Relationships between δ^{37}Cl and δ^{81}Br in natural water and salt samples

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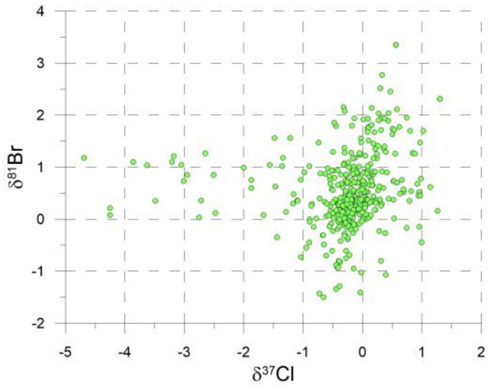
Since the development of analytical techniques to measure the stable isotope composition of Br isotopes the number of papers presenting both Cl and Br isotope data is slowly increasing. At this moment thirteen papers are known that present a total of 422 samples from which both isotopes are measured. To this inventory I added a small number of recently measured still unpublished water and evaporite samples leading to an inventory of about 450 samples.



When these data (only of samples with both isotopes measured) are plotted against each other it is obvious that Cl and Br isotopes do not show clear relationships (see Figure). Cl isotope data range from -4.7 to +1.3‰ with 50% of the samples between -0.4 and +0.1‰ and a median value of -0.2, Br isotope data range from -1.5 to +3.4 with 50% of the samples between +0.1 and +0.9 and a median value of +0.4

Although originally it was assumed that Cl and Br isotopes would be well correlated it is now clear that different fractionating processes cause very variable effects. While processes like diffusion lead to correlated isotope variations, processes such as salt precipitation, (biological) oxidation and “ion filtration” can probably cause highly different non-correlated and even “opposing” isotope variation.

In the presentation I will indicate how Cl and Br isotope variations are related depending on the characteristics of the samples as well as how it is expected that various fractionating processes will cause different isotope variations between the two elements.