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129I records of nuclear activities in the East China Sea inner shelf

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Abstract:
Anthropogenic 129I on surface environment mainly originates from three sources, including nuclear weapon tests, nuclear fuel reprocessing plants, nuclear accidents, with different pathway. This leads to 129I deposition history recorded in sediment is not the same in different regions. Due to its long half-life and high conservative feature in the ocean, 129I has been used as an effective environmental and oceanographic tracer. Due to the same production ways and properties with the short-lived and high radiation hazard 131I, 129I also can be applied to evaluate the radioactive influence of early nuclear activities [1,2,3].
With the rapidly increased numbers of nuclear power plants constructed along the China coast, the environmental radioactive impact in East coastal area of China has raised high concern. The impact of other nuclear activities such as the nuclear weapons tests Lop Nor, Fukushima accident and nuclear reprocessing plants are also concerned. To elucidate these issues, we analyzed two sediment cores collected in East China Sea, covering the periods of 1959-2011 and 1960-2011, respectively, to obtain a temporal fallout of 129I in this region.
The results show that 127I concentrations range 5.0-42.5 μg/g, 129I concentrations 0.05-1.2×107 atoms/g, and the 129I/127I ratios were 15.0-66.0×10-12. The 129I level are similar to that obtained in the similar latitudes elsewhere. Significantly enhanced 129I level than pre-nuclear (1.5×10-12 for 129I/127I ratio and 0.043×107 atoms/L for 129I concentration) was observed in these two sediment cores, with similar peak values in the layer corresponding to 1965-1967, 1970-1973, 1975-1977, 1980-1983. According to the peak time coincidence with Lop Nor NWT, the source of 129I before 1980s was regarded from Lop Nor NWT, but less related to Semipalatinsk NWT. The transportation mechanism of radioactive substance from Lop Nor was simulated on basis of the local general circulation of atmosphere and the transmission characteristics of radioactive materials from NWT [4,5,6]. It shows that the radioactive material could reach ECS (East China Sea) through the direct atmospheric dispersion. Meanwhile, the regional deposition of Lop Nor turned into soil in the Jinsha River Valley area that is one of the most important branches of Yangtze River. And the 129I can be continuously leached out by rain and entered to YDW (Yangtze River Diluted Water) in ECS within Yangtze River input [7]. Finally, 129I was further transferred to sediment by the biochemical processes [8]. The 129I signal in the sediment core after 1980s was mainly from European nuclear fuel reprocessing plants at La Hague and Sellafield by the direct atmospheric release and the re-emission of marine discharges in the highly contaminated seas [9]. In comparison, the Fukushima nuclear accident had no detectable effect on the ECS until September 2011.

Reference

1. Fabryka-martin J, Bentley H, Elmore D, et al. Natural iodine-129 as an environmental tracer[J]. Geochimica Et Cosmochimica Acta, 1985, 49(2):337-347.

2. Hou X L, Hansen V, Aldahan A, et al. A review on speciation of iodine-129 in the environmental and biological samples[J]. Analytica Chimica Acta, 2009, 632(2):181.

3. Hou X L. Application of 129 I as an environmental tracer[J]. Journal of Radioanalytical & Nuclear Chemistry, 2004, 262(1):67-75.

4. UNSCEAR. 2000, Annex C: Testing and Production of Nuclear Weapons [J].174, 158–160.

5. Kuroda P K, Miyake Y, Nemoto J. Strontium Isotopes: Global Circulation after the Chinese Nuclear Explosion of 14 May 1965[J]. Science, 1965, 150(3701):1289-1290.

6. Yoshikawa K, Fujita A, Murayama N, et al. Fallout particles in the ground-level air from the Chinese nuclear explosion of December 28, 1966[J]. Journal of Geophysical Research, 1968, 73(12):3637-3641.

7. Dan L, Hou X, Du J, et al. 129I and its species in the East China Sea: level, distribution, sources and tracing

water masses exchange and movement[J]. Scientific Reports, 2016, 6:36611.
8. Moran J E, Fehn U, Teng R T D. Variations in 129I/I ratios in recent marine sediments: evidence for a fossil organic component. Chem. Geol. 152, 193-203[J]. Chemical Geology, 1998, 152(1):193-203.
9. Reithmeier H, Lazarev V, Rühm W, et al. Anthropogenic 129I in the atmosphere: overview over major sources, transport processes and deposition pattern. [J]. Science of the Total Environment, 2010, 408(21):5052-5064.

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