Water content of lithospheres deduced from xenoliths: The example of Kerguelen Islands and South African craton

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The formation of the Kerguelen crust since 110 Ma, through magma underplating, may represent a good analogue for continental growth in oceanic environment like it was during the Archean period. The study of water content of granulite xenoliths representative of Kerguelen deep crust and related mantle xenoliths offers the opportunity to: 1) evaluate the distribution of water along the Kerguelen lithosphere; 2) compare it to the content of the older lithosphere like for instance the South African cratonic lithosphere.

We measured water content from 10 granulite xenoliths and 5 mantle xenoliths from alkali basaltic lavas erupted on Kerguelen Islands on the Northern part of the Kerguelen plateau. The xenoliths are composed of two-pyroxenes granulites with spinel or garnet [1]. The analysis of water dissolved as H-related point defects in the main anhydrous phases was done by micro-FTIR with a spot size of 50 microns, a spectral resolution of 4 cm^{-1} and with unpolarized beam following the procedure proposed by Kovacs *et al*. [2]. The water contents of pyroxenes from the granulite xenoliths (up to 180 and 330 ppm H_2O for orthopyroxenes and clinopyroxenes respectively) are significantly higher than those from the mantle xenoliths.

The Kerguelen xenoliths are less hydrous than the ones from the Kaapvaal Craton [3] suggesting that the mantle source at the origin of their formation is less hydrous than the ones at the origin of the older deep crust formed beneath South Africa or the North Chinese cratons [4].

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Studies on annual variation of $^{14}C/^{12}C$ ratios in plant samples by AMS

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Carbon-14 ($T_{1/2}$; 5730yr) is one od the most impotant radionuclides produced by the reaction of cosmic ray with nitrogen in the upper atmosphere. Therefore, $^{14}C/^{12}C$ ratios in plant materials should provide information on the past atmospheric ^{14}C levels which might be related to the variation of solar activities. The ^{14}C levels in the atmosphere are also affected by the anthropogenic sources such as nuclear weapons testing and accident of nuclear facilities. In this study, we have determined $^{14}C/^{12}C$ ratios by AMS in three different plant materials, i.e. tree rings of Japanese Yaku-ceder, Japanese rice grains and tree rings of pine from Chernobyl area, for assessing the variation of atmospheric ^{14}C.

In order to know the natural variation of ^{14}C, we used tree rings of old Yaku-ceder (1139 year-old) and focused on a period between 1000-1100 A.D. As a result, we found a peak around 1050 A.D. This suggests that the solar activity was weak in this period.

Results obtained for rice grain samples (1950-2009 A.D.) showed that there was the highest peak around 1963 due to nuclear weapons testing and the values decreased gradually. Residence time of the produced ^{14}C was calculated to be about 11 years.

Tree rings of pine collected from the vicinity of Chernobyl NPP was used to assess the release of ^{14}C at the accident, which occurred in late April 1986. A peak of $^{14}C/^{12}C$ ratio clearly observed in the tree ring of 1986. However, the ratio varied widely within the tree ring. This heterogeneous distribution should be due to the short time releases (about 10 days) of ^{14}C during the accident. To examine this, we have separated early and rate wood and found that the early wood contained markedly high ^{14}C and the late wood contained low ^{14}C compared to whole ring of the same year .