Dependence of ^{14}C ages on carbon fraction and reservoir effect for archeological materials

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In 1996/97, we installed a ^{14}C-AMS system (model 4130-AMS) manufactured by HVEE, The Netherlands. The system provides us highly precious and accurate ^{14}C concentrations as well as $\delta^{13}C$ values for the graphite targets (1.5mgC) prepared from standards and samples.

We have measured ^{14}C ages for seven sets of wood, animal bone, and shell fossil samples, collected from each of the seven layers of the shell mound, at the Awazu submarine archeological site located in the southern basin of Lake Biwa, Shiga, Central Japan. The ^{14}C dates for each of the three kinds of samples did not show any big difference among the seven layers. However, ^{14}C dates were systematically different dependent on the sample type. The shell fossil samples showed the oldest dates from 4800 to 5080 yr BP, the wood samples provided the middle dates (4570-4760 yr BP), while the bone fragment samples provided the youngest ones (4090-4430 yr BP).

Shell carbonate originates from dissolved inorganic carbon in the lake water, which carbon was derived partly from the dissociation of old organic materials in the lake sediment, and possibly including dead carbon from limestone rock surrounding Lake Biwa. Thus the shell carbonate samples can be older than the formation age of the shell mound. In addition, younger ^{14}C dates for collagen separated from bone samples indicate that younger carbon may have contaminated the bone samples when they were in the sediment, and may not have been removed completely during chemical preparation of collagen. To obtain a carbon fraction without any possible contamination, amino acids, that were more essential to bones, have been extracted. The amino acid fractions of the bone samples tend to show older ^{14}C ages than the corresponding collagen, which are almost consistent with the ^{14}C ages of wood materials from the same layers.

This experiment suggests that to obtain accurate dates of archeological events by ^{14}C dating, we must carefully select archeological materials for ^{14}C measurements that are not only related exactly to the events, but also well preserved in a closed system of carbon. The particular carbon reservoir, in which the sample materials were produced, should be mixed well with the atmospheric carbon reservoir. Temporal and spatial variations of ^{14}C concentration in the reservoir should be also known in comparison with those of the atmospheric reservoir.

Estimation of construction effect on PM2.5 consentration.

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The continuous measurement of PM2.5 concentration was carried out outside the construction site of Kashiwa campus of Tokyo University to estimate the PM2.5 concentration emitted by construction activity which has not been researched as the source of air pollution before. For this purpose,PM2.5 concentration was monitored with two β-gages (BAM1020Shibata_Co.), which were placed in the direction, SW (A) and NNE (B) from the construction site. Wind speed and direction were also measured near the measurement point.

By analysing these data with the plume model, we estimated the PM2.5 emission rate of the construction activity as about 0.02g/sec, which is comparable to estimated values from the number of the heavy vehicles used at the construction site. The effect was not so serious as we expected ,but this result indicated that the small amount of PM2.5 concentration from minor source can be detected by two β- gages placed in the proper wind position

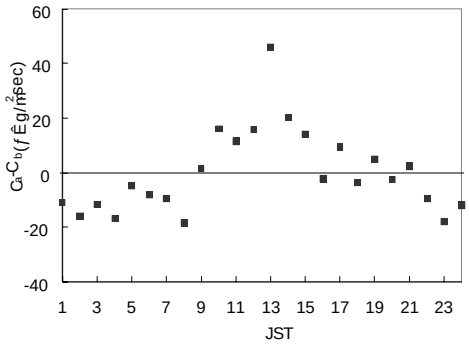

Fig.1 The diurnal variation of the PM2.5 concentration difference between BAM1020 A and BAM1020 B.