# Asian dust source variability since 10 Ma based on grain size specific mineral composition at IODP Site U1425 in the Japan Sea

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*李 梅花[1]、Irino Tomohisa[1]
*Mui Fa Alison Lee[1], Tomohisa Irino[1]

1. Faculty of Environmental Earth Science, Hokkaido University
1. Faculty of Environmental Earth Science, Hokkaido University

Sediments at Integrated Ocean Drilling Program (IODP) Site U1425 in the Japan Sea is under the strong influence of westerly jet stream and winter monsoon wind which transporting a significant amount of aeolian dust from both Taklamakan deserts and Gobi deserts. Aeolian dust from Taklamakan showed very high content of quartz (60-90%) and less plagioclase (5-40%) than from NE Chinese deserts and Loess (Gobi). The lower value of half height width (FWHM) of illite peak in X-ray diffraction (XRD) profile can be used as an indicator higher illite crystallinity. A decreasing trend of illite FWHM (increasing trend of the crystalinity) towards the core of the fold and thrust anticline has been recognized (Robinson et al. 1990; Orozco et al. 1998). Illite is also predominant component of the Chinese loess, and its highly crystallized nature has been interpreted to indicate that the illite was not formed at surface temperature and may have originated from a low temperature metamorphic environment.

In order to reconstruct a long-term changes in dust sources and transport pathways of Asian dust utilizing knowledges above, we examined mineral composition of IODP Site U1425 located at the central Japan Sea. The sediment samples were separated into >4 $\mu$m (silt) and <4 $\mu$m (clay) fractions by repeated pipette method. Both fractions were used for powder XRD analysis and peak heights of diagnostic peaks of major minerals were regarded as relative abundance of the minerals. FWHM and chemical index of illite were also examined.

In general, a very high quartz content found at Site U1425 may indicate sediments are aeolian source from Taklamakan deserts and higher plagioclase (albite) may infer dust source from Gobi deserts. Intervals around 9.5 Ma, 8.3 Ma, 7.9 Ma and 4.5 Ma showed very high quartz content and less albite at Site U1425, which indicate increases in dust supplied from Taklamakan than Gobi deserts due to stronger westerly wind. During Pliocene to early Pleistocene (4.2-2Ma), Taklamakan dust is still dominant, however the increasing influence of Gobi dust is recognized at 4.1 and 3.4Ma. On the other hand, an abrupt increase of the ratio of albite to quartz from 0.2 at 4.5 Ma to 0.8 at 4.1 Ma is found, which also shows another maximum at 0.6 Ma. In general, increase of albite abundance in sediments at Site U1425 during Pleistocene indicates the increasing dust supplied from NE China and Gobi deserts and the strengthened winter monsoon.

FWHM (crystallinity) of illite in silt fraction at Site U1425 showed low values (high crystallinity) with narrow range around 0.2°2$\theta$ during Pleistocene. The illite chemistry index showed values below 0.4 and genrerally around 0.3 during Pleistocene, which represents (Fe, Mg)-rich illites (biotite) characterized for physically eroded or unweathered rocks. The highly crystallized and Fe–Mg rich illites in the silt fraction at Site U1425 in the Japan Sea suggests their aeolian origin which may be derived from pre-existing sediments which eroded from low-grade metamorphic rocks in the northern regions of the Tibetan

 

Plateau. In a longer time-scale, higher crystallinity and lower chemistry index of illite in silt fractions occurred in similar timing at 9.3 Ma and 6.6-2.7 Ma which could be correlated with the active regional uplift and tectonic activities of the northeastern margin of the Tibetan Plateau. Possible changes in source of illite indicates frequent plate tectonic activities near the Taklamakan deserts of North Tibet plateau especially from 6.6-2.7Ma.

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