Seasonal variation of Sr isotope ratios of the eolian dust in rainwater

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Mineralogical and strontium isotopic compositions and amounts of eolian dust contained in rainwater in Japan may reflect the variation of air circulation above the Asian continent and the transportation rate of eolian dust to the Pacific Ocean. Accordingly we have made observation of dust contained in rainwater collected at the peak of Mt. Sefuri (1000 m) in North Kyushu, Japan, from 1998 to the present to see their seasonal and yearly variations. The collection bottles are set near the Sefuri weather-radar station. In usual cases, the analysis of the rainwater collected in the bottles is made every month.

The rainwater contains eolian silicate dust and organic dark material several times of the silicates. In summer time the organic material may comprise mainly of pollens derived from vegetation in Kyushu, however, it seems mostly to be transported with the eolian dust from China in other seasons.

Minerals in dust samples are quartz, plagioclase, K-feldspar, biotite, muscovite, chlorite, amphibole, talc, pyroxene, and clay minerals. They are mostly free from carbonate. In spring, dust contains much muscovite. In summer, minerals are generally fine grained and contain much clay minerals.

Seasonal and yearly variations in 87Sr/86Sr ratio, Rb/Sr ratio and in monthly amount of the silicate dust show the same mode of variation pattern with the peak at around April and the valley at around August. The yearly variation of monthly days of Kosa observation has also the peak in a period from March to April.

Distribution of dust sample on the 87Sr/86Sr vs. Rb/Sr diagram suggests varied contribution of three endmembers, two of which are those of the dust from China and have the highest 87Sr/86Sr ratio over 0.718 and the lowest 87Sr/86Sr ratio at about 0.710. The third is volcanic ash from Sakurasima volcano.

Contribution of the ash becomes significant in summer, because the observation site lies on the downwind of prevailing SE winds above the volcano in summer and because the monthly amounts of the dust from China components become least during summer. Dust samples with the least ash contribution, eolian deep sea sediments, loess in China and varied deposits in arid lands in NW China have almost the same slop on the 87Sr/86Sr vs. Rb/Sr diagram, corresponding to apparent ages of 200 to 300 Ma.