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中新世における中国西部の乾燥化：タリム盆地南西からの証拠

Aridification of western China during Miocene: evidence from southwestern margin of the Tarim Basin

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Desertification in the Asian interior is one of the most remarkable climate changes in the northern hemisphere during the Cenozoic, and increased number of studies have been conducted in the last decade. The Based on those studies, the onset of desertfication in the Central China seems to have been as early as 22 Ma (Guo et al., 2002). On the other hand, the evidence of desertification in the Tarim Basin can go back only to 5 Ma so far (e.g. Sun et al., 2008), although Sun et al. (2009) recently reported the evidence of local desert development at 7 Ma. Because the area is still poorly investigated especially for the sequences older than late Miocene, it is possible that the onset of desertification in the Tarim Basin can go further back before 5 or 7 Ma.

The studied sequence is located at Aertashi in the southwestern margin of the Tarim Basin, where thick shallow marine to terrestrial sequence of Oligocene to Pliocene is well-exposed (Yin et al., 2002). We try to distinguish the eorian dust contribution to fluvial materials derived from the western Kunlun Mountains to Aertashi section using ESR (Electron Spin Resonance) signal intensity and Crystallinity index of quartz in two size fractions (fine=0-16um, coarse=63um<) separated from sandstone. ESR is an analytical technique to estimate the amount of oxygen vacancy in quartz formed by natural radiation, whose amount shows positive correlation with the age of the host rock (Toyoda, 1992), whereas the Crystallinity Index [CI] of quartz has information on the physical condition of its formation (Murata and Norman, 1976). Therefore, these two parameters give us information on two different aspects of its host rock characteristics, one is the age and the other is the rock type, which help us to identify the provenance of quartz (Nagashima et al., 2007). We focused on quartz because quartz is a major component of eolian dust and resistant to chemical and physical weathering. The fine fraction may contain eolian grains transported long distance by wind whereas coarse fraction may contain eolian grains transported only short distance by saltation or bottom traction, in addition to the grains transported by river current. In our previous study, it is demonstrated that ESR and CI of quartz in fine and coarse fractions are similar in river sediments uncontaminated by eolian dust whereas these values are different between fine and coarse fractions of the river sediments when they are contaminated by eolian dust (Isozaki, 2009). It is also demonstrated that changes in ESR and CI of quartz in coarse fraction may reflect unroofing history in the drainage area (Tada et al., 2010 in press).

Our preliminary result revealed that ESR and CI values in the middle unit is different between the two fractions, suggesting eolian contribution, whereas the values in the two fractions are more or less the same in the lower and upper units. Because the age of the middle unit is late Miocene based on our tentative age model, the above result suggest the onset of aridfication of the Tarim Basin could have been late Miocene (probably about 8 Ma) or older.

Keywords: Tarim Basin, desertification, pleoclimate, ESR, eolian dust