Iodine isotopes in rainwater from Argentina: First ^{129}I deposition rates reported for the Southern Hemisphere

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Iodine is a very mobile element which follows a complex geochemical cycle, including evaporation, dry and wet deposition, and transportation by wind and ocean currents. The interchange processes in this cycle can be experimentally traced by the long-lived radionuclide ^{129}I, which is produced by natural and now dominantly by anthropogenic processes. For using ^{129}I as a global tracer, in particular, to assess the interchange between Northern and Southern Hemispheres, comprehensive worldwide data are necessary. While plenty of ^{129}I concentration measurements were performed in the Northern Hemisphere, scarce data are available for the Southern one. In this work, concentration of iodine isotopes, deposition of ^{129}I and ^{129}I/^{127}I ratios in rainwater samples from several stations across Argentina were analyzed aiming to assess current distribution patterns and potential sources of atmospheric iodine in the region. The gathered data imply a higher than expected ^{129}I deposition flux, indicating the existence of another source besides natural contribution and recycling from nuclear weapons fallout. Nuclear fuel reprocessing plants in western Europe look as candidates as only a minute fraction of their emissions entering the austral hemisphere would give account of the ^{129}I excess found in this work. Moreover, a four-year (2011-2014) monthly sampled rainwater time series from Buenos Aires was studied. This set presents high isotopic ratio variability, suggesting the mix of material from sources with different isotopic mark in the region. Retrospective monthly ^{129}I deposition flux in Buenos Aires after French nuclear tests during 1960s and 1970s in Polynesia are also reported.