

# A 68,000 year tephra record in marine sediment cores offshore southeast Iceland

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Large Icelandic explosive eruptions inject pyroclastic material and gases into the atmosphere, modifying its composition even on a global scale. Regionally, they affect infrastructure, air-traffic and human health. The 2010 Eyjafjallajökull eruption demonstrated that even medium-size eruptions can have a major societal impact beyond Iceland. Reconstructing the time-series of past eruptions is of key importance for understanding the temporal evolution and dimensions of Icelandic volcanic activity. Here we report detailed down-core investigations of tephra in four up to 10 m long marine sediment gravity cores obtained during RV Poseidon Cruise 457, at distances of 60 to 180 km southeast of Iceland. We analyzed major element compositions of volcanic glass shards and used geochemical fingerprinting to determine their provenance. We identified 52 primary basaltic ash layers, complemented by minor amounts of rhyolitic to basaltic-andesitic glass shards within these layers and in the background sediment. For the tephra identification, chronostratigraphy and inter-core correlation, we applied color-scans, AMS <sup>14</sup>C dating and the tuning of proxy records to the  $\delta^{18}\text{O}$  NGRIP reference climate record.

The succession of medium to large volcanic events as preserved in our cores reaches back to 68 ka BP. Therewith, we extend the Icelandic eruption record much further back in time than

previously inferred from terrestrial Iceland and in more detail than determined from distal deposits. Grímsvötn-Lakagígar volcanic system was most active in the periods between 68 and 52 ka BP and between 40 and 35 ka BP. A phase of high activity at Kverkfjöll volcanic system since 30 ka BP culminated in the event producing the wide-spread Fugloyarbanki tephra at 27 ka BP, after which the explosive activity at Kverkfjöll almost ceased. Thereafter, we observe a shift towards higher activity at Bárðarbunga-Veiðivötn and Hekla volcanic systems. The investigated tephra record also points to a possible climate forcing component in Icelandic volcanism, with increasing activity during stadial-interstadial transitions and towards the end of Marine Isotope Stage 3.