Radiocarbon and ^{13}C variations during the last 300 years in lacustrine sediments of Lake Biwa, central Japan

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Lacustrine sediment cores collected from the northern and southern basins in Lake Biwa were measured for carbon content, $\delta^{13}C$ and $\Delta^{14}C$. Acid-alkali-insoluble fraction (residue) and acid-soluble fraction obtained by acid-alkali-acid treatment of the sediments were analyzed. The sedimentation rates of the northern basin sediment (KAN) and the southern basin sediment (KAS) were estimated to be ca. 0.13 cm/y and ca. 0.50 cm/y, respectively, by the ^{210}Pb or ^{137}Cs method. Carbon content of KAN is very high at the upper layer than 5cm depth and that of KAS has a highest peak at 19cm depth. $\delta^{13}C$ of KAN is the highest at 3cm depth layer and that of KAS is the highest at 20cm depth. The highest peaks, both corresponded to ca. 1960 A.D., might be due to nourishing in Lake Biwa. $\delta^{13}C$ and $\Delta^{14}C$ of residue are higher than those of acid-soluble fraction, indicating that ^{13}C and ^{14}C might be relatively gathered in fulvic acid.

$\Delta^{14}C$ suddenly increases from 1950 A.D. to 1985 A.D. in the vertical distribution of KAN residue (Fig. 1). This high $\Delta^{14}C$ is due to contribution of artificial ^{14}C produced in atmosphere by nuclear tests after 1950 A.D. with maximum peak of 1964 A.D. $\Delta^{14}C$ of KAS residue has a wide peak between about 1920 A.D. and 1980 A.D. This suggests the sediment in the southern basin could be a little disturbed. The ^{14}C of KAN at the lower layer than 20cm, which might have no artificial ^{14}C produced by atmospheric nuclear tests, shows ca. 4000 BP, older than the age obtained from ^{210}Pb or ^{137}Cs, and the true sedimentation age is difficult to be decided from ^{14}C data of the bottom-surface sediments in this study.

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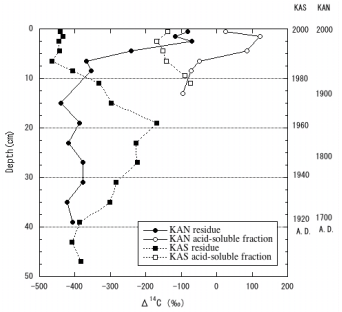
Figure 1: $\Delta^{14}C$ vertical distributions of Lake Biwa sediments.



Equilibrium iron isotope fractionation factors for magnetite from Mössbauer spectroscopy and inelastic nuclear resonant X-ray scattering data

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Mössbauer spectroscopy and inelastic nuclear resonant X-ray scattering (INRXS) in synchrotron radiation experiments are two independent experimental techniques for detemination of equilibrium iron isotope fractionation factors (β-factors). The iron β-factor for magnetite evaluated from our Mössbauer studies of two natural samples is presented on Fig. 1 along with the β-factor computed using the INRXS-derived partial density of states (Seto *et al*., 2003). The Mössbauer temperature is 494 ± 15 K for the A (Fe^{3+}) site and 429± 20 K for the B (Fe^{2+}+ Fe^{3+}) site.

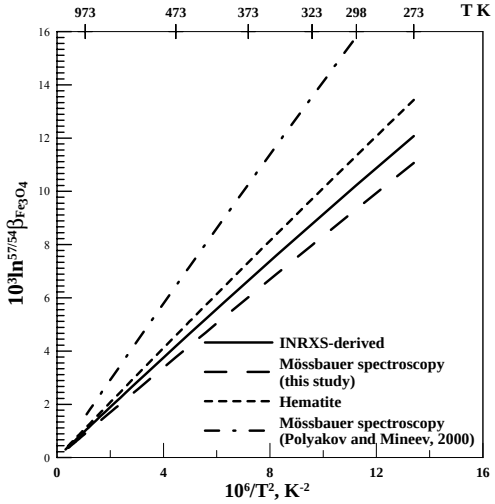

Figure 1. Temperature dependence of the Fe β-factors for magnetite (different evaluations).

Seto *et al*. (2003) used oxidized magnetite (A and B sites ratio is 1.3:1.0) instead of stoichiometric (A/B=1:1) magnetite used in our Mössbauer study. This may explain the slight difference between INRXS- and present Mössbauer-derived β-factors (Fig. 1). New Fe β-factors for magnetite are in agreement with isotope fractionations observed in natural and laboratory conditions and obey the general correlation between the β-factor and the potential energy of the Fe-occupied site, unlike β-factors previously computed by Polyakov and Mineev (2000) using Mössbauer data by Persoons *et al*. (1993).