A widespread partial melting event firstly identified within the Paleoproterozoic Jiao-Liao-Ji orogenic belt, North China Craton

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Voluminous meta-sedimentary rocks, including the Macheonayeong Group in North Korea, Ji'an and Laoling groups in the southern Jilin, the North and South Liaohe groups in the eastern Liaoning, the Fenzishan and Jingshan groups in the Jiaobei massif, and Wuhe Group in Anhui Province, are widely distributed within the Paleoproterozoic Jiao-Liao-Ji orogenic belt, North China Craton. Previous studies revealed that a Paleoproterozoic partial melting event was only identified in the Jiaobei terrane. However, present study shows that layers and irregular lenses of granitic leucosomes are widely distributed within granulite-facies meta-sedimentary rocks from North and South Liaohe, and Ji'an groups. The migmatized rocks extend over an belt of at least 900×50 km from Jiaobei, through eastern Liaoning, to southern Jilin. A combined study of mineral inclusions, cathodoluminescence (CL) images, and zircon U-Pb LA-ICP-MS dates provide clear evidence on the nature and timing of the partial melting in these granulite-facies meta-sedimentary rocks. Most zircons from the granitic leucosomes are either inherited crystals (igneous or detrital) with distinct overgrowths, or are simply new euhedral crystals. Both the overgrowths and the new crystals commonly exhibit perfect euhedral shapes, pronounced oscillatory zoning. These features suggest that the new zircons are anatectic in origin. Numerous U-Pb spot analyses of anatectic zircons reveal that the whole Jiao-Liao-Ji orogenic belt experienced a major episode of partial melting in the Paleoproterozoic, with crystallization of the melt occurring in two distinct periods from 1860±4 to 1855±3 Ma, and 1840±3 to 1835±5 Ma, as represented, respectively, by the magmatic cores and rims of the anatectic zircons. The first age group probably represents the initial crystallization of melts derived from partial melting within the Jiao-Liao-Ji orogenic belt, while the second age group may represent the completion of migmatization and crystallization of granitic leucosomes. This significant partial melting event was gernetially associated with the Paleoproterozoic granulite-facies 'hot' stage of exhumation of the Jiao-Liao-Ji orogenic belt, and it induced extensive retrogression of the voluminous pelitic granulites, as well as the formation of regional migmatites.