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Estimation of sand's source and transport system in the Taklimakan desert by quart's ESR intensity and crystallinity

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Taklimakan desert in the Tarim basin in Western china is the second largest sand desert, which is surrounded by Tinshan Mountains, Karakorum Mountains and Kunlun Mountains. Because of this specific location and climate, this desert is one of the most eolian dust source areas in the Northern Hemisphere now (Zheng et al.,2003). Thus, it is important to know eolian dust's generation and transport system in the Tarim basin in order to appreciate the impact of Northern Hemisphere in the past, present and future. So we characterize the sand and estimate sand's provenance and transport system by using quart's Electron Spin Resonance (ESR) signal intensity and Crystallinity.

Quart's ESR intensity indicates the amount of oxygen vacancies in quart's mineral (Toyoda and Ikeya, 1991), and shows a clear positive correlation with the age of the host rock (Toyoda and Hattori, 2000). Crystallinity of quartz reflects the condition of its formation such as temperature and speed of crystallization, so crystallinity of quartz varies from its original rock's type (Murata and Norman, 1976). These barometers reflect quartz's chemistry and they are independent of each other. Now, we collected river and desert sand samples across the Taklimakan desert, and measured ESR signal intensity and crystallinity after dividing samples to fine fraction ($<$0.016mm) and course fraction($>$0.064mm). Why we divide two fractions is to watch the difference of wind transport and river transport.

From measurement of river samples, we could detect quartz's origins like Tinshan Mountains, Karakorum Mountains and Kunlun Mountains and also realized that these data can be used for estimation of quartz's provenance. Moreover, fine fraction quartz near Kunlun mountains are mixed with them derived from Tinshan mountains by wind transport. In this presentation, we add the data of desert sand, and show the distribution from all sand's provenances in the whole Taklimakan Desert. We also consider sand transport system for two fractions by focusing on transport ability of wind and river.

Keywords: desert, deposition, erosion, material transfer, ESR, Crystallinity