The widespread 10ka Saksunarvatn Tephra: a product of three large Basaltic Phreatoplinian Eruptions

The Saksunarvatn tephra, from Grímsvötn Volcano, Iceland, which forms a wide spread marker horizon across the North Atlantic, has been extensively used in paleoclimate research because of its occurrence at the boundary between the Holocene and the last deglaciation at 10.3ka. The Saksunarvatn tephra was first identified in the Faeroe Islands at the type locality of Lake Saksunarvatn. Since then it has been found in outcrops & lake sediment cores throughout Iceland, Norway and Germany, as well as in marine cores across the Greenland-Norwegian Seas and in the Greenland ice cores. Existing data indicates a minimum dispersal of 1,500,000 km\(^2\) & a volume > 15 km\(^3\). Major element analyses reveal a tholeiitic composition that corresponds with magmas produced by the Grímsvötn volcano throughout the Holocene. In three lakes in western Iceland a sequence of three tephra layers span about 100-200 years around the 10,300 year mark. The major element composition of all three layers is identical and has a strong chemical affinity to the Saksunarvatn tephra. Preliminary elemental data indicate that there is a slight difference in the most incompatible elements. The lowest layer has the lowest Th, U and Ba while the middle layer has the highest Th, U and Ba. These results indicate that the Saksunarvatn tephra is not the product of a single event, but rather formed by three (or more?) successive large-volume, explosive subglacial eruptions at the Grímsvötn volcano. It can not yet be concluded whether one or all of these three layers correspond to the horizon collectively known as the “Saksunarvatn tephra”