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First high-precision U-Pb CA-ID-TIMS age of the Chuanlinggou Formation in the North China Craton: Implications for global correlations of black shales and Statherian-Calymmian boundary

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The Chuanlinggou Formation in the Yanliao Basin in the northern North China Craton (NCC) hosts the earliest black shales in China and which preserves the world's earliest multicellular microfossils of eukaryotes[1]. Previous SHRIMP U-Pb zircon dating on tuff beds within black shales from the upper part of the Chuanlinggou Formation in Kuancheng County yielded variable crystalization ages from 1621±12 Ma to 1634.8±6.9 Ma [2-3]. Here we firstly present a high-precision zircon U-Pb CA-ID-TIMS age of 1641.7±1.2 Ma for a tuff layer within the black shales from the upper part of the Chuanlinggou Formation in Kuancheng County. The new age of 1641.7±1.2 Ma is similar within analytical error to those ages obtained for black shales from the Cuizhuang Formation in the Xiong'er Basin in the southern NCC[4], the Barney Creek Formation in the southern McArthur Basin of the North Australian Craton (NAC)[5] and Fraynes Formation in Birrindudu Basin[6] in the northwestern NAC, indicating synchronous deposition of large volumes of black shales across the NCC and NAC at ~1640 Ma. Global correlations and analysis of spatial distribution of ~1640 Ma black shales and large igneous provinces (LIPs) and associated magmatic rocks[7] in the paleogeographic reconstruction map of the Columbia supercontinent[8] reveal a temporal/spatial and probable causal link between the ~1640 Ma LIPs and black shales (Figure 1). The widely distributed ~1640 Ma LIPs and black shales in the Columbia supercontinent may represent a global-scale geological event during the Mesoproterozoic Era and can provide a natural marker for Statherian/Calymmian boundary at 1640 Ma in the international chronostratigraphic scale.

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