Geologie en Mijnbouw 67: 467–469 (1988)

Note on a mid-Proterozoic stromatolite limestone, south of Grythyttan, Bergslagen, Sweden

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Received 2 February 1988; accepted 23 February 1988

Abstract

At Grimsudden south of Grythyttan relatively well preserved limestones are present in a sequence of volcanoclastics of mid-proterozoic age. In these limestones textures were found that are characteristic for stromatolites.

Introduction

In the course of the fieldwork project in western Bergslagen initiated by I.S. Oen in 1974 at the Department of Geology at the University of Amsterdam, the bedrock geology of the region around Älvestorp village in Middle Sweden was studied petrographically by A.C. van der Raad. His observations led the first author to revisit the area in 1987. His material was studied by the carbonate petrologists Kenter and Reymer.

The locality

Grimsudden is a small promontory projecting into the southern part of lake Torrvarpen, south of Grythyttan. Directly to the east of Grimsudden, Proterozoic metasediments and volcanites are exposed in small outcrops at the southern slope of a hill at the intersection of the 66° 15′ N and 14° 30′ E grid lines of the topographic map of Sweden, 1:50.000 Filipstad SO number 11 E. The bedrock geology of this area is rendered in Fig. 1. It is seen that volcanoclastics are intercalated by beds of often dolomitized limestones, cut by later metadiabases and dykes of olivine diabase. This pattern was, in less detail, already published by Sundius (1923).

Generally, the carbonates have been altered to more or less coarse-grained marbles. Dolomitization also took place during metamorphosis. Primary sedimentary structures have only been preserved at a few isolated places. Ghosts of lamination structures are also seen in silicified often brecciated parts of the carbonate sequence. These semi-transparent flintlike rocks are contained in vein-like structures in the felsic metavolcanics, and are as far as could be ascertained, not connected to diagenetic alterations in the carbonate deposits. They are possibly related to hydrothermal processes triggered by the intrusion of the older diabasic intrusions. In thin sections, the flints are found to contain many euhedral carbonate crystals and sulfide ore grains.

The stromatolite limestone

Several outcrops were sampled of a limestone zone, as far as exposed not more than 2 metres thick. A polished slab of this limestone is seen in

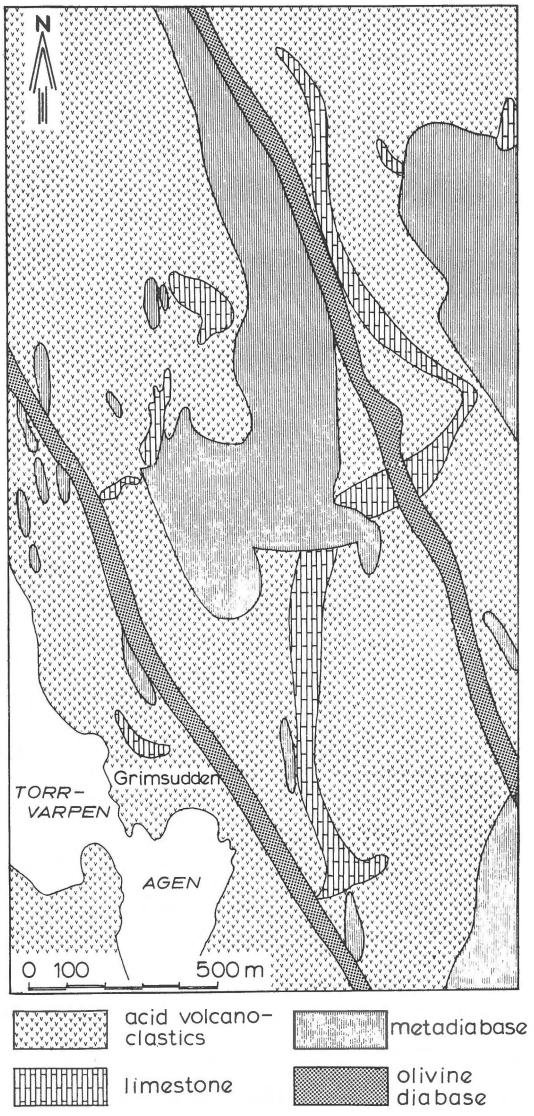

Fig. 1. Bedrock geology of the Grimsudden area.

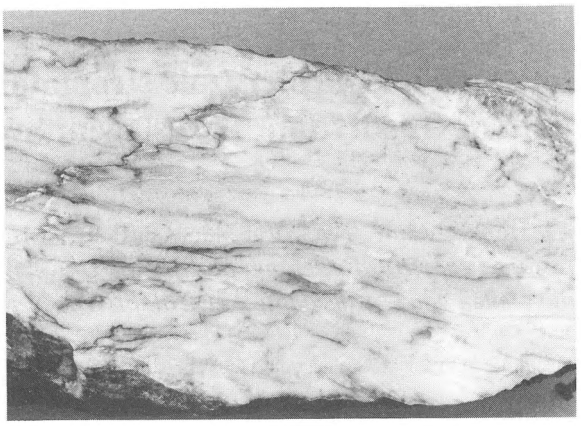

Fig. 2. Grimsudden stromatolite limestone: ×0.55.

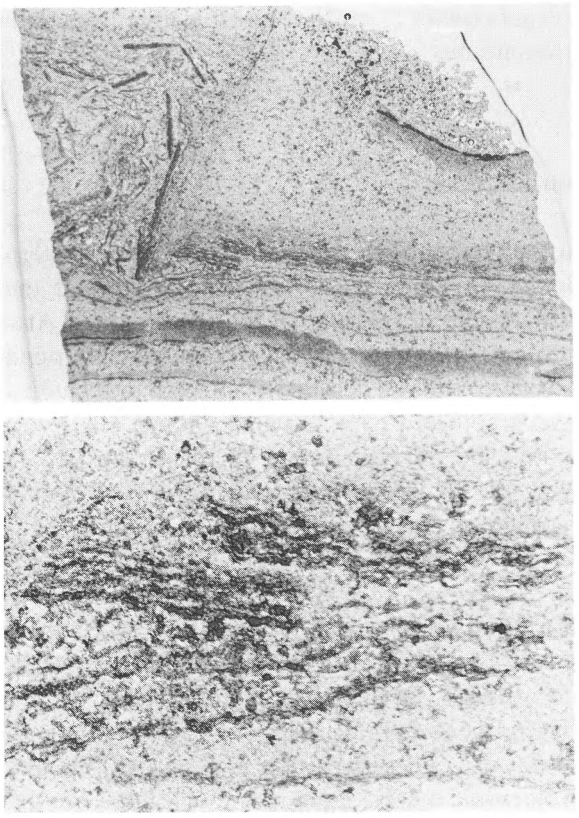

Fig. 3. Thin sections showing crinkly banding; photo A: ×5.7, photo B: ×24.

Fig. 2. The rock is very thinly laminated, on a milimetre scale. These laminae have been disturbed by later processes: dissolution (numerous stylolites are seen), deformation by tectonic events (faulting and sliding phenomena are visible) and redeposition of calcareous material (notably in hollows produced by mechanical processes). Still the laminae seem to be original sedimentary features.

Thin sections of this laminated limestone (Fig. 3A & B) confirm this, and prove its origin as stromatolite. Distinct irregularly spaced, crinkly dark coloured banding is seen, resembling algal stromatolite features such as described and figured in Flügel (1977, 1982) and Wray (1977).

Discussion

Oen et al. (1986) described skarns containing probable microbial fossils from the siltstone-slate member that overlies the Middle Leptite Group from which the stromatolites are reported in this note. These microbial microspheroids are interpreted as fossilized organic mats, produced by microorganisms of cyanophytean affinities. The stromatolite limestones at Grimsudden were likewise produced by blue green algal mats. The limestone lenses in the leptites from Bergslagen then would represent lens-like shallow water deposits, that originated during prolonged standstills of volcanoclastic sediment production. It is noteworthy that both in Sundius (1923) and Kuipers (1987) maps of the region, limestone tracts are found present along the boundary lines of their lithostratigraphic units. A more detailed study of the Bergslagen limestones and their stratigraphic position may help to unravel facial and spatial relationships of metasediment bodies in this fascinating mid-proterozoic area.

Acknowledgements

Dr. J.H. Baker helped during fieldwork; discussions with Prof. I.S. Oen are gratefully remembered.

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