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Mesoproterozoic geochronology in the North China Craton

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The Mesoproterozoic successions in the North China Craton (NCC) and the Qinling-Qilian-Kunlun Orogens have been revised using the new and highly reliable age data. Many Proterozoic strata in the Qinling-Qilian-Kunlun Orogens, such as the Qinling, Jinshuikou and Beidahe groups that have been ascribed to be Paleoproterozoic are actually of Mesoproterozoic Era^[1]. The most significant advances are recent geochronological studies on the Mesoproterozoic stratigraphy and magmatic events in the NCC^[2~6]. The boundary age between the Dahongyu Formation and the overlying Gaoyuzhuang Formation is well constrained to be ~ 1600 Ma, corresponding to the boundary age between Statherian and Calymmian. The boundary between the Tieling Formation and the overlying Xiamaling Formation is best positioned at ~ 1400 Ma, which is coeval with the boundary between Calymmian and Ectasian, and is about 400 Myrs older than the conventional value of 1000 Ma originally defined by the All China Commission of Stratigraphy. Hence the Jixianian System, including the Gaoyuzhuang, Yangzhuang, Wumishan, Hongshuizhuang and Tieling formations in ascending order, is comparable with the Calymmian System in the International Stratigraphic Chart. The lower boundary of the Changchengian System, the first system of the Mesoproterozoic in China Regional Stratigraphic Chart, also needs revision from the conventional 1800 Ma to ~ 1650 Ma well constrained by the zircon U-Pb ages 1673±10 Ma (LA-MC-ICP-MS) and 1669±20 Ma (SHRIMP) of a granite-porphry dike that was overlain unconformably by the basal conglomerate of the Changzhougou Formation, the first formation of the Changchengian System. Therefore, the earliest Mesoproterozoic sequence in the NCC represented by the Changchengian and Jixianian Systems in the Yanliao Aulacogen is identical to that of the Vindhyan Supergroup in Central Indian and the Riphean Series in Russia. On the other hand, a series of 1.8-1.6 Ga anorogenic magmatic records were well-preserved around the NCC, which marked the initial rifting of the Columbia Supercontinent in the NCC. The magmatic events can thus be subdivided into three phases with peaks at ca 1.77 Ga, ca 1.70 Ga and ca 1.63 Ga, respectively. In addition to 1.8-1.6 Ga magmatic events, some minor volcanic eruptions at ca 1.56 Ga and 1.44 Ga, and wide-spread bi-modal magmatic intrusions at 1.35-1.32 Ga have been recognized in the northern NCC, marking the continued rifting of the Columbia Supercontinent since ~1.8 Ga.

References

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