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129I in the Antarctic seawater measured by carrier free iodine separation and AMS

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Due to low concentration of iodine in seawater, iodine carrier is normally added as carrier for separation of 129I from matrix using solvent extraction, this is not suitable for the determination of low level 129I in the seawater received less anthropogenic 129I such as those collected in south hemisphere including the Antarctic and deep seas, because of contribution of 129I in the iodine carrier to the sample during sample preparation. A simple co-precipitation method for separation of carrier free iodine from seawater for measurement of 129I/127I using accelerator mass spectrometry (AMS) has been reported by our group. In this work, some improvement of this method was completed to able to obtain better measurement uncertainty in AMS measurement. The results reveal that addition of small amount of carrier (0.1-0.2 mg) can significantly improve the measurement accuracy and precision. A certified seawater reference material, IAEA-418 (Mediterranean Sea water) has been successfully analyzed by utilizing the presented method and the concentration of 129I was measured to be 2.36×108 atoms L-1 in this sample, which agreed well with the certified value (2.28×108 atoms L-1), as well as the results measured by traditional solvent extraction by addition of 2 mg iodine carrier, indicating reliability of the developed method. Six seawater samples collected from the Antarctic in 2011 were analyzed utilizing the developed method. The results indicate that 129I/127I atomic ratios in the investigated area range from 0.7×10-12~9.9×10-12 with a mean of 6.1×10-12, which is close or slightly higher than the reported pre-anthropogenic ratio of 1.5×10-12. The main source of 129I in the investigated area might be attributed to the global fallout of both atmospheric nuclear weapons testing and long distance dispersion of fuel reprocessing releases. This is the first report of 129I in the seawater from the Antarctic, the results shed a light of feasible application of 129I as an oceanographic tracer application of 129I the Antarctic.

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