

PROVENANCE AND METAMORPHISM IN THE WESTERN ANDRELÂNDIA NAPPE SYSTEM: COUPLING U–PB AGES FROM ZIRCON AND MONAZITE WITH FORWARD METAMORPHIC MODELLING AND TRACE-ELEMENT SIGNATURES

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ABSTRACT: The Andrelândia Nappe System comprises a stack of metasedimentary rocks from medium amphibolite up to granulite facies conditions in the south of Minas Gerais state, southeast Brazil. Its structural position lies below the arc-related Socorro-Guaxupé Nappe and above the metasedimentary rocks from the São Vicente Complex and the Carrancas Nappe System. Together, these groups compose the Southern Brasília Orogen. The western domain of the Andrelândia Nappe System contains basal metagraywackes, under amphibolite facies conditions, with granulite facies metapelite, and minor calc-silicate and metamafic rocks from the Três Pontas-Varginha Nappe sitting at its top. The present work is a contribution to the provenance and age of metamorphism of these units. The comparison of U–Pb ages and geochemistry of zircon and monazite from the basal nappes is used to: 1) evaluate their correlation and further characterize the temporal aspects of the metamorphic *P–T* paths recorded, including detailing the anatexis process that generates widespread tonalite-trondhjemite leucosome; 2) determine the time span recorded during the evolution of anatectic metapelite and metamafic samples from the upper Três Pontas-Varginha Nappe. The coupling of petrography and the microstructural location of zircon and monazite to U–(Th)–Pb age data and trace-element signatures of zircon, monazite, and garnet via LA–ICP–MS allows a thorough petrochronologic approach. This information is tied to forward metamorphic modelling with THERMOCALC, and the Zr-in-rutile geothermometer to determine the *P–T–t* paths. Preliminary detrital age data show a variety of sources for the western domain of the Andrelândia System with the main contribution in the Tonian and Cryogenian periods, and subordinate Meso- and Paleoproterozoic inheritance more common toward its eastern base. The timing of metamorphism ranges from the Cryogenian to the Cambrian, with ages decreasing from top to lower nappes. For the metagraywackes, the metamorphic modelling suggests water fluxed anatexis at upper amphibolite facies conditions (~13 kbar, ~750 °C), generating discrete quantities of tonalite melt, in agreement with field descriptions and Zr-in-rutile temperatures of ~750 °C, consistent with a convergent/collisional tectonic regime. Furthermore, a tonalite sheet emplaced in these rocks has crystallization age in the late Cambrian and whether it is the result of anatectic melt migration related to the partial melting process recognized in the metagraywackes, or a non-related intrusion due to a younger event on the system, is a question under investigation.

KEYWORDS: ANDRELÂNDIA NAPPE SYSTEM, FORWARD METAMORPHIC MODELLING, GEOCHRONOLOGY