Examples of glacigenic sediments and erosional events on the Mid-Norwegian continental shelf

RUNE MOGENSEN

Mogensen, R. 1987: Examples of glacigenic sediments and erosional events on the Mid-Norwegian continental shelf. *Polar Research 5 n.s.*, 333–334.

Rune Mogensen, Continental Shelf and Petroleum Technology Research Institute A/S, Håkon Magnussons gt. 1B, P.O. Box 1883 Jarlesletta, N-7002 Trondheim, Norway.

This extended abstract describes the glacial history of the Norwegian offshore area between 65–66°N from the coast to the shelf edge. Attention is focused on the Skjoldryggen moraine, which is the most impressive end moraine on the Norwegian Continental Shelf (Holtedahl 1940; Holtedahl & Sellevoll 1972; Andersen 1975). The shelf is 250 km wide in this area, and water depths vary from 90 m to 460 m. Topographical highs represent large bank areas and ridges. The eastern flank of the bank areas is bounded by longitudinal marginal channels that often mark the transition between Mesozoic sedimentary rocks and older crystalline rocks. The bank areas are separated by large transverse channels/depressions that can be followed to the shelf edge.

Seismic stratigraphy

A regional seismic sparker grid of 10 × 25 km has been used for this study. In addition, 8 gravity core samples have been analyzed to confirm the interpretation. Quaternary sediments are generally thin on the innermost part of the shelf and increase in thickness towards the shelf edge. Sediments as thick as 300–500 m are found at the shelf edge where the Skjoldryggen end moraine is situated. There is often an angular unconformity between the Quaternary sediments and the underlying sedimentary bedrock.

Based on the smooth continuous nature of the reflectors (mainly erosional) the Quaternary seismo-stratigraphy east of 8°E has been divided into five main depositional sequences (Mogensen 1986). Four of these units can be followed to the shelf edge. The different sequence borders represent a wide transverse channel, which is thought to have resulted from ice erosion. The channel can be followed from the mainland to the shelf edge, and its direction has changed from an essentially westerly to a more north-westerly direction in the younger periods. This former channel has served as a depocenter for glacigenic sediments, and at the present time it is represented by only a transverse depression (Sklinnadjupet). The Skjoldryggen end moraine (250 km long and up to 150 m high) is situated at the shelf edge of this paleochannel.

The five depositional sequences have been investigated thoroughly for internal reflectors that may give some indication of the depositional environment. The sequences are often seismically transparent, with some discontinuous weak to strong reflectors and diffraction hyperbolas. In places, there are internal reflectors typical of prograding sequences. In the distal thinner part of the prograding sequence, there is often a lateral seismic facies change from mainly transparent to seismically layered unit. The younger sequences, which have more variable thickness, frequently have internal eastwardly (landward) dipping reflectors. Examples of this configuration are seen in the Skjoldryggen end moraine (Fig. 1). The ridge accumulated during the penultimate depositional sequence. The lowermost reflector in Fig. 1 represents the base of the sequence. The westwardly dipping reflectors (usually three) are continuous on the distal side of the Skjoldryggen moraine. They can be followed parallel to the ridge over considerable distances (King et al. 1987). On the proximal slope, eastwardly dipping reflectors have angular unconformities to the westwardly dipping reflectors. The eastwardly dipping reflectors are uneven and discontinuous. These reflectors appear as local erosional events on seismic sections parallel to the moraine ridge.

Interpretation of the internal seismic configuration at the Skjoldryggen end moraine

The westwardly dipping reflectors display small scale irregularities similar to the present sea floor, and they are interpreted as paleosurfaces of the moraine ridge. This indicates that the Skjoldryggen end moraine has been accumulated during at least three stages of deposition.

The proximal side of the moraine with discontinuous erosion reflectors, is interpreted as local readvances of a grounded glacier or the gliding plane from gravity movements of the sediments. The sediments on the proximal side probably consist of ice contact deposits or proximal glacimarine sediments. The exact timing of the deposition of the end moraine is unknown, but the major depositional cycles probably occurred during the last glaciation.

References

Andersen, B. G. 1975: Glacial geology of northern Nordland, north Norway. *Nor. Geol. Unders. 320.* 74 pp.

Holtedahl, H. & Sellevoll, M. 1972: Notes on the influence of glaciation on the Norwegian continental shelf bordering on the Norwegian Sea. *Ambio Spec. Rep. 2*, 31–38.

Holtedahl, O. 1940: The submarine relief off the Norwegian coast. *Det Nor. Vidensk.-Akad. i Oslo.* 43 pp.

King, L. H., Rokoengen, K. & Gunleiksrud, T. 1987: Quaternary seismostratigraphy of the Mid-Norwegian Shelf, 65°–67°30'N. – A till tongue stratigraphy. *IKU publ. 114.* 58 pp.

Mogensen, R. 1986: *En regional beskrivelse og tolkning av kvartærgeologien i Sklinnabankområdet (65°–66°N, 8°–12°E).* Unpubl. thesis, Univ. Oslo. 154 pp.

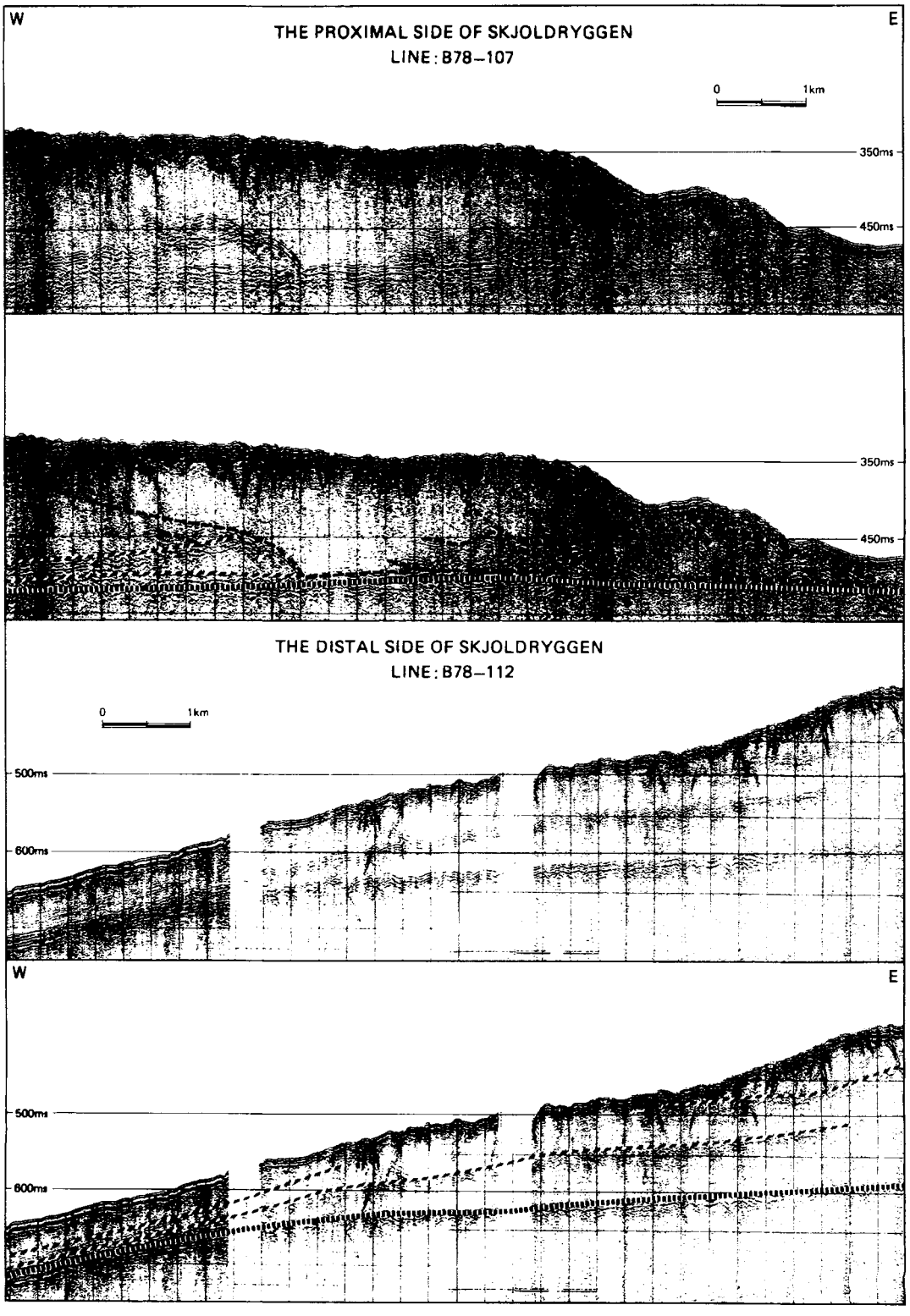

Fig. 1. Interpreted examples of sparker registrations from the Skjoldryggen end moraine.