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New Early Carboniferous paleomagnetic results from Tuva-Mongol Block and Gurvansayhan Zone and their implications for the evolution of Central Asian Orogenic Belt

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The Central Asia Orogenic Belt (CAOB) is a giant and long-lived accretionary orogen between East Europe-Siberia and Tarim-North China cratons, and its formation process was closely associated with the complex geodynamic evolution of the Paleo-Asian Ocean and Mongol-Okhotsk Ocean from the Neoproterozoic to Mesozoic. The Tuva-Mongol Block (TMB) and Gurvansayhan Zone (GZ) occupied the center of the CAOB, and are the important areas to understand the tectonic evolution of this orogenic belt. However, the tectonic relationship among the TM, EGZ and their adjacent blocks has long been a subject of much debate because of the lack of the reliable paleomagnetic data.

In order to address the puzzle, we carried out new paleomagnetic studies on the Early Carboniferous sandstones from Altan-Ovoo Formation near Ulaanbatar in the TMB and the Gunbuyn Formation near Saynshand in the GZ. All samples were subjected to stepwise thermal demagnetization. After a low-temperature component of viscous magnetic remanence acquired in the recent field was removed, the stable high-temperature components (HTCs) were isolated from most samples. The HTCs from each rock unit passed a fold test, indicating their primary origins. The corresponding Early Carboniferous paleomagnetic poles were calculated as the Altan-Ovoo Formation of TMB (38.0˚N/349.5˚E, A95=2.4˚) and the Gunbuyn Formation of GZ (45.9˚N/321.3˚E, A95=2.9˚). By comparing our new Early Carboniferous paleomagnetic results of TMB and GZ and the published data of their adjacent blocks, the poles of TMB, GZ and North China Block are located at a common small circle centered around the reference site (43˚ N, 120˚ E), indicating that these three blocks shared a similar paleolatitude near equator and were very close to each other during Early Carboniferous. However, their paleolatitudes were significantly lower than the Siberia craton, suggesting that there was a large Mongol-Okhotsk Ocean between the Siberia and TM during that time.