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Review

The fluid geochemistry of Icelandic high temperature geothermal areas

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ABSTRACT

Icelandic high temperature geothermal systems are considered to number thirty three, thereof three are submarine and seven subglacial. All are briefly described but the chemistry of fluids from twenty four of them is considered. The fluid in the three submarine areas and those four on land that are closest to the sea are relatively saline but to a differing extent mixed with groundwater. The rest contain dilute fluids. The fluids of the central highland systems are mostly locally derived but may in some instances be quite old whereas those in the northerly Krafla area which is inland and the Öxarfjörður area which is close to the sea appear to be a mixture of local and central highland water, but those in the inland Hengill, Geysir, Námafjall and Theistareykir areas appear to have travelled relatively long distances from the central highlands. The gas observed is magmatic except in the northerly Öxarfjördur area close to the sea where it is apparently derived from organic sediments.

Contents

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1. Introduction

On the basis of available drillhole data, Bödvarsson (1961) concluded that the base temperature in low-temperature areas was less than 150 °C but above 200 °C in the high-temperature areas. The concept of base temperature was based on the assumption that the geothermal systems represent convecting groundwater and the highest temperature attained by the water at the base of the convection cell is the base temperature. The temperature limits proposed by Bödvarsson (1961) have had to be revised in the light of later drillhole data. At present it is considered that maximum temperatures are lower than about 150 °C in the uppermost 1000 m of low-temperature areas, but reach at least 200 °C in the uppermost 1000 m of high-temperature areas (Fridleifsson, 1979). This division appears appropriate from a geological point of view as few geothermal reservoirs seem to have

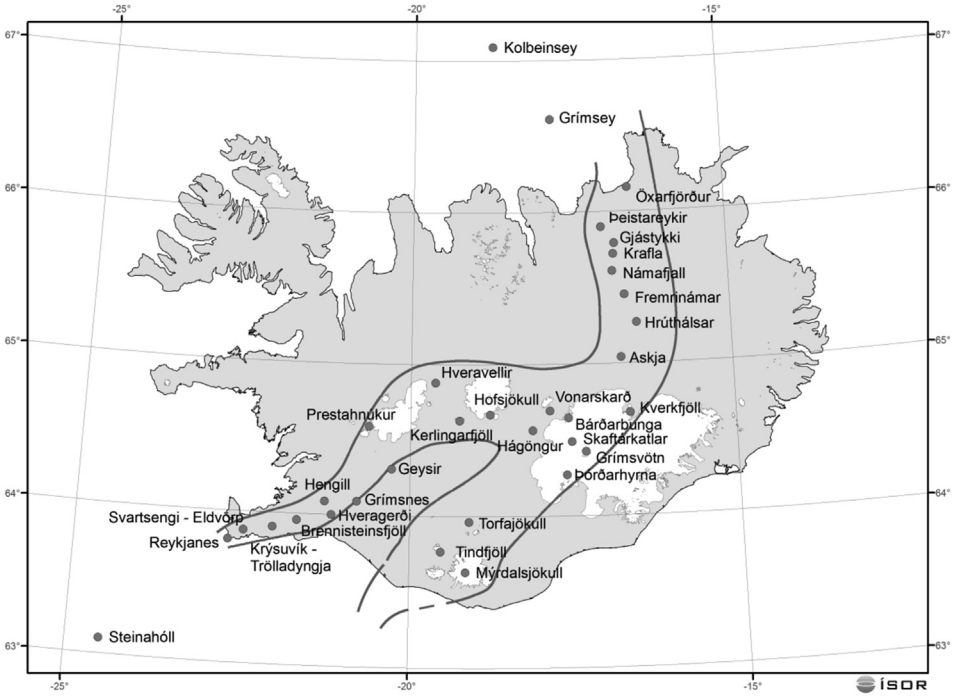

Fig. 1. High temperature areas in Iceland.