Seven years record of ^{127}I and ^{129}I in precipitation

A. ALDAHAN[1,4]*, S. PERSSON[2], G. POSSNERT[2] AND X.L. HOU[3]

[1]Department of Earth Sciences, Uppsala University, SE-758 36 Uppsala, Sweden
[2]Tandem Laboratory, Uppsala University, SE-751 21 Uppsala, Sweden
[3]Risø National Laboratory, Technical University of Denmark, DK-4000 Roskilde, Denmark
[4]Department of Geology, United Arab Emirates University, Al Ain, UAE

Despite the significant role of iodine (^{127}I) in human nutrition, cloud condensation and global climate forcing together with the overwhelming anthropogenic supply of the radioactive ^{129}I, there is scarcity of long time series data of the isotopes in precipitation. Here we report a 7 year time series on iodine isotopes atmospheric distribution in precipitation from sites situated between latitudes 55°N- 68°N and longitudes 12°E-19°E, namely in Sweden and Denmark. Precipitation (rain and snow) samples were mainly collected during single events and thus would reflect contemporary atmospheric iodine fallout. ^{127}I was measured using ICP-MS with a detection limit, as 3 SD of blanks, of 0.03 ppb and ^{129}I was measured with AMS using NISTSRM 4949C standard and samples ^{129}I /^{127}I at two orders of magnitude above blanks background of 10^{-13}. The range of ^{127}I concentration is 0.05-10.8 μgL^{-1} with the highest values occurring in rain and the lowest in snow. The range of variation in the ^{129}I concentrations is wider between sites with respect to individual precipitation (0.4-298 $x10^8$ atoms L^{-1}) and averages (7.4-42$x10^8$ atoms L^{-1}). As is the case with ^{127}I, there are clear differences in the ^{129}I between the southern and northern sites and higher concentrations are also more frequent in the rain compared to snow. The annual ^{127}I wet fallout represents minor amount of the estimated global oceanic iodine flux. Similarly, the annual wet flux of ^{129}I comprises minor amount when compared to the total annual gaseous and liquid discharges from the Sellafiled and La Hague Facilities. Calculated air mass back trajectories indicate that a major source for enhanced ^{129}I in precipitation is related to southwesterly weather fronts.

Effect of CO_2 interaction with Svalbard shale: Implications to caprock integrity for subsurface sequestration of CO_2

B.L. ALEMU[1]*, P AAAGARD[1], E. SKURTVEIT[2] AND I.A. MUNZ[3]

[1]Department of Geosciences, University of Oslo, P.O.Box 1047 Blindern, N-0312 Olso, Norway (*correspondence: binyama@geo.uio.no)
[2]Norges Geotekniske Institutt, Sognsveien 72, 0806 Oslo, Norway
[3]Institute for Energy Technology, P.O. Box 40, Kjeller NO-2027, Norway

Reactive behavior of CO_2 with caprock material is one of the main factors that determine the sealing capability for long-term sequestration of CO_2. A shale seal rock from Adventdalen Group, a proposed CO_2 storage site in Svalbard near Longyearbyen, was used for this experiment. The lithology of the caprock varied from homogenous shale to silty-sandy shale over a thickness of 155m, present burial depth of 654.77- 810.13m below surface. Crushed rock samples from different layers of the caprock were reacted with CO_2-brine mixtures for a period of six weeks in closed reactors at 250°C. Experimental pressure conditions were close to site conditions, while temperature has been raised in order to speed up reaction rates. Chemical alteration in the rock was studied with XRD and SEM and compared with un-reacted material. Solutions sampled from the experiment, were analyzed for major ions, and showed a fair relation with changes in mineral grains in the shale rock. Results from the experiment were also used in PHREEQC simulation in order to predict the effect of reactions for long-term exposure conditions.