Artificial radionuclides recorded in lacustrine sediments in Bosten and Qinghai Lakes, NW China

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Establishing accurate historical records of the distribution, inventory and source of artificial radionuclides in the environment are important for environmental monitoring and radiological health protection due to its high toxicity, and useful for identification and risk assessment of possible future environmental inputs of radionuclides from nuclear weapons test and from the accidental release from the nuclear fuel reprocessing process and the power plant reactor. It has been known that the $^{239}Pu/^{240}Pu$ atom ratio is a good indicator to identify the source of Pu because this isotope ratio is characteristic for various Pu sources. On the other hand, accurate dating of lake sediments is important for many studies, such as the reconstruction of pollution history of organic pollutants and heavy metals, historical variation of biological productivity and carbon preservation, and early diagenetic processes in the sediments. Taking into account the long half-lives of Pu isotopes this technique established could be a useful tool for next researchers to study the history of anthropogenic pollutants in the environment.

We applied a sector-field ICP-MS to study the recent sedimentation in ca. 10 lakes in China via measurements of both Pu and U isotopes, besides the conventional radiometric determination of ^{210}Pb and ^{137}Cs. In this work, we report the results of Lake Bosten and Qinghai in the Northwestern China. The Pu activity profile obtained with SF-ICP-MS was in agreement with a γ spectrometric ^{137}Cs profile, indicating that the ^{137}Cs and Pu activities convey essentially the same information about sedimentation processes in the investigated lakes. Based on the isotopic compositions of Pu and U isotopes, the sources of artificial radionuclides and the potential application of Pu isotopes for sediment dating will be discussed.

The Re-Os systematics of the Bixiling eclogites, Dabieshan, central China

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The Bixiling ultrahigh pressure (UHP) mafic massif, located in the North Dabie high-T/UHP granulite-facies zone, Dabieshan, central China, is one of the largest and most extensively studied outcrops of eclogite-facies rocks in the world [1]. This massif was involved in Triassic subduction and subsequent exhumation of the Yangtze craton beneath the North China craton, as is well recorded by garnet-omphacite Sm-Nd isochrones [2]. However, the ages of possible older metamorphic events and of protolith formation are still debated, which adds uncertainty to the geodynamic models of the Dabie-Sulu orogenic belt.

Here we present preliminary Re-Os results of 15 eclogites and 2 granite gneisses collected near the eastern edge of the Bixiling massif (N:30º43', E:116º17'). Os and Re were extracted using Carius tube digestion + bromine extraction + micro-distillation/anion exchange techniques and analyzed by NTIMS (Os) or by ICPMS (Re). Non-radiogenic Os concentrations are extremely low (<1 pg/g) in all eclogites except DB42 (386 pg/g). This is consistent with the formation of the massif by fractional crystallization of a roughly cogenetic magma in a crustal intrusion. DB42 is thought to represent a basal norite cumulate, which stripped Os from the overlying magma as it formed. Re concentrations vary from 51 pg/g to 2835 pg/g. With the exception of a ratio of 0.1565 for DB42, $^{187}Os/^{188}Os$ ratios vary from 8 to 390. These high ratios are mainly due to the very low non-radiogenic Os contents. Except for one sample (BXL-3, with 2835 pg/g Re), all Re-Os data yield unreasonably old T_{MA} ages, implying significant Re loss, most likely during subduction-exhumation. If a 750 Ma protolith age is assumed, 20%-60% Re loss is calculated, which is similar to that inferred for subduction of oceanic crust [3,4]. On the other hand, Sm-Nd results from garnets suggest that the Bixiling protolith formed less than 300 Ma before subdution [2]. Our Re-Os results are consistent with only the oldest limit of this estimate; younger ages would require a protolith with an unreasonably high Re concentration.. Analysis of mineral separates prepared from BXL-3 indicates that garnet and omphacite host only a small fraction of the total Re in this sample. An additional phase (sulfide?) is required to explain the missing Re.

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