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樹木年輪中 14C 濃度にみられる突発イベント
Rapid events in the carbon-14 content of tree-ring

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Measurement of cosmogenic nuclides, which are radioisotopes produced by cosmic rays, can provide us important information to search past extraterrestrial high-energy events such as supernova, solar proton event (SPE), and so on. Until now, the contents of ^{14}C in tree-rings and ^{10}Be in ice cores have been used for this purpose. However, no clear evidence has been found by ^{14}C and ^{10}Be.

We show the results of ^{14}C content measurement in Japanese cedar annual rings from AD 600 to 1020 with 1- to 2-year resolution, and report two findings of rapid increases of ^{14}C content from AD 774 to 775 and AD 992 to 993. These are clear increases against its measurement errors. The shapes of the two series are very similar, i.e., a rapid increase within one year followed by a decay due to the carbon cycle. The scale of the AD 993 event is 0.6 times as large as the AD 775 event.

The 10Be flux in the Antarctic ice core also shows peaks corresponding to these two ^{14}C events. The proportions of flux increase (^{14}C/^{10}Be) of the two events are consistent with each other. Therefore, it is highly possible that these events have the same origin.

Although the cause of this event can be explained by a large solar proton event (SPE) or a short gamma-ray burst, we conclude that solar activity is a plausible cause because the occurrence rate of ^{14}C increase events is inconsistent with a observed rate of an short gamma-ray bursts.