



Geochemical Investigations of the Hellisheiði Geothermal Field, SW-Iceland

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A fluid sampling campaign has recently been carried out at the Hellisheiði geothermal field in southwest Iceland. This high-temperature field is part of the Hengill volcanic system, and is host to the largest geothermal power plant in Iceland. A geochemical assessment of the field is presented based on the analysis of 19 wet-steam well discharges. Emphasis is placed on the chemical and physical processes that account for the concentrations of the major reactive gases (CO_2 , H_2S , H_2 and CH_4). Aquifer compositions were calculated from composition of water and steam and discharge enthalpies using the WATCH speciation program and phase segregation model. Under this model, discharge enthalpies in excess of that of vapor-saturated liquid at the aquifer temperature are accounted for by retention of liquid in the formation at a single pressure. The sensitivity of calculated aquifer chemical compositions to the choice of the phase segregation p/T conditions is evaluated.

Previous studies of geothermal gas chemistry at Hellisheiði have indicated that the concentrations of the H_2S species and H_2 are in equilibrium with specific hydrothermal mineral assemblages and the presence of a small equilibrium vapor fraction ($\sim 0.5\%$ by mass). While results from the recently sampled fluids are still forthcoming, geothermal gas concentrations will be interpreted in light of lithology and alteration mineralogy, structural geology, and downhole p/T measurements. The main objective is to correlate distributions of the gases with physical processes such as potential upflow, outflow or recharge zones.