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Hydrochemistry of surface water in Iceland

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Here we present the second report of water quality analyses of surface water in Iceland with additional 35 samples. Last one was shown at JpGU Meeting 2009 as 'The chemical evolution of glacier-sourced surface water in southern Iceland'. To obtain a rough picture of the chemical characteristics of surface water in Iceland, the first expedition was carried out during 13th to 22nd August in 2008, mostly in the southern part of the country, while the second one, dated from 27th August to 2nd September in 2009, covered coastal areas. The collected 26 + 35 samples include stream water, thermal water (both natural and artificial), tap water, drainage, rain and glacier-melt water. The samples of ice-melt water were taken from some glacial lakes or directly from top surface of the glacier. Since we have several kinds of water samples, especially including what seem to be sources of others (e.g., rainwater), we can see how they evolve chemically as they flow in contact with surrounding igneous rocks and deposits (mainly Holocene basaltic sands or lava). According to our analyses of concentrations of major ions and stable isotopes of hydrogen and oxygen, there can be stated three distinguished characteristics. Firstly, there seem to be several compositional features related to their sources. For instance, thermal waters in geothermal power plants as well as in natural environments like geysers have rich Na and scarce Ca and Mg ions. On the other hand, glacier-sourced waters are characterized as enriched in $HCO_3$and depleted in cations.
Secondly, the dD versus $d^{18}O$ diagram shows an aligned trend as $dD = 7.66\ d^{18}O + 7.15$, which clearly reflects each distance from the seashore. While the heaviest end member was sampled from a brook running into the sea at Vik, the lightest end member (i.e., dD = - 84.6 per mil and $d^{18}O$ = - 12.0 per mil vs. SMOW) was from ice-melt water of the Skeidararjokull glacial lake. Isolated examples were obtained from thermal waters, showing positive (heavier) $d^{18}O$ shifts in comparison with their adjacent waters supposed to have the same origin. Those shifts could be caused by isotope exchange reactions between water and minerals under geothermal environments.
And then thirdly, our trilinear diagrams capture an overview image of hydrochemical characteristics and transitions. Most of the samples are distributed in a narrow range and characterized as a sodium-bicarbonate type. Within the plotted range, starting with one end member (i.e., the glacier-melt waters and the rainwater) toward the other, surface water seems to undergo chemical transitions as follows: the increase of Na and Cl ions and the decrease of Mg, Ca and HCO_3ions, and evolve into seawater-alike water. The other end member was sampled from Blue Lagoon, the famous hot spring in the country. This result is understandable because the solution is primitively taken from the sea, heated and drained at the nearby geothermal power plant, Svartsengi.