

Variation of Asian dust during Holocene based on the mineral composition of peat sequence in Mt. Daisetsuzan area, northern Japan

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Asian dust transported to the northern Japan may have a different source from those transported to the southwestern Japan. In spite of this, many of previous dust studies for Asian dust deposition in Japan have been conducted for the paleo-archives collected from the southern area. On the other hand, the Mt. Daisetsuzan area located just below the northern route of Asian dust transport receives a significant amount of dust in spring time, which dies snow surface brown, and the geology mainly consists of volcanic materials. This area is also characterized by well-developed high moors on the mountains covering the last 4000 - 7500 yrs, which would continuously record the history of climate change during the middle to late Holocene. Peat collected from these high moor could be also a suitable material for a precise age determination using the radio carbon, and its inorganic fraction might consist of aeolian dust of continental origin and volcanic materials of the local origin which could be easily distinguished from each other.

In order to reconstruct the Holocene variability of Asian dust deposition in the northern Japan, we collected peat cores from the high moor in the Mt. Daisetsuzan area, and measured the mineral composition contained in peat. After heat treatment of peat samples, we conducted X-ray diffraction (XRD) analysis on the ash fraction and semi-quantified the minerals. Quartz, illite, and chlorite showed positive correlation among others, while various feldspars showed another positive correlation among others independent from quartz. Amorphous materials exhibited a variability different from quartz or feldspars. High ash content was associated with high feldspars or amorphous. Comparing these mineral compositions with those of aeolian dust deposited in this area and the local riverbed materials, we judged that the inorganic fraction could be explained by mixtures of aeolian dust and two kinds (crystalline and amorphous) of local volcanic materials.

The average Asian dust content in the peat was estimated 89.7 mg/g dry peat, using ash contents and contribution of aeolian dust endmember calculated from XRD analysis. Assuming the bottom of peat sequence was 7500 yrs BP (Takahashi and Igarashi, 1985) and the dry bulk density of peat was 0.1 g/cm³, the average Asian dust flux to the site was calculated as 0.14 mg/cm²/yr, which was consistent with known values (0.2 - 4.5 mg/cm²/yr) from previous studies around Japan. Temporal variation of the reconstructed dust flux generally showed an anti-phase relationship with the dust flux reconstructed in the Jeju Island (Li and Matsumoto, 2007). This might be due to the change in the meandering pattern of the westerly jet which promoted an alternation of the main dust transport pathway between northern and southern routes.

Keywords: aeolian dust, peat, Holocene, Mt. Daisetsuzan