



## **The SUSTAIN ICDP 2017 drilling of Surtsey: First results on physical volcanology and island formation**

Magnus Tumi Gudmundsson (1), Marie D. Jackson (2), James D.L. White (3), Carolyn Gorny (1), Jocelyn McPhie (4), Tobias B. Weisenberger (5), Bernd Zimanowski (6), J.Michael Rhodes (7), Kristján Jónasson (8), Andri Stefánsson (1), and the Surtsey OnSite Team

(1) University of Iceland, Institute of Earth Sciences, Nordic Volcanological Center, Reykjavik, Iceland (mtg@hi.is), (2) Geology and Geophysics, University of Utah, Salt Lake City, UT, 84112-0102, USA, (3) Geology Department, University of Otago, Dunedin, New Zealand, (4) Department of Earth Sciences, University of Tasmania, Hobart, Australia, (5) ÍSOR, Iceland GeoSurvey, Reykjavík, Iceland, (6) Institut für Geographie und Geologie, Universität Würzburg, Würzburg, Germany, (7) Department of Geosciences, University of Massachusetts, Amherst, USA, (8) Icelandic Institute of Natural History, Gardabaer, Iceland

Since its formation in 1963-67, the island of Surtsey off the south coast of Iceland has been the type locality for Surtseyan and emergent basaltic volcanism. Sea depth when? Surtsey formed was about 130 m and the seafloor sediments on which it rests are at least 100 m thick. The initial explosive eruption in November 1963-April 1964 lasted four and a half months before effusive eruption took over. The course of events during the formation of Surtsey is very well documented. A core was extracted from a 181-m-deep hole (SE-01) in 1979 from the eastern rim of the main explosive vent active in November 1963-January 1964 (Surtur I). The 2017 ICDP-supported SUSTAIN drilling project drilled two new vertical holes (SE-02A, SE-02B), 152 and 192 m deep, close to the 1979 hole. Preliminary results for both holes indicate altered and consolidated basaltic lapilli tuffs formed by the 1963-1964 Surtsey eruptions, with a few minor basaltic intrusions. One of the principal objectives of the SUSTAIN project is to add new information on the structure of the island and its formation. We therefore drilled an angled hole, coring the region under Surtur I. The 354-m-long inclined hole (SE-03) has an angle of 35° from vertical, reaching a vertical depth of 290 m (~232 m below sea level) about 100 m beneath the pre-eruption seafloor. The lowermost point of this angled hole lies ~200 m west of the drill site, directly beneath centre of Surtur I crater. The bottom third of the core therefore samples the uppermost 100 metres of a wide diatreme formed through the seafloor sediments during the explosive phase of the Surtsey eruptions. Full results on volcanic stratigraphy and particle morphology await detailed core analysis. Borehole temperature measurements obtained in the days following the drilling show that the temperatures in the sub-seafloor diatreme are several tens of degrees higher than expected for shallow ocean sea bottom. The tuffs making up the diatreme have apparently not reached thermal equilibrium with the surrounding seafloor sediments, 50 years after volcanic activity ended.