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Mid-Pleistocene rapid increase of sedimentation rate caused by rapid deformation and uplift of the northeastern Tibetan Plateau: evidence from high-resolution magnetostratigraphy in Guide and Linxia Basins

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The Mid-Pliocene rapid increase of the sedimentation rate over the world is attributed to be caused by climatic change. Here we provide lines of evidence to show this feature may be largely caused by tectonic event. The Guide and Linxia Basins, locating at the northeastern Tibetan Plateau in Qinghai and Gansu Provinces, NW China, receive thousands of meters of Cenozoic sediments and are affected strongly by Asian monsoons. The basins are mainly bordered by transpressional thrusts dynamically linked with two huge fault systems, the Kunlun and Altyn Tagh fault systems, and have strongly subjected to flexural subsidence. High-resolution paleomagnetism was carried out for the sediments from eight sections in the two basins and yields ages of 0 to $>$ 29 Ma. The calculated sedimentation rates exhibit a rapid increase since about 3.6 Ma. Detailed tectono-stratigraphic investigation and basin analysis demonstrate that a clear angular unconformity caused by thrusts occurred at about 4.3 – 3.6 Ma in sediments close to the feet of the mountains, but gradually disappears toward the centers of basins. Concurrent with this unconformity is a set of thick debris flow boulder conglomerates firstly appearing in the region in the Cenozoic. Fisher-averaging of declinations of characteristic remanent magnetizations archived in sediments shows that a fast clockwise rotation of the region occurred at about 3.6 Ma. We think that

the simultaneity of the unconformity, boulder conglomerates and the rotation of the region indicates that the NE Tibetan Plateau underwent a rapid deformation and uplift at that time, and thus was probably a major factor causing the rapid increase of sedimentation rate. The reported subsequent cooling of the northern hemisphere and intensification of Asian monsoons were probably also results of this tectonic event, and in turn, enhanced the erodibility contributing to the increase of sedimentation rate in the studied region and over the world.