

The Paleoproterozoic tectonic basin evolution of the Trans-North China Orogen, the North China Craton

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The Trans-North China Orogen (TNCO) has been recognized as a continent-continent collisional belt along which the Eastern and Western Blocks amalgamated to form the North China Craton. However, controversy has surrounded the timing and tectonic processes involved in the collision of the two blocks, ranging from the westward-directed subduction with final collision at ~2.5 Ga, through the west-dipping subduction with two collisional events at ~2.1 Ga and ~1.85 Ga, to the eastward-directed subduction with final collision at ~1.85 Ga. Lithostratigraphic data indicate that the Jiangxian and Lower Zhongtiao Groups and lower parts of the Hutuo and Yejishan Groups are composed of metaclastic rocks, carbonates and metavolcanic rocks, interpreted as back-arc basin deposits, whereas the Upper Zhongtiao, Danshanshi Groups and the upper parts of the Hutuo and Yejishan Groups consist only of metaconglomerates and metasandstones, interpreted as foreland basin deposits. For the Hutuo and Yejishan Groups, we found major detrital zircon age peaks at ~2.5 and ~2.15 Ga, which are consistent with ages of the lithological units in the middle sector of the TNCO. Besides the age peaks of ~2.5 Ga and ~2.15 Ga, detrital zircons from the Lower Zhongtiao, Upper Zhongtiao and Danshanshi Groups also gave an older age peak of 2.7 Ga, which is comparable with ages of the lithological units in the Taihua Complex. For the back-arc basin deposits, their maximum depositional ages were constrained at ~2.1 Ga, whereas the presence of ~1.85 Ga detrital zircons from the foreland basin deposits indicates that they were deposited after this time. Taken together, we present a brief scenario for the evolution of the sedimentary basins in the TNCO. At ~2.1 Ga, a series of back-arc basins developed behind an “Andean-type” arc that were subsequently incorporated into the TNCO during the collision of the Eastern and Western Blocks. At ~1.85 Ga, the two blocks collided along the TNCO, resulting in the crustal thickening followed by rapid exhumation/uplift, which shifted the back-arc basins to foreland basins. Such a shift in the late Paleoproterozoic supports the model that the collision between the Eastern and Western Blocks occurred at ~1.85 Ga.