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水月湖の堆積物はダスト沈積フラックスの経年変動を記録しているか？
Is Lake Suigetsu sediment recording annual-scale dust flux changes?

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The depositional flux record of Asian dust during the late Holocene provides key to understand the role of Asian dust in meteorological effects and bio-geochemical cycles. Sea of Japan sediment was typically studies for this purpose. However, dust flux changes with millennial and shorter time-scales was not possible to detect due to the relatively large uncertainties in the depositional rates of the marine sediments.

Lake Suigetsu in Central Japan is known for the annually-laminated sediments which cover at least last 70 kyr. Recently, accurate age model is established for SG06 core based on varve counting and more than 800 radiocarbon dates (e.g., Ramsey et al., 2012; Staff et al., 2013). Lake Suigetsu sediments are expected to contain dust particles from continental Asia, however the dust particles in the sediment matrix are not easy to identify and analyse quantitatively as they are diluted with the detrital materials supplied from surrounding slopes of the lake and from the catchment areas of Hasu River, the water of which drains to the Lake Mikata which in turn is connected to the Lake Suigetsu by a shallow sill. We therefore developed a method to identify Asian dust within lake sediments and apply the method to the near-surface samples of Lake Suigetsu to reconstruct dust flux changes during the last 100 years.

We focus on three mineralogical parameters, the crystallinity of quartz, plagioclase-quartz ratio, and plagioclase type (albite vs. anorthite). These mineralogical parameters were determined for fine-silt sized Asian dust collected at Japan and detrital materials collected at nine sites near lake Suigetsu and from the drainage areas of Hasu River. Compared to the detrital materials from local sites, Asian dust is characterized by the lower crystallinity of quartz, moderate plagioclase-quartz ratio, and anorthite rich plagioclase type. The recognised differences were then applied to the lake Suigetsu sediments to diagnose air-born dusts from continental Asia. The estimated dust flux changes show gradual decrease from the middle of the 1960s to the end of the 1990s, which is well correlated with the decreasing trend of the dust emission frequency at dust source areas (Gong et al., 2007). Furthermore, the dust flux shows annual to decadal-scale changes. We will check whether the estimated flux changes are consistent to the observational records and model simulation results, and further discuss the nature and mechanisms of the Asian dust flux changes.

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