Abstract

The biggest part of Iceland is built up of volcanic rocks. It is situated on the mid Atlantic ridge and is a part of it above sea level.
This results from a mantle plume located under the island. This is the reason why there are in addition to flood basalts, which occur everywhere on mid ocean ridges, another type of volcanism: Central volcanoes that also produce more differentiated lavas.
Eastern Iceland, which belongs to the oldest part, began in the Tertiary period. There are both, flood basalts and eroded central volcanoes. George Leonard Walker, a British geologist, published most of the basics of the geology there. He died in January 2005.
The mapped area is located in eastern Iceland in the valley of Breiðdalur close to a 9 million-year old eroded central volcano (Breiðdalur central volcano), 6-14 km east and north east of its core. In the eastern part there are tholeiitic flood basalts and in the western part younger tholeiites and andesites of the central volcano. A number of basic dikes cut the basalt section. In the eastern part of the mapped area they are the feeders of flood basalt eruptions.
Further in the west there is, in addition to mafic dikes, one porphyric dike (probably andesitic) and an acid intrusion. Both arise from the central volcano.
Tertiary sediments occur as interlayers in flood basalt sections. They are mostly red. This is an indication for a warm tertiary climate. The landscape in Breiðdalur valley is strongly modified by Quaternary glaciations. That's the reason for the frequent occurrence of glacial forms like roche-moutonnée. The floor of the valley is often covered by fluviatile sediments.
The structure of Iceland in general is simple. There are no normal faults with vertical displacement of the layers. In the mapped area there are several faults with N-, NNW or NNE-trend. They can be followed up to two kilometers.
Secondary minerals tell something about the history of the rock. Zeolites are indicators for the regional determination of the maximal burial depth of the lava pile. Different types of them form at different pressures and temperatures. This regional metamorphism is interrupted by contact aureoles around central volcanoes. There you can find locally totally different minerals.
The emphasis of this work is the secondary mineral chert, called jaspis in Iceland.
It is based on the publication of Hofmann & Farmer (2000). The colored aggregate of SiO_2- minerals forms preferred at the outer margin of the contact aureole of Breiðdalur central volcano. Its color is caused by contaminations of hematite, goethite and or celadonite.
Often, this contaminations are filaments. The origin of some of them is biogenic.
In particular examples they are that well preserved that they can be identified as products Gallionella ferruginea, an iron oxidizing bacterium. Its extra cellular precipitates form a typical helical structure. This species could also be found recent in conspicuous red (ferrous iron) pools in swamps of the mapping area. Other filament types can be interpreted as bacterium Leptothrix sp. or as traces of fungal hyphae.
The interest of chemo autotrophs grew in the last years.
It is not for so long known that subsurface microbes make up a big part of the biomass of the planet earth. Also on the seafloor there are a couple of microbial habitats. In some of them they live without light up to temperatures of 100_C (extremophiles). Black smokers on mid ocean ridges are the most famous among them, only discovered in 1977.

Until now two other types of submarine habitats have been found: Conic silicate structures with hot springs north of Iceland and an off-axis geothermal field at 20° N, 15 km away from the Atlantic spreading centre, called Lost City.
The existence of such life forms raises more questions about the origin of life. Although there is no planetary body in the solar system where there are temperatures for liquid water at its surface, which is said to be a condition for life it is possible at the subsurface. There could be heat flow from inside the planetary body. Possibly primitive life hosting planetary bodies are Mars, Jupiter's moon Europa and Saturn's moon Titan.

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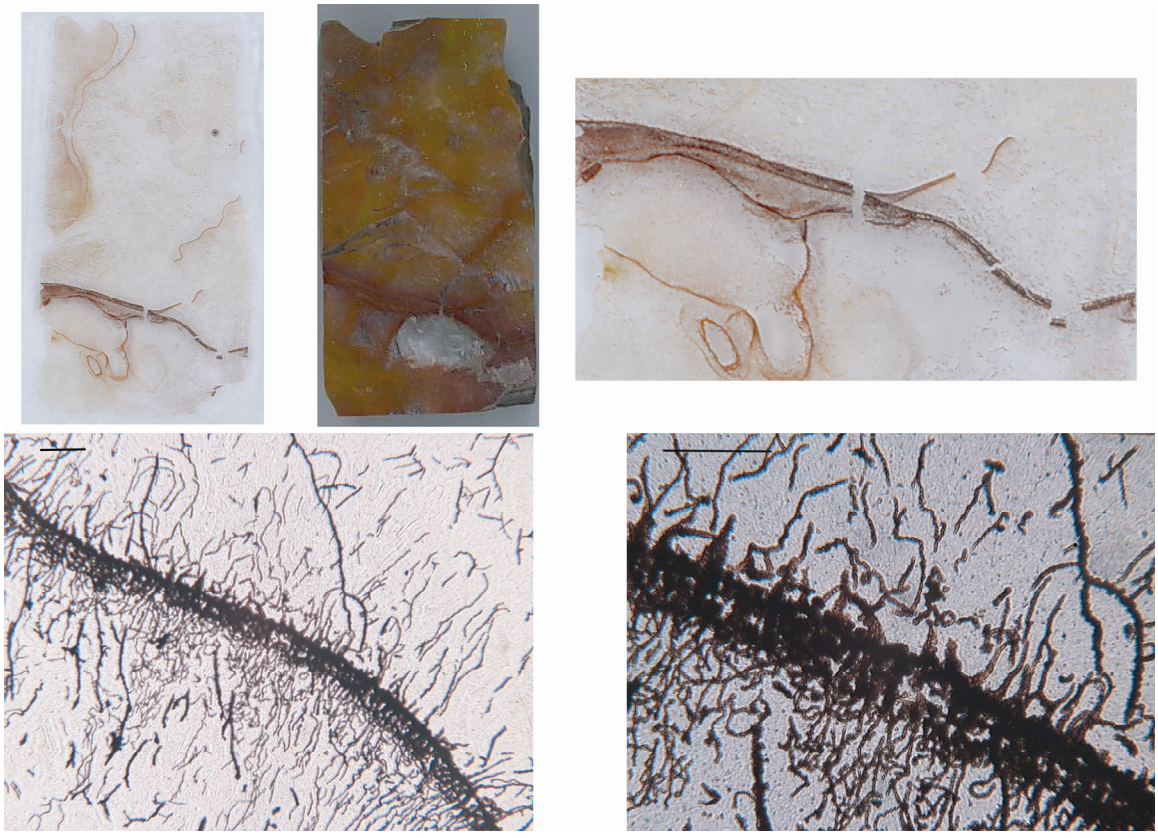

Top left and center: Thin section and accordant sample nr. is04.1. Top right: Part of the thin section with a macroscopical band, that consists of microscopical filaments. Bottom: Sections of this band, filaments are most likely biogenous balk length 100 µm.