Provenance changes of the Cenozoic terrestrial sequence in the southwestern Tarim basin and its implication to tectonics of the source area

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The relationship between the stepwise uplift of Himalaya and Tibet caused by the collision between the Indian subcontinent and the Eurasia continent, and the evolution of the Asian monsoon during Cenozoic has been examined by many researchers (e.g., Tada et al, 2016). The Tarim basin is located at the northwestern side of the Tibetan plateau and climate models have demonstrated that the Tarim became one of the most arid areas in the Asia as the result of uplift if Tibet (Manabe and Broccoli, 1990). However, there are not so many geological evidences that indicate the connection between the tectonic uplift of Tibet and the desertification of Tarim. One reason is that it is difficult to obtain an accurate and high-resolution age model that allow to compare the timings of the tectonic uplift and the aridification. Recently, Zheng et al. (2016) constructed a highly reliable age model at the Aertashi section in the southwestern Tarim basin by combining the paleomagnetic data and the radiometric dating of the tephra layer.In this study, we measured the ESR (Electron Spin Resonance) signals of quartz in 64-500 μm fraction of the fluvial sediments at the Aertashi section to examine provenance shifts and reconstruct the tectonic uplift in the drainage area. The ESR signals are the indicator of the amount of lattice defects in quartz grains which depend on the total radiation dose and correlated to the age of the crystal formation (Toyoda and Ikeya, 1992), so it is commonly used for provenance studies (Toyoda and Naruse, 2002). First, we measured the grain size distribution of each sample and confirmed that the 64-500 μm fraction mainly consists of the particles transported by bed-loads and is rarely affected by eolian dusts. The result of the ESR signal measurement revealed that the ESR signal intensity is around 10 before ~32 Ma, then it increased to about 18 at ~32 Ma. It suddenly decreased to about 10 at ~22Ma and decreased again to about 2 around 16 Ma. These changes are consistent with Blayney et al. (2016) who studied the provenance change at the same section using the zircon age distribution in the sediments. As the next step, we planned to analyze a proxy for the aridification at the same section and compare it with the data obtained in this study to directly test the relationship between the uplift and the desertification.

Keywords: Tarim Basin, uplift, ESR

