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Characterization of Aeolian Dust, Sediment, with SEM-EDS Automated Particle Analysis

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SEM-EDS automated particle analysis, which is the automated particle analysis combined with a scanning electron microscope (SEM) with energy dispersive X-ray spectroscopy (EDS), is a very powerful method to characterize particle mixtures of several different substances. With this method, we can analyze a large number of particles, more than 10,000 particles one by one, directly. The analyzed data, the shape and size as well as the composition of each individual particle, are stored for the characterization of the mixtures and classified into about some groups with similar composition, same minerals, and so on automatically. We have successfully applied this method to the characterization of a few rocks and sediments by using this method [1], [2] and [3]. Detailed analysis of rocks and sediments would give important information on mountain uplift, river contention and erosion process. In this study, we extend our efforts to aeolian dusts and sediments, for example Beijing Urban Aerosols and Gobi Kosa Dust. They were purchased from National Institute of Environmental Studies (NIES), which distributes them as environmental certified reference materials. Classification was made of their composing particles. Furthermore, statistically averaged concentrations of elements obtained in the present study were compared with those listed in the NIES document. For example, in Beijing Urban Aerosols, we analyzed 30,000 particles and classified by their composition. The average of the particles size is 6 μm and the distribution of the particle size is 1- 40 μm. These particles contained quartz, feldspar, gypsum, calcite and other material. In addition, a lot of hydro sulfates and sulfides were detected with clay minerals. In the presentation, we will show more detailed descriptions of the correlation between Beijing Urban Aerosols and Gobi Kosa Dust, and other sediment analysis results.

[1] H. Muto, A. Shimada, 2014, SEM-EDS Automated Particle Analysis of Mineral Compositions of Rocks, the Japan Geoscience Union Meeting 2014.

[2] H. Muto, A. Shimada, 2014, Characteristics of Granitic Rocks around Lake Biwa with SEM-EDS Automated Particle Analysis and ESR Signals, the 2014 annual meeting of Japan Association Mineralogical Sciences.

[3] H. Muto, A. Shimada, 2014, SEM-EDS Automated Particle Analysis of Mineral Compositions of River Sand, the annual academic conference of the Japan Society of Microscopy 2014.

Keywords: Sediment, Aerosol, SEM, EDS, Particle analysis