Iodine isotope system in natural environment

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Before the human nuclear activities, a long lived radio isotope ^{129}I (half life: $1.57x10^7$y) is produced by cosmic ray interaction in the atmosphere and spontaneous fission from ^{238}U in the ocean and crust. One of major iodine reservoirs is the ocean. Considering the residence time and seawater circulation, the isotopic ratio ($^{129}I/^{127}I$) is believed to have been in an equilibrium state, i.e., the isotopic ratio ($^{129}I/^{127}I$) is identical everywhere. If this had been the case, like $^{14}C/^{12}C$ in the atmosphere, iodine isotope system ($^{129}I/^{127}I$) could be used for the dating with longer time scale. On the several hypotheses including this equilibrium, some studies tried to determine the formation age of iodine-concentrate reservoir such as brine. However there is always a discrepancy between isotopic age and geologic age [1, 2]. One possible reason is the equilibrium initial ratio was different. Above mentioned works used the initial ratio of $^{129}I/^{127}I = 1.5x10^{-12}$ based on the study by J. Moran et al (1998) [3]. Another possibility is that the hypothesis of equilibrium was not true. In this study, iodine dynamics is re-evaluated with new knowledge recently obtained. The behavior of ^{129}I released from the nuclear accident, like Fukushima Dai-ich Nuclear Power Plant is quite useful to consider the iodine transportation.

[1] U. Fehn *et al*. (2000) *Science* **289**, 2332.
[2] Y. Muramatsu *et al*. (2001) *EPSL* **192**, 583.
[3] J. Moran et al. (1998) *Chemical Geology* **152**, 193.