

Tertiary (Miocene-Pliocene) interbasalt Sediments, NW- and W-Iceland

ELEN ROALDSET

Norsk Hydro — Forskningsenteret, Lars Hilles gt. 30, 5000 Bergen, Norway.

ABSTRACT

The Tertiary NW- and W-parts of Iceland are mainly built up of flood basalts, which in the west represent the oldest exposed rocks in Iceland (14-16 m.y.) Interbedded with the basalts extensive sediment horizons occur, which may reflect long periods of volcanic quietness. The sediments consist of laterite, lignite, clay and tuffaceous material. Their age can be determined indirectly by K-Ar dating and paleomagnetic mapping of the lavas above and below.

The samples studied represent vertical sections through selected interbasalt sediment sequences. The investigation includes textural, mineralogical and chemical analyses of sediments of different geological age (14-13, 10-9, 7-6.5, and 4-3 m.y.).

Their composition is a result of various processes: palaeonitisation, weathering (kaolinite, halloysite, smectite, amorphous Al-Fe-hydroxides), thermal metamorphism (maghemite) and regional burial metamorphism/diagenesis (heulandite, analcime). The oldest sediments have highest kaolinite and halloysite contents. The younger are richer in smectite, and in the youngest illite and vermiculite were found.

INTRODUCTION

During the last 20-30 million years Iceland has developed as a large basaltic plateau on the Greenland — Faeroe Ridge. Tertiary plateau basalt. covers the main part of W and E Iceland (Fig. 1). The lava pile of NW-Iceland consists of 4 1/2 km of subaerial lavas of which 1 1/2 km is exposed and 2 km drilled. The lava pile has been modified by isostatic sinking and glacial erosion. The flows have variable thickness, 2-30 m, and are often intercalated with sedimentary beds from a few cm and up to 100 m in thickness (Dagley et al. 1967; Kristjánsson et al. 1975).

By combining paleomagnetic and K/Ar data for the lava succession with results from deep sea sediment cores stratigraphic boundaries are recorded:

The Miocene-Pliocene at 5.2 ± 0.1 m.y. the Pliocene — Pleistocene boundary at 3.2 m.y. (Berggren and van Couvering 1974, McDougall et al. 1976, 1977). The oldest glacial deposits in Iceland have an age of about 3.1 m.y. (McDougall and Wen-sink 1966).

The average building rates of the Tertiary lava pile are 10-15 m per 10, 000 years (McDougall et al. 1976, 1977; Kristjánsson et al. 1975, Kristjánsson 1979, pers. comm.) As the average flow thickness is 10-11 m this means that the mean time interval between two successive flows is slightly higher than 10, 000 years. In comparison lavas from the flanks of Hawaiian shield volcanoes show similar interflow intervals, while intervals of 100-200 years have been recorded within the summit calderas (Doell and Cox 1965).

The geology and geophysics of the Tertiary lavas of the NW-peninsula, Vestfirðir, have been investigated by Einarsson (1962), Kristjánsson (1968, 1973), Hald et al. (1971), and Kristjánsson et al. (1975). The oldest rocks in Iceland 14-16 m.y. occur here (Moorbath et al. 1969, K. Sæmundsson 1979, pers. comm.). Minor zeolitization has taken place. The geology of the younger Borgarfjörður area is reported by Sæmundsson and Noll (1974), Jóhannesson (1972) and McDougall et al. (1976). Chemically the lava suites plot as quartz normative basalts following a tholeiitic trend.

Interbasalt sediments are of common occurrence within the lava pile. The sediments consist of lateritic soils, clays, lignite, hyaloclastite and tephra. Sediment horizons of regional extension have been traced (Kristjánsson et al. 1975, K. Sæmundsson 1979, pers. comm., Fig. 1). The lateritic and lignite beds commonly occur in the Miocene section but disappear during the Pliocene probably in consistency with the climatic change. The lignite occurrences are comprehensively reviewed by Thoroddsen (1896) and Friðriksdóttir (1978). In times of fuel shortage