The P–T–t evolution of a migmatite dome and its metamorphic envelope: a case study from the Southern Altai Belt in Mongolia.

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Résumé

The *P*–*T*–t evolution of a migmatite-cored dome-like structure overlayed by low-grade metasediments of the Mongol Altai is investigated. Phase equilibrium modelling, U-(Th-)Pb and trace element analyses of monazite are applied to a migmatite and two micaschists (Grt–St and Grt–St–Ky) sampled in the core and within a high-strain zone of the envelope of the dome, respectively.
Three metamorphic events are inferred in the micaschists based on index minerals: garnet 1 (M1); garnet 2-staurolite and garnet 2-staurolite-kyanite (M2); and sillimanite (M3). The *P*–*T* evolution documents: M1 pressure and temperature increase (525-550 ∘C, 4-5 kbar to 550-575 ∘C, 5-6 kbar), M2 near isobaric heating (550-575 ∘C, 6-7 kbar to 600-650 ∘C, 6-8 kbar in Grt-St sample; and to 650-676 ∘C, 7-8 kbar in Grt-St-Ky sample), and M3 decompression (< 6 kbar). Monazite included in garnet 1 yield Carboniferous dates of c. 350 Ma, interpreted as the age of M1. Monazite in garnet 2, staurolite, sillimanite and the matrix of both samples from c. 305 Ma to c. 285 Ma are interpreted in terms of progressive (re)crystallization of monazite during M2 and M3.

Three metamorphic stages recorded in the migmatite are tentatively correlated with the evolution of the micaschists. They are marked by garnet (1?)-ilmenite-rutile-chlorite (M1), garnet (2?)-kyanite-rutile-melt (M2), sillimanite-ilmenite (M3). The *P*–*T* conditions indicate subsolidus M1 (5-7 kbar, _˜550 ∘C), peak suprasolidus M2 (8-10 kbar, 750-775 ∘C) and decompression and cooling during M3 (to 3-5 kbar and 550-700 ∘C). Textural interpretations suggest that a well-defined date of c. 285 Ma from monazite of this sample encompasses the (re)crystallization of monazite during melting and subsequent exhumation.
The Grt–St and Grt–St–Ky micaschists resembling the typical result of Barrovian metamorphism, formed through the superposition of two metamorphic events with significantly contrasting ages. Geochronological data indicate that the Grt–St–Ky assemblage is closely related with partial melting (M2) and exhumation (M3) of the migmatites rather than with crustal thickening (M1). We suggest the Barrovian assemblage formed during the advection of heat from the migmatite-core of the dome undergoing exhumation, most likely enhanced by magmatism, during extensional tectonics.

*Intervenant

Mots-Clés: Central Asian Orogenic Belt, Petrology, Geochronology, Barrovian metamorphism, Extensional tectonics, Permian