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A new lake bottom surface sediment collection method: mini ice finger method

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It is well known that natural archives of past environments, such as lake sediments, offer a valuable resource for examining the nature of the interactions between Man and the environment. In particular, annually lake laminated (varved) sediments has the good advantage for paleoclimate study. We can establish accurate chronology by counting lamina sets (varves) as well as clarify paleoenvironment with annual resolution by geochemical and paleontological analyzing of each one year samples. Also from the point view of transfer-function study and quantitative paleoclimate study, it is very important to compare various proxy data from the sediments with observational (meteorological) data over the past century. However, regardless of such our demands as mentioned above, there are a few paleoclimatic reports about lake bottom surface sediments links to modern depositional situation. Most significant problem is that the lake bottom surface sediments have generally much of high water contents, and it is quite difficult to keep sediment for instance when cutting and slicing, after picking core samples up by several kinds of corer or diver due to deformation under those own weight. Thus, it is needed for such research to take sediment completely undisturbed and no any changing and modification such as deformation under those own weight.

To solve this, we hatch out a new lake bottom surface sediment collection method named as mini ice finger method (Saarinen and Wenho, 2005). In this method, sediments are frozen rapidity by powdered dry ice (frozen carbon oxide) with inserting thin pipe into the sediment after taking bottom surface sediments by upper-opened gravity core sampler. Generally, it takes within a half hour to take one frozen sample. Maximum length of sample is 50 cm (Now, we have been testing longer sampling). The method is very convenience and efficient to do without heavy equipment. Only two workers are needed to do everything on a boat. After the field, frozen samples are delivered to the Laboratory, directly. Firstly, we can check sedimentological observation and perform image analysis from cross section surface by a plane. After that, frozen samples were cut to slab samples and done to freeze-dry treatment to use different kinds of analysis as radioactive measurement, geochemical and paleontological research very easily.

In Japan, it is reported that some lakes as Lake Suigetsu, Lake Fukami and Lake Ogawara have the potential to deposit varved sediments up to present, however nobody reports accurate modern deposition of varve. Our preliminary investigation in those lakes indicates that modern varve formation from the sediment-water interface in all lakes was observed without any disturbance during sediment sampling and sub-sampling.

For paleoclimatologist, it is very useful to use our method and only way to reconstruct paleoclimate links to present.