Relationship between the carbon isotope ratios of Sphagnum from bog cores band the past atomospheric CO2 concentration

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[Introduction]

White et al.,(1994) presented an idea of estimating the atmospheric carbon dioxide concentration based on the carbon isotope ratio of the peat moss indirectly. The atmospheric carbon dioxide concentration of the past 10,000 years has been studied almost exclusive by analyzing of ice cores (Indermuehle et al., 1999). The report values of the atmospheric carbon dioxide concentration for the past 10,000 years are not in a good agreement.

The main organic components of peat mosses are subdivided into lignin-like and cellulose-like components. The decay rate of cellulose is greater than with that of lignin (Waksman and Stevens., 1928) and the abundance of the two components varies with depth. Furthermore, the carbon isotope ratios in the two components are different systematically from each other (Akagi et al., 2004). So it is necessary to isolate one of the components from the other.

We sampled the five peat cores (Argentina, Ozegahara, Northern Ireland, Poland, Sweden) in total from the northern as well as the southern hemispheres. Here we report the results of Northern Ireland, Argentina peat cores and discussed the reason for the changes of the stable carbon isotope ratio.

[Methods]

Peat core samples were cut into 2-5cm sections and dried. Moss tissues were carefully separated using tweezers. Oil and fat components were removed from the sample with a mixture of benzene and ethanol. The lignin-like and cellulose-like components were separately extracted and weighed. The carbon isotope ratios of the fat-removed samples, lignin-like and cellulose-like components were measured with AE-IRMS. ^{14}C ages were determined with AMS.

[Results]

The proportions of the lignin-like components increased with depth, while that of the cellulose-like components decreased. It is due to different decay rates of both the components. The overall variation of the carbon isotope ratio of both the cores showed increasing trends with time, which are similar to that observed in the preceding study of the Ozegahara peat core. In addition, a systematic difference in the carbon isotope ratio was observed between the fat-removed samples and the lignin components. As a main factor to explain the similar trends of the different cores, the concentration of the atmospheric carbon dioxide may be considered. One may be able to reconstruct the concentration of the carbon dioxide in the past atmosphere by measuring the carbon isotope ratio of the Sphagnum.

[References]

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