

日本列島降下物中の石英のESR信号と結晶化度の年変化 Temporal change of the sources of Aeolian dust delivered to East Asia revealed by ESR signal and Crystallinity Index

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Change of atmospheric circulation system in the past is an important issue for studies of paleoclimate. Aeolian dust, fine particle suspended in air and brought by wind, is a clue to know the wind direction and the strength in the past. Historical record of aeolian dust accumulation in Japan will give important information on this issue as well as on the climate change in the arid source regions in China. Various features, such as grain size distribution, mineral compositions, and isotope compositions, have been investigated for loess sequence for this purpose. In the present study, we would like to propose that ESR signals in quartz are other good proxies as well.

We observe the signals of the E_1' center, an unpaired electron trapped at an oxygen vacancy. It was shown previously that, by measuring the number of oxygen vacancies, as evaluated as the heat treated the E_1' center, in loess sequence, the aeolian dust source in Holocene was different from that in LGM (Toyoda and Naruse, 2002). Later, the crystallinity index was found to be another proxy for such studies. Temporal change of the origins of the eolian dust accumulated in the Sea of Japan was found to be correlated with the climate change by using crystallinity index and the number of oxygen vacancies (Nagashima et al., 2007).

The samples of monthly atmospheric deposition (total deposition = wet + dry) were collected for a month in a 0.5 m² plastic open surface collector installed in the observation field of the meteoritic observatories at Fukuoka and at Akita for one month. The collected samples in the container were heated to evaporate out the water. Meteorological Research Institute offered the atmospheric depositions collected in March and in June in 1964 to 2000 for the present study. Samples of fine grain river sediment were also collected at Fukuoka and at Akita

The temporal changes in the number of oxygen vacancies in quartz of atmospheric depositions collected at Akita and at Fukuoka were investigated. The temporal change of the number in the sample collected at Fukuoka in March is correlated with the total Kosa days, while no correlation was found in Akita but gradual decrease with age. The number of oxygen vacancies in quartz in the atmospheric deposition might be an indicator to estimate quantitatively the contribution of the dust originated from Chinese to the atmospheric deposition. The difference between Fukuoka and Akita would imply possible difference in mode of transportation of the dust to these two cities.

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