



Volume and climatic effects of Early Eocene volcanism in the North Atlantic region

Hans Egger (1) and Ewald Brückl (2)

(1) Geological Survey of Austria, Neulinggasse 38, 1030 Vienna, Austria, (2) Vienna University of Technology, Gusshausstraße 27-29, 1040 Vienna, Austria

The North Atlantic Igneous Province (NAIP), which is one of the largest basaltic lava accumulations on Earth, formed in the early Paleogene (62–53 Ma), prior to and during the continental break-up between Europe and Greenland. Beside voluminous flood basalts and associated igneous intrusions, it produced widespread pyroclastic deposits. More than 200 ash-layers of predominantly basaltic composition and related to this explosive volcanic activity have been recorded from the early Eocene Fur Formation in Denmark. The paroxysm of this activity, the positive ash-series or “main ash-phase”, is characterized by a succession of 140 closely spaced ash layers (layers +1 to +140 at Fur). 23 layers of these layers have been recorded in early Eocene deposits of the Austrian Alps, about 1,900 km away from the source area. We have calculated the total eruption volume of the main ash-phase as 21,000 km³, which occurred in 600,000 years. The most powerful single eruption of this series took place 54.0 million years ago (Ma) and ejected ca. 1,200 km³ of ash material which makes it one of the largest eruptions in geological history. The clustering of eruptions must have significantly affected the incoming solar radiation in the early Eocene by the continuous production of stratospheric dust and aerosol clouds. This hypothesis is corroborated by oxygen isotope values which indicate a global decrease of sea surface temperatures between 1–2°C during this major phase of explosive volcanism.