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Paleomagnetic data bearing on the Mesozoic deformation of the Qiangtang Block: Implications for the evolution of the Paleo- and Meso-Tethys

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Paleomagnetism has played an important role in quantifying the Mesozoic evolution of "Proto-Tibet". In this paper, we present new paleomagnetic data from five Middle-Upper Jurassic sedimentary sequences (Quemo Co, Buqu, Xiali, Suowa and Xueshan Fms.) of the eastern North Qiangtang Terrane (QT) at Yanshiping (33.6°N, 92.1°E). The new paleomagnetic results form a large dataset (99 sites, 1702 samples) and reveal a paleopole at 79.1°N/306.9°E (dp = 3.9°, dm = 6.3°) for the Quemo Co Fm., at 68.9°N/313.8°E (dp = 2.1°, dm = 3.7°) for the Buqu Fm., at 66.1°N/332.1°E (dp = 2.7°, dm = 4.6°) for the Xiali Fm., at 72.4°N/318.6°E (dp = 3.9°, dm = 6.7°) for the Suowa Fm., and at 76.9°N/301.1°E (dp = 7.9°, dm = 13.2°) for the Xueshan Fm. These results indicate clockwise rotations of ∼19.8 ± 9.4° between ∼171.2 and 161.7 Ma and counterclockwise rotations of ∼15.4 ± 13.4° between ∼161.7 and b157.2 Ma for Yanshiping. We attribute the change in rotation sense at approximately ∼161.7 Ma to the initial collision of the Lhasa and Qiangtang terranes. Using this and other paleomagnetic data from the Lhasa, Qiangtang and Tarim terranes, as well as other geological evidence (e.g., tectonism-related sedimentary sequences, volcanism, and HPmetamorphism), we propose a new conceptual evolution model for the Mesozoic QT and Tethyan Oceans. The Longmo Co-Shuanghu oceanic slab was subducted before 248 Ma, followed by continental collision of the North-South Qiangtang subterranes between ∼245 and 237 Ma. The Qiangtang Terrane experienced post-collisional exhumation between ∼237 and 230 Ma during subduction of the Jinsha oceanic slab. The collision of the Qiangtang and Songpan-Ganzi terranes occurred between ∼230 and 225 Ma. The QT experienced post-collisional relaxation from ∼225 to ∼200 Ma, followed by subsidence and extension-related exhumation between ∼200 and 162 Ma in association with subduction of the Bangong-Nujiang oceanic slab. Finally, these events were followed by the scissor-like diachronous collisions of the Lhasa and Qiangtang terranes between ∼162 Ma and the mid-Cretaceous.