Zircon UPb Chronometry of the Pressure and Temperature History of Granulites in the Musgrave Ranges, Central Australia

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Abstract

Ion microprobe U-Pb measurements of zircon in the Musgrave Ranges of central Australia date the emplacement of a charnockite, which is cut by a shear zone containing a garnet-clinopyroxene assemblage, M2 (PT conditions {approximately} 11 kb and 720C), at {approximately} 1200 Ma. Veinlets of a post-M2 adamellite cut an M4 assemblage (PT conditions {approximately} 6 kb and 670C) contained in a metadolerite inclusion, suggesting that the adamellite was emplaced during or after M4. Igneous and metamorphic zircons in the adamellite, however, grew at about 1200 Ma, indicating that M2 and M4 were synchronous. At the level of precision of the data, the time interval between the growth of the two assemblages can not have been more than 20 Ma. The authors interpret the pressure, temperature and time (PTt) path obtained by combining the thermobarometric data, and zircon U-Pb ages in terms of magmatic heat input in a thickened crustal segment followed by rapid, possibly tectonically driven, uplift of the lower part of the thickened crust to a depth of 15-20 km.