

2.043 Numerical analysis of seasonal change of iodine-129 deposition in Japan using a global atmospheric iodine transport model.

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Abstract:

Iodine-129 (^{129}I) is a useful isotope for dating of water, tracing of marine sediments and investigating the geochemical cycle of iodine. Main sources of atmospheric ^{129}I are volatilization from ocean and discharge from nuclear fuel reprocessing plants. Although released ^{129}I is globally transported in the atmosphere and is deposited on the Earth's surface, the global cycle of ^{129}I are still not well understood. In this study, we focused on the deposition process of ^{129}I and investigated the seasonal change of ^{129}I deposition measured at Rokkasho in Japan by using a global atmospheric iodine transport model, GEARN-FDM developed by us. The simulation period was set to be from 2006 to 2010, and input meteorological fields to drive GEARN-FDM were calculated using WRF (Weather Research and Forecasting) model Version 3.6.1 with ERA-interim dataset. The model successfully reproduced the seasonal change of total deposition measured at Rokkasho. In summer, 85-90% of the monthly total deposition was attributed by wet deposition of the inorganic gaseous ^{129}I volatilized from ocean. In contrast, in winter, wet deposition of the inorganic gaseous ^{129}I discharged from European nuclear fuel reprocessing plants was the major contributor to the total deposition. The seasonal difference of contributor to total deposition at Rokkasho resulted from the atmospheric transport due to westerly wind in mid- and high-latitudes in the Northern hemisphere—strong in winter and weak in summer. Furthermore, over northern part of Eurasia where was estimated as the transport pathway of atmospheric ^{129}I from European nuclear fuel reprocessing plants to Rokkasho, the wet deposition in winter was less than that in summer, suggesting the rainfall over northern part of Eurasia plays an important role in determining the seasonal change of ^{129}I deposition at Rokkasho in Japan.