New recognition of NNE-strike belt of negative aeromagnetic anomaly in Tibetan plateau

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The aeromagnetic data (see Figure 1) used in this study came from the survey of scale 1:1000000 in mid-west Tibetan plateau conducted by the Center of Aerial Survey and Remote Sensing of the Land and Resources Department in 1998-2000 (Xiong et al. 2001). This study adopts the matched-filter technique to obtain regional anomaly fields (He et al., 2007; Figure 2). It have a good agreement with upward continuation (Xiong et al. 2001), which shows that there is a regional NNE-trending negative anomaly belt in the middle part of Tibetan plateau. Figure 2 indicates that the source depth responsible for generating this negative anomaly belt is greater than the average depth of Curie isothermal surface in Tibetan plateau (Alsdorf and Nelson 1999). Below the Curie surface, rock magnetism is mainly caused by inductive magnetization, which is related to the regional tectonic stress field. The regional tectonic stress field is in turn dictated by regional deep structures and tectonics.

Shapiro et al. (2004) studied the seismic waveform data crossing the mid-western part of Tibetan plateau and considered that there was a near-NS low-velocity zone from 20 km down to the lower crust of Tibet, where the VSH is about 8% lower than the standard velocity. The result from Teleseismic P-wave tomography shows that the front of the subducting Indian lithospheric mantle reaches northward to the middle of Qiangtang terrane(He et al. 2006, Zheng 2006). Combining with the result of deep seismic profiling east-westerly crossing this low-velocity zone (Teng et al. 1994, Zhang et al. 2001), the synthesis indicates that the Indian lithospheric mantle beneath the plateau is deformed to a “spoon” shape, and the regional NNE-trending negative anomaly in the middle of the plateau is rightly in the center of the spoon. Beneath the northern part of Qiangtang terrane in middle Tibetan plateau, there is a mantle-originated low-velocity body (Zheng 2006, Zhou and Murphy 2005), whose position coincides with the region of low Pn velocity and insufficient Sn propagation (McNamara et al. 1997), on its top is the region of widespread potash volcanic rocks in northern Tibet (Deng et al. 1996 Hacker et al. 2000, Chung et al. 2005). This indicates that the front of Indian lithospheric mantle is not sutured together with that of Eurasian plate, resulting in a low-velocity anomaly body originated from the mantle (Zheng

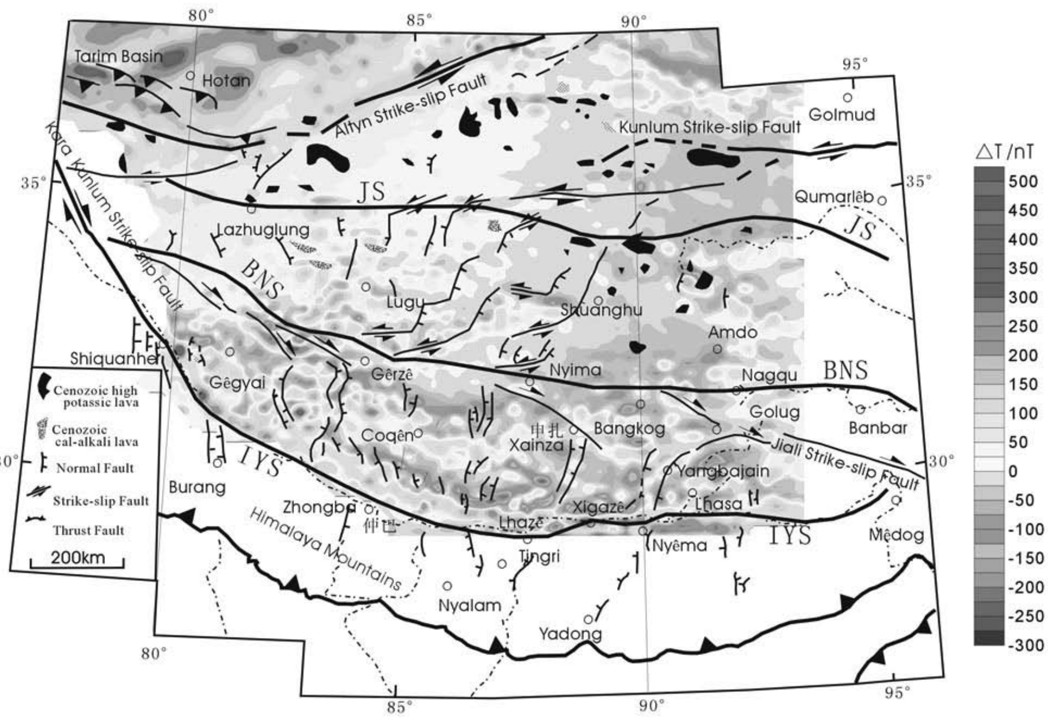

FIGURE 1. The map of aeromagnetic T anomaly reduced to the pole in mid-western Tibet Plateau. Tectonic base map from Yin et al. (2001). IYS: Indus-Yalung Zangbo Suture; BNS: Banggonghu-Nujiang Suture; JS: Jinshajiang Suture.

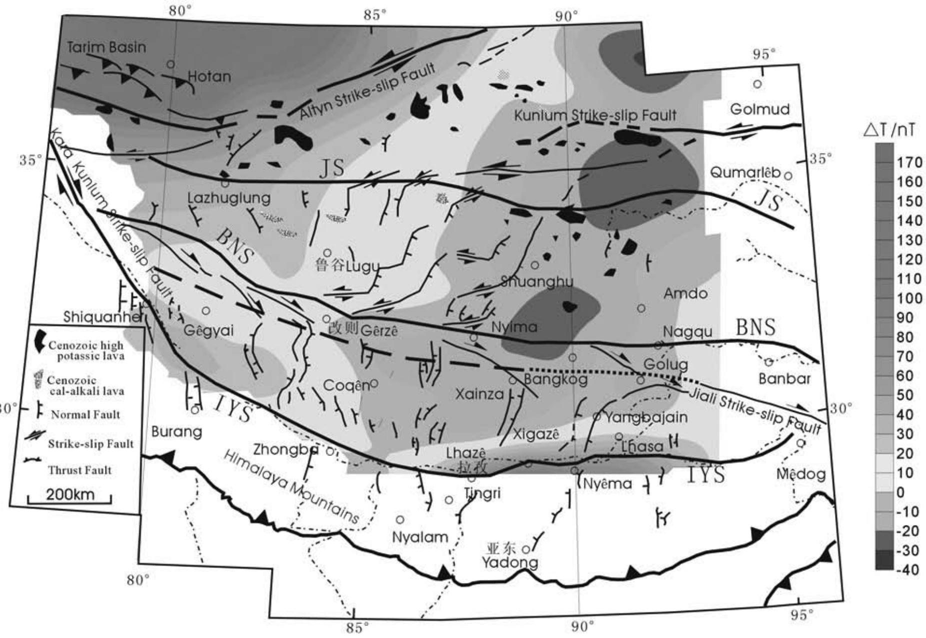

FIGURE 2. The regional magnetic anomaly field in mid-western Tibet Plateau (legends and tectonic basemap are the same as in Figure 1).

2006). The location of this low-velocity body is comparable to that of the NNE-trending negative aeromagnetic anomaly given in this paper. The anomalously hot material from deep mantle flows southward and upward along the NNE spoon-like Indian lithospheric mantle. This made the temperature of the primary lithosphere of midsouth Tibetan plateau on top of the spoon-like Indian lithospheric mantle to rise anomalously, resulting in an enclosed NNE-trending thermal anomaly zone, which caused thermal demagnetization of the magnetic minerals inside the lithosphere of middle Tibetan plateau. In this way the regional NNE-trending negative aeromagnetic anomaly belt was formed.

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