

Holocene tephra archives and tephrochronology in Iceland – a brief overview

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Abstract — *Tephra layers constitute archives on the eruption history of volcanoes or volcanic system where explosive eruptions are dominant, they preserve records of individual eruptions and they form time parallel marker horizons extending across large areas. In Icelandic terrestrial soils the tephra record may cover the last 9000–10000 years, depending on deglaciation and ensuing sea level changes. In lacustrine sediments it may extend into the Lateglacial and in marine sediments the record is much longer. Explosive volcanic eruptions comprise a substantial part of Holocene volcanism in Iceland. The majority are explosive hydromagmatic basaltic eruptions due to the presence of ice and water in volcanic areas. Out of about 200 eruptions in the past 11 centuries, verified by eruption products or trustworthy written accounts, some 130 left tephra layer as the only product and another 25 eruptions produced substantial tephra deposits in addition to lava flows. Four out of every five tephra layers were of basaltic composition. The great majority of explosive Holocene eruptions in Iceland have taken place within the Eastern Volcanic Zone (EVZ), partly because of its numerous central volcanoes and partly because ice caps cover substantial parts of the EVZ. The major producers of basaltic tephra are the Grímsvötn, Veidivötn and Katla volcanic systems, with the highest eruption frequency in the Grímsvötn system. The largest explosive eruptions on these systems have uncompacted volumes of $\sim 5 \text{ km}^3$ to $>10 \text{ km}^3$, reaching VEI-index of 5 to 6. The major producer of silicic tephra is the Hekla central volcano. The largest Hekla tephra layers have uncompacted volumes of $\sim 2 \text{ km}^3$ to $>10 \text{ km}^3$ (Volcanic Explosive Index 5 and 6). In addition to applications in volcanology, tephra markers are an invaluable dating tool in studies of environmental changes. The four largest Hekla tephra layers form the backbone of the Icelandic tephrochronology and are also important mid- to late Holocene marker tephras on the shelf off North Iceland. The ~ 10350 year old Saksunarvatn tephra from the Grímsvötn system is an important early Holocene marker tephra on the shelf off North and West Iceland. Among recent achievements of land-sea correlation of tephra layers is the detection of significant climate related changes in palaeoceanography through Holocene time indicating reconfiguration of the oceanic Polar Front separating cold Arctic and warmer Atlantic surface water masses north of Iceland.*