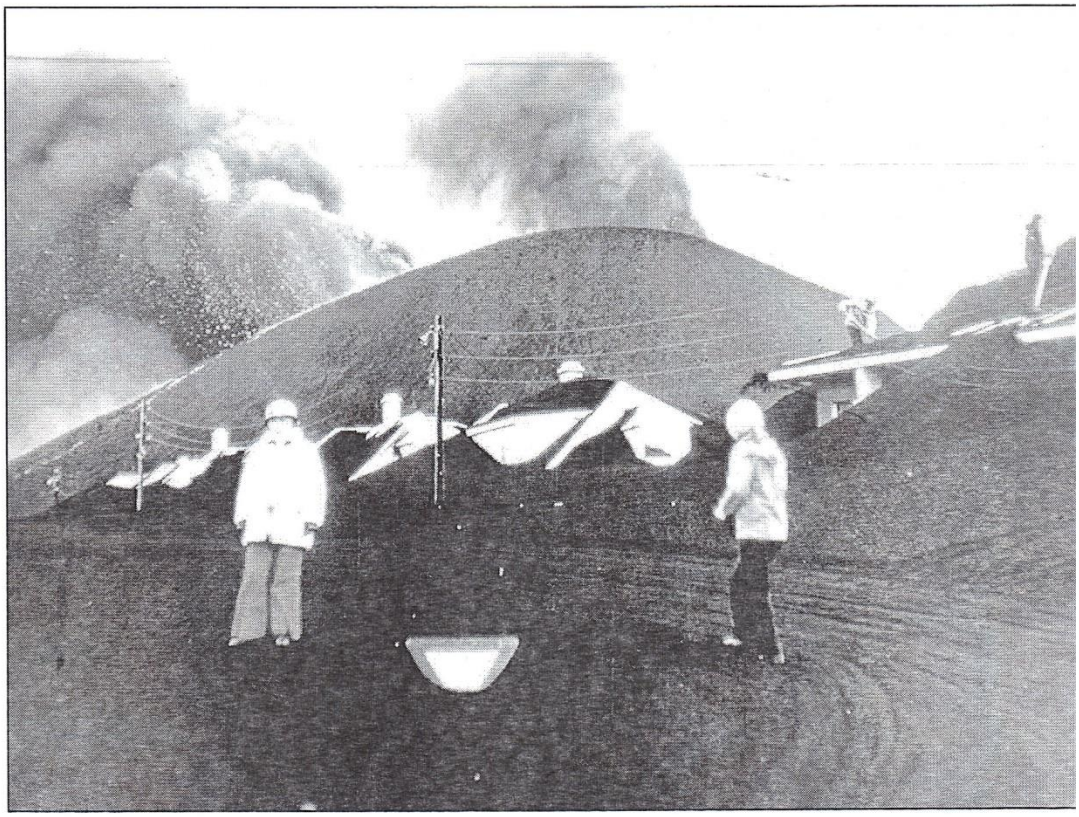
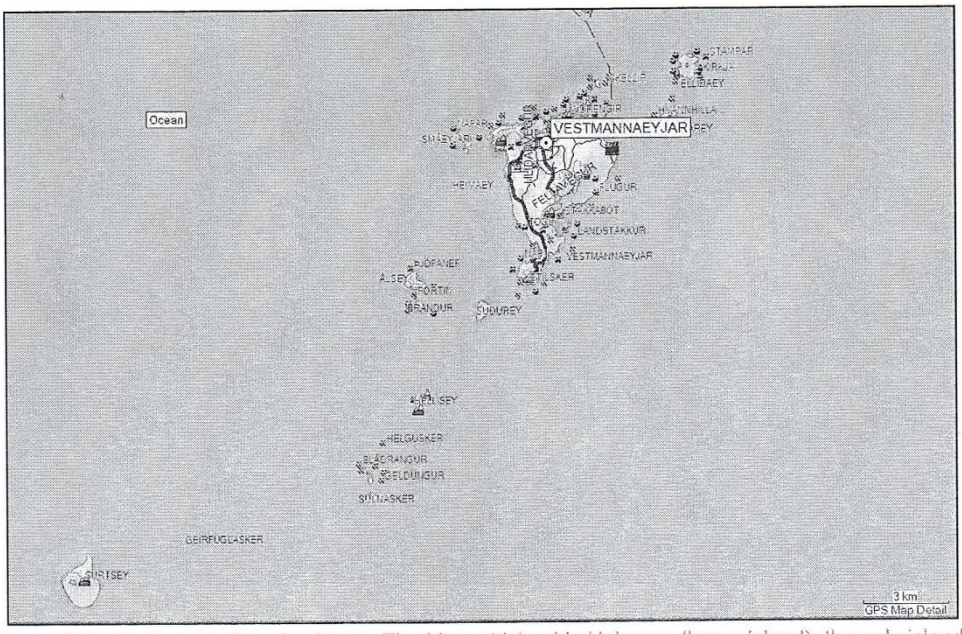


Geology and the Geological History of the Vestmanna Islands

by Kristinn Arnar Guðjónsson

Geology and geological history of the Vestmanna islands

The Vestmanna islands (Vestmannaeyjar) is an island cluster that lies 10 km of the south coast of Iceland. I includes 14 islands in addition to 30 skerries and rocks. The islands usually form steep cliffs (volcanic plugs) bu often have a flat and well vegetated top. Heymaey is the largest island in the cluster (13,4 km^2) and the only on that is populated. Other large islands in the group are Elliðaey, Bjarnarey, Suðurey, Álsey, Brandur, Hellisey Súlnasker and Sutrsey (the Icelandic word ey means island).



The islands of the Vestmanna islands cluster. The biggest island is Heimaey (home island), the only island that i populated.

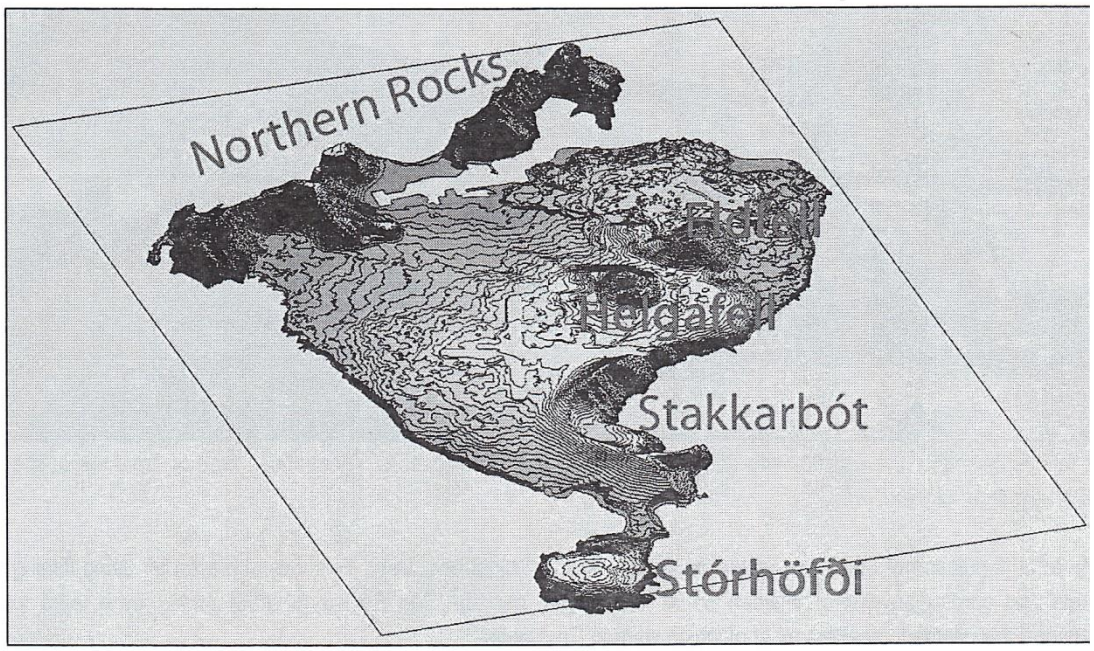
The islands are geologically young. Volcanic activity in the area probably started 100-200 thousand years ago bu the islands that exist today are much younger, the oldest ones dating back 40.000 years and the most recer island created in the period 1963-67 (Surtsey). Except for Surtsey and parts of Heimaey the islands are formed i sub-glacial eruption during the last interglacial of the ice age (see chapter on Hyaloclastiet mountains in th handbook on the geology of Iceland). Heimaey is the only island that is created in several eruption, the others ar all formed in a single event.

The volcanic system that the islands are a part of covers some 700-900 km^2 and contains at least 80 volcani vents (craters) of which 18 are above sea level. These vents have for most parts erupted during the Holocene (i the past 10.000 years). This is a relatively young volcanic system that does not have a well defined centra volcano. It has been suggested that Heymaey could in fact be a new central volcano in the making. Geophysica measurements indicate that a magma chamber may be forming at great depths (10-30 km) underneath th island. The repeated eruptions in Heymaey also support the suggestion that the area is the centre of activit within the system.

Geological history of Heimaey

The oldest parts of Heymaey are the so called "Northern rocks". These are in fact six sections formed in individu eruption during the last glacial period of the ice age (Dalfjall, Klifið, Háin, Heimaklettur, Miðklettur and Ystiklettur Until recently it was assumed that these eruptions occurred at the end of the glacial period or even during the lat glacial period 10-20 thousand years ago. Recent dating suggested that this part is older and may have forme

30-50 thousand years ago. At first these sections formed two independent islands that with time became joinec with a reef thus forming a continues landmass.

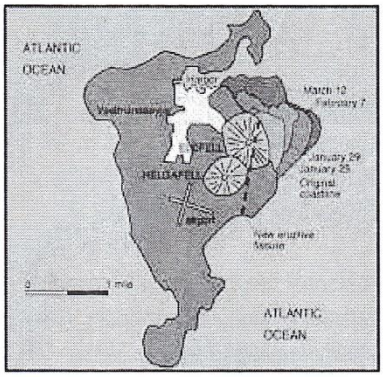


A topographical map of Heimaey showing the main geological sections of the island. See text for furthe explanation.

The third island (Stórhöfði) that forms the southernmost part of Heymaey today erupted 6000 years ago. Othe islands east and north east of Heymaey (Bjarnarey and Elliðaey) were formed at a similar time. This activity wa: followed with about 500 years of volcanic dormancy. Stórhöfði grew in size in additional activity 5500 years ag(with a great explosive eruption in Stakkarbót.

These three islands where then joined into one unit with lava when Helgafell erupted 5000 years ago. The lava: are typical flood basalt lavas (shield volcano) that connected the three islands into one.

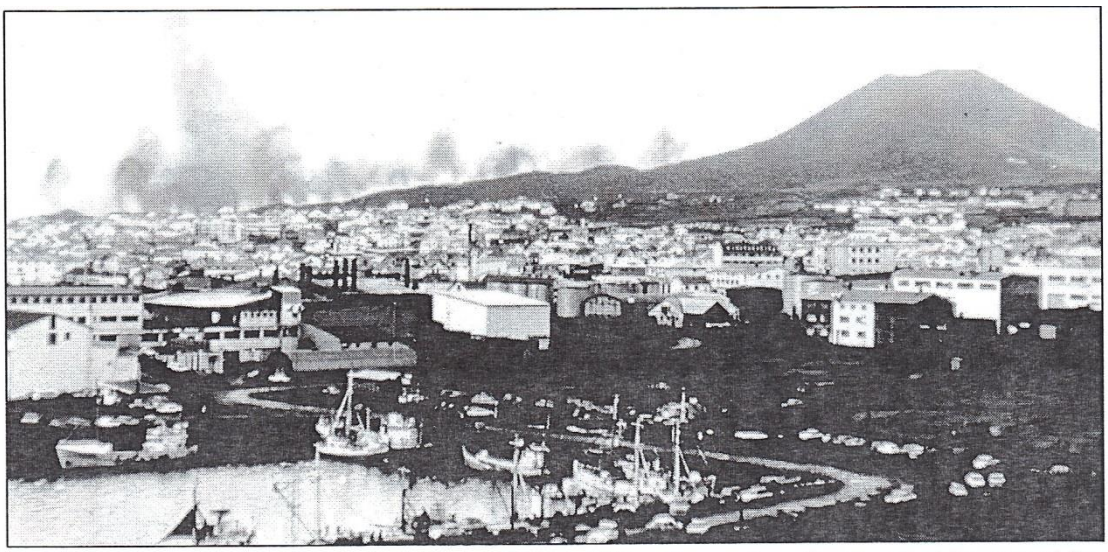
The eruption in Eldfell 1973



The location of the fissure that erupted in 1973 (broken line) and the addition to the island (gray areas).

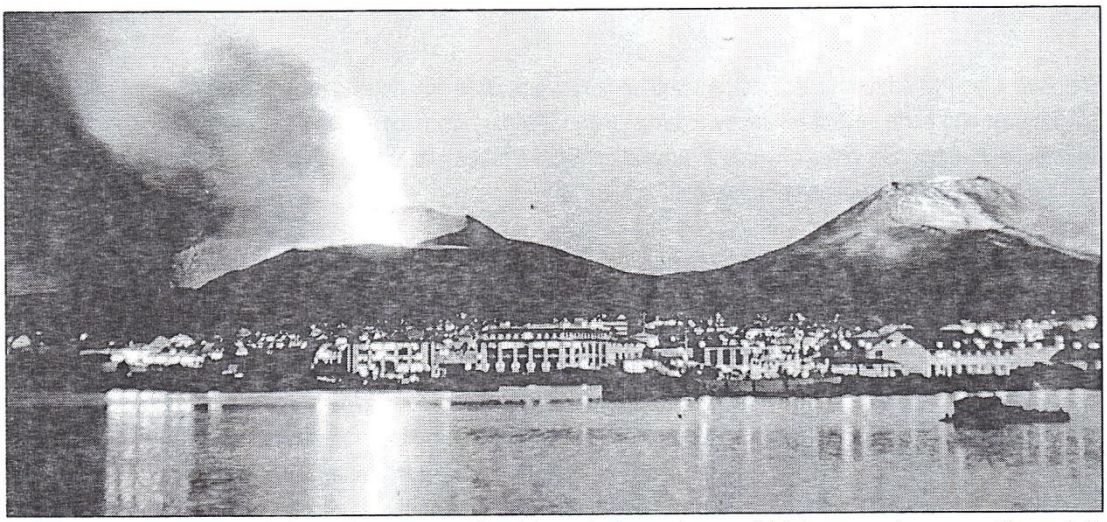
At 1 o'clock on January 23d 1973 a 1600 m long fissure opened up o: the eastern part of Heimaey. This was a typical fissure eruption that i: the first 12 hours produced more than 30 million tons of material. Th(eruption lasted for five months during which time 0,25 km^3 of tephra an(lava were ejected to the surface. Few weeks after the fissure opened th(activity became confined to one vent where with time the cinder mountai: Eldfell was created. The lava added 2,2 km^2 to the island thus increasin(its area from 11,2 to 13,44 km^2.

The magma that came to the surface was intermediate (with silica greate than 52% but less than 65%). The volcanic activity was mixed producin(both lava and tephra. More than 400 homes were destroyed by lava an(the greatest part of the town was buried in volcanic ash.



At the beginning of the eruption the activity was along a 1600 m fissure. A continues wall of fire rose at the eastern margin of the town.

The total population of 5000 was evacuated during the first night of activity. This was achieved by using fishing boats that carried anywhere between 50 to 400 people per trip. The Reykjavik street buses were used to transport the people to shelters most of which were in Reykjavík.



As the eruption progressed the activity was confined to a single vent over which a new volcano was formed. It was later given the name Eldfell (Fire mountain). Next to it is Helgafell (Helgi's mountain) that erupted 5000 years ago. The lava from Helgafell connected several islands in one continues land mass thus forming Heimaey.

After the population had been rescued emphasis was put on rescuing their personal belongings and preventing house from being destroyed by gloving volcanic bombs. This was done by barricading windows and doors. Great amount of volcanic ash (thepra) collected on the roofs of many house eventually leading to their collapse. The rescue afford was to a large degree concentrated on constantly clearing the roofs. By the end of the eruption in June 417 homes and businesses had gone under lava and additional 400 had been greatly damaged by tephra. In addition most of the house in town had been buried partly or completely by tephra. The cleaning process started in May and by June most of the house had been dug out. It is estimated that by September 800.000 tons

of tephra had been removed from the town. At that time 1200 people had returned to their homes and by November the population was up to 2000. After that the population slowly increased to close to 4000 but it has not yet reached the 5000 that lived in the island prior to the eruption.