Marine dispersion of 236U in Danish Straits

Qiao, Jixin; Steier, Peter ; Nielsen, Sven Poul; Hou, Xiaolin; Roos, Per; Golser, Robin

Published in:
9th International Conference on Nuclear and Radiochemistry - NRC9

Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

Marine dispersion of ^{236}U in Danish Straits

Jixin Qiao,[a] Peter Steier [b], Sven Nielsen,[a] Xiaolin Hou,[a] Rer Roos,[a] Robin Golser [b]

[a] *Center for Nuclear Technologies, Technical University of Denmark, DTU Risø Campus, Roskilde, Denmark*
[b] *VERA Laboratory, Faculty of Physics – Isotope Research, University of Vienna, Vienna, Austria*

In recent years, the potential of ^{236}U as an oceanographic tracer has been promisingly recognized. However, the distribution of anthropogenic ^{236}U in the marine system is not well assessed yet. Danish straits are the connecting area between the North Sea and the Baltic Sea, which provides geographic advantages to study the mixing behaviour of uranium along these two water systems exchange process and the dispersion pattern of ^{236}U in North-Baltic Sea. In the present work, both surface and bottom seawaters collected along the Danish straits were analysed for ^{236}U (as well as ^{238}U and ^{137}Cs) to investigate the distribution characteristics of ^{236}U, thus to better understand the uranium mixing behaviour, source term and transfer of ^{236}U in North-Baltic Sea. Our results indicate that ^{236}U concentrations in both surface and bottom seawaters from Danish straits are distributed within a relatively narrow gradients of, and somewhat independent on the variation of salinity. $^{236}U/^{238}U$ atomic ratios vary in the range of (5-35) $\times 10^{-9}$, being > 4 times higher than the estimated global fallout value (1×10^{-9}), with a notable increase trend from northwest Jutland and Zealand (North Sea area) to southeast Zealand (Baltic Sea area). The positive linear correlation between ^{238}U concentration and salinity confirms the conservative mixing character of uranium during the exchange process between the North Sea and the Baltic Sea water. Comparable results obtained in this work to the literature values regarding both ^{236}U concentrations and $^{236}U/^{238}U$ atomic ratios for seawaters from the North Sea area demonstrate the Sellafield and La Hague nuclear processing plants related ^{236}U source term in Danish straits. The unexpected high $^{236}U/^{238}U$ ratios and ^{236}U concentrations in the Baltic Sea area observed in this work might be a clue indicating another potential ^{236}U input originated from the Baltic Sea. Nevertheless, comprehensive investigation in the Baltic Sea and its surrounding environment are needed to clearly identify the ^{236}U source term in the Baltic Sea.