palavras-Chave do trabalho: Metamorphic Petrology; Migmatites; Thermodynamic modelling;