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Early Devonian paleomagnetic pole from the Mongolia Block: its paleogeographic implication and a possible origination from Gondwana

Pan Zhao (1), Erwin Appel (1), Bei Xu (2), Turbold Sukhbaatar (3,4)

(1) Department of Geosciences, University Tübingen, Tübingen, Germany, (2) Key Laboratory of Orogenic Belts and Crustal Evolution, Peking University, Beijing, China, (3) Institute of Paleontoloty and Geology, Mongolian Academy of Science, Ulaabaatar, Mongolia, (4) Institute of Petrology and Structural Geology, Charles University, 12843 Praha 2, Czech Republic

The Mongolia Block (MOB) is an important Precambrian block constituting the modern Asia Continent. However, its origination has not been well studied and previous early-middle Paleozoic paleogeographic reconstructions rarely include this block due to the lack of paleomagnetic data. In this study, we report firstly paleomagnetic data from the early Devonian Nariintai Formation clastic rocks in northeastern Mongolia, which are used to understand the paleogeographic position of MOB in the middle Paleozoic paleogeographic reconstruction and decipher its relationship with the Gondwana Supercontinent. Magnetic mineralogical analyses reveal magnetite and pyrrhotite as the main magnetic carriers. Characteristic remanent magnetizations isolated from eight sites show both normal and reverse polarities. A formation-mean direction was calculated with eight sites at Dg/Ig = 335.7°/40.6° (kg = 10.3, α95g = 18.1°) in geographic coordinate and Ds/Is = 323.2°/9.9° (ks = 38.2, α95s = 9.1°) after tilt-correction. The formation-mean direction passes fold tests and an early Devonian paleomagnetic pole has been calculated for the MOB at λ/φ = 37.2°N/338.1°E (dp = 4.7°, dm = 9.2°) corresponding to a paleolatitude = 5.0° N. This pole is consistent with published Devonian poles from the Amur region of Russian Far East, indicating that the Amur region has become a part of the MOB before the early Devonian. Devonian poles of the MOB are close to that of the North China Craton (NCC) but far away from that of the Siberia Craton. Considering previous paleomagnetic and paleontological studies, we place the MOB in equatorial latitude near the NCC in the early Devonian paleogeographic reconstruction. By tracing drifting history of Asiatic blocks from Gondwana, we proposed that the MOB, like the other Asian blocks, originated from or very close to Gondwana during the Neoproterozoic-Cambrian, and it drifted to the equatorial latitude (north hemisphere) in the late Silurian-early Devonian due to the opening of the Paleo-Tethys Ocean.