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Paleomagnetic study on the Neoproterozoic mafic dikes and Early Permian volcanic-sedimentary rocks from NW Yili Block (NW China): Implications for post-orogenic kinematic evolution of the SW CAOB

Xin Zhu (1), Bo Wang (1), Yan Chen (2), Hongsheng Liu (1,2), Liangshu Shu (1), and Michel Faure (2)

(1) State Key Laboratory for Mineral Deposits Research, School of Earth Sciences and Engineering, Nanjing University, 210093 Nanjing, China, (2) Institut des Sciences de la Terre d'Orléans, UMR 7327 CNRS-Université d'Orléans, 45071, Orléans, France

As one of the largest accretionary orogens of the world, the Central Asian Orogenic Belt (CAOB) has been the focus of geological studies in the last decades. However, several key points are still in hot debate, such as the formation process of the Paleo-Asian Ocean, the intracontinental movements among constituent blocks of the CAOB. In order to better understand these questions, we conducted a paleomagnetic study on the Neoproterozoic (ca. 780 Ma) mafic dikes and Early Permian (ca. 268 Ma) volcanic and sedimentary rocks from NW of the Yili Block (NW China). Ten sites have been sampled from three mafic dikes. The thickness of dikes varies from 10 to 40 meters. At about 15 km west of the mafic dikes, 4 sites were drilled in the Lower Permian basalts and limestones that unconformably overlay the Neoproterozoic mafic dikes. Mineralogical investigations show the titanium-poor magnetite as the major magnetic remanence carrier. Stepwise alternating field (AF) and thermal demagnetizations reveal two-component magnetizations. The low temperature (coercivity) component shows a viscous and unstable magnetic remanence, whereas the high temperature (coercivity) component stably decays toward to the origin and is considered as the characteristic remanent magnetization (ChRM). All ChRMs isolated from both the mafic dikes and volcanic-sedimentary samples exclusively show a reversed magnetic polarity. Based on the following 3 arguments, we suggest that the Neoprotozoic mafic dikes have been remagnetized in the Early Permian. 1. International reference of magnetostratigraphic polarity shows a dominance of the normal polarity for the Neoproterozoic period and a superchron of the reversed polarity for the late Carboniferous-Permian; 2. Two groups of sampling show coherent paleomagnetic poles with an undistinguishable angular difference; and 3. The widespread Early Permian magmatism in the sampling area could be the cause of the remagnetization. Consequently, an Early Permian paleomagnetic pole of the Yili Block has been calculated from dikes and volcanic-sedimentary rocks: λ=79.0°N, φ=209.6°E, A95=6.1°. Comparisons of this new paleomagnetic pole with available poles of Yili, Tarim and South Junggar provide more precise constraints on the kinematic evolution among these blocks: (1). The Yili Block underwent an important dextral strike-slip movement along the Nikolaiev-Nalati Fault with respect to Tarim from C2 to P2, moreover, this movement seems faster during the C2- P1 period than the P1-P2 one. These two blocks were unified as a single block since the P2; (2). The South Junggar Block experienced a significant dextral strike-slip movement with respect to the Yili-Tarim block since the Late Permian.

Key words: Paleomagnetism, remagnetization, kinematics, Central Asian Orogenic Belt, Tianshan, Paleozoic.