

Thickness and Distribution of Sedimentary Rocks in the Southern Barents Sea

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Sundvor, E. 1975: Thickness and distribution of sedimentary rocks in the southern Barents Sea. *Norges geol. Unders.* 316, 237–240.

The southern Barents Sea is underlain by sediments of varying thickness and physical properties. The thick sequence of Tertiary sedimentary rocks, which is representative of the southern provinces of the Norwegian continental margin, is found only as a wedge near the shelf edge of the Barents Sea. Structures that can be associated with salt diapirs are recorded in a limited area on Tromsøflaket.

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The data presented in this short article, which is a summary of a longer paper (Sundvor 1974), show that the Barents Sea is covered by layered strata. A sediment isopach map has been constructed from all available data from the area (Plate 1). The structural information revealed by the seismic results indicates that the investigated part of the Barents Sea does not represent a uniform area. The results from various locations are therefore summarized in Table 1, in terms of average velocities.

The velocity distribution along the coast of Troms and Finnmark corresponds very well with the velocities measured by Eldholm (1970) on the southern part of the Norwegian shelf. Farther north in the Barents Sea the velocities are not significantly different from those reported by Eldholm & Ewing (1971). However, by using explosives as energy source it has been possible to penetrate the considerable thickness of sediments and record the basement velocity in the areas near the shelf edge.

In the main part of the Barents Sea, high seismic velocities (2.8–3.3 km/s) occur near the sea floor, while a low velocity (1.8–2.2 km/s) sedimentary wedge was recorded both in the shelf edge areas of the Barents Sea and along the coast of Troms and Finnmark. The seismic data confirm the suggestions made by Eldholm & Ewing (1971) and the regional geological model proposed by Frebold (1951) that the main part of the Barents shelf was emergent during the Tertiary. Eroded material from the uplifted landmass to the east was deposited in this period on the present shelf edge areas to form an upper section of prograded Cenozoic sedimentary rocks. The Paleozoic–Mesozoic succession in the main part of the Barents shelf was probably deposited during a changing pattern of transgressions and regressions in a shallow sea environ-

Table 1. Velocity structure of various areas of the continental shelf between Andøya and Bjørnøya (69°N–75°N)

Area	Average velocities (km/s)						
Coast of Troms and Finnmark	1.8	2.2	2.55	3.2	3.85		5.2
Southern Barents Sea (main shelf)			2.8	3.3	3.8	4.4	5.1
Southern Barents Sea (shelf edge)	1.75	2.15	2.65	3.4		4.35	5.05

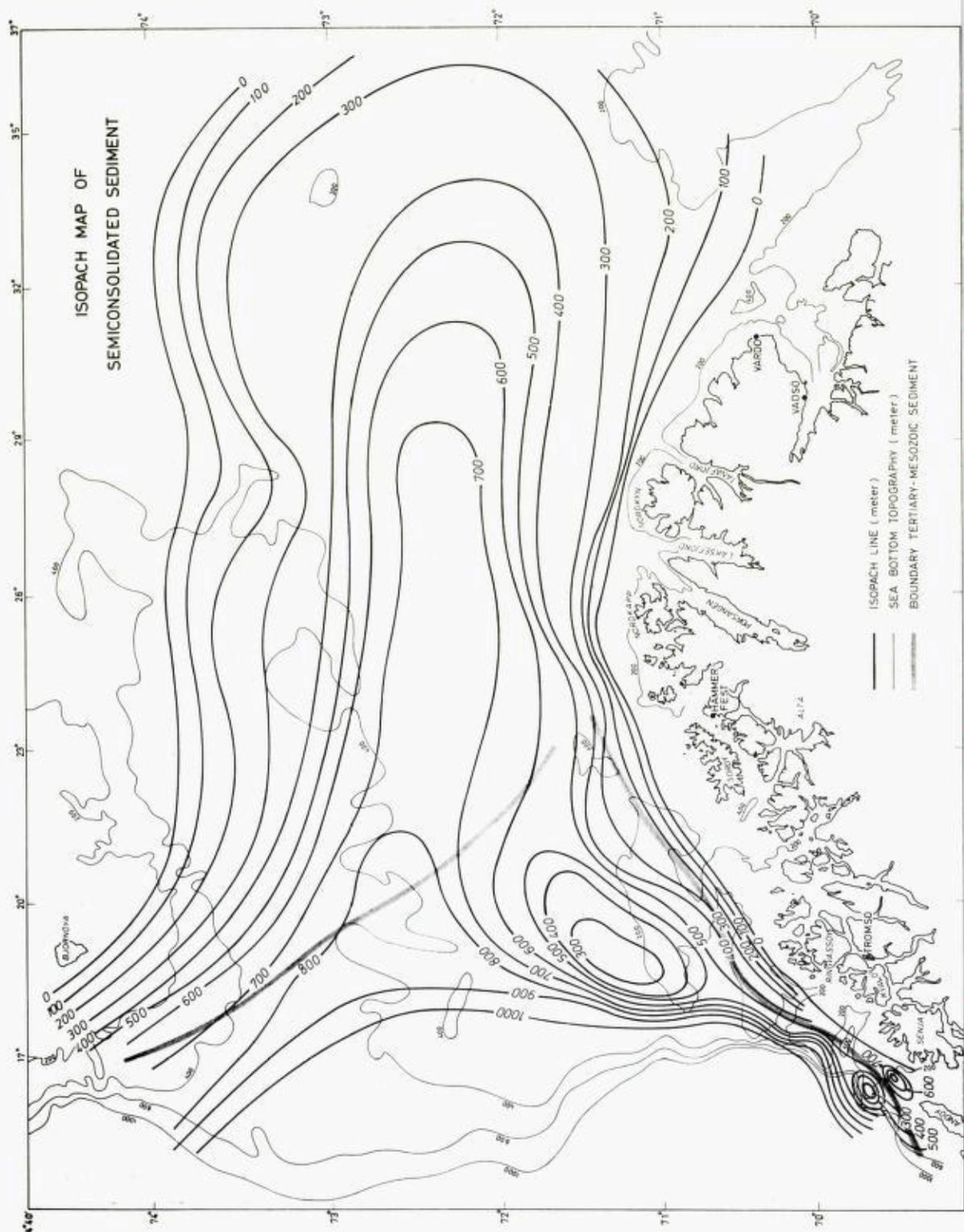


Fig. 1. Isopach map of semi-consolidated, probably Cretaceous sediment and outline of the base of Tertiary outcrop.

ment. A gentle westward-dipping basement surface is noted in the main part of the Barents shelf and there are no special structural highs in the basement topography which may reflect a continuation of the Caledonides through the western portions of the investigated area.

Previous studies in the North Sea have shown difficulties in correlating seismic velocities with the ages of Mesozoic rocks. The semi-consolidated layer in the southern Barents Sea with velocities from 2.65 to 2.8 km/s lies within the range of reported Cretaceous velocities. The continuous profiler data from the same area show that a prominent reflecting interface is present in many of the records. This layer corresponds very well with the refractor showing an increase in seismic velocities to values greater than 3.0 km/s. Fig. 1 was compiled on the basis of refraction and reflection data, and shows contours of the semi-consolidated, probably Cretaceous strata. Between the Norwegian coast and the northern parts of Bjørnøyrenna, these strata either crop out or, in some locations, are covered by relatively thin layers of Quaternary deposits, forming an apparent basin with a maximum thickness of 800 metres. Fig. 1 also outlines the areas of the base of Tertiary outcrop, dividing the southern Barents shelf into two different sedimentary provinces. West of the limit of Tertiary outcrop, the thickness of the semi-consolidated layer increases rapidly, except for the local areas north of Andøya and on Tromsøflaket where areas of a thinner sedimentary sequence are found.

In contrast to the southern provinces of the Norwegian continental shelf, some of the profiler records north of Andøya show the occurrence of faulting and tectonism. Locations of such structural features are shown in Fig. 2. The most prominent area of faulting is in the trough south of Bjørnøya. The records show that the areas of faulting and vertical movements are located in the southern parts of the trough, and that the sedimentary layers wedge out towards the north. All of these traverses lie east of the Tertiary boundary and the fault structures occur in the semi-consolidated, probably Cretaceous section. This may indicate a late Cretaceous or Tertiary age of the faulting.

The continuous reflection records show structures that appear to be diapiric in a limited area on Tromsøflaket (Fig. 2). These apparent intrusive structures occur at shallow depths and do not show internal reflecting horizons. A seismic velocity of 4.9 km/s is recorded in these structures in the refraction profile S13. The magnetometer records show no significant anomalies which can be associated with these structures, and the fact that the structures are located in an area of thick sedimentary deposits (Plate 1) strongly supports an assumption that they are sedimentary diapirs rather than uplifted crystalline basement. It has not been possible to identify the layer from which the diapiric structures have originated, but Fig. 1 shows that the semi-consolidated, probably Cretaceous sediments show a local decrease in thickness in the Tromsøflaket area. The thinned strata may very well be associated with the observed intrusive structures indicating that the structures are pre-Cretaceous in age.

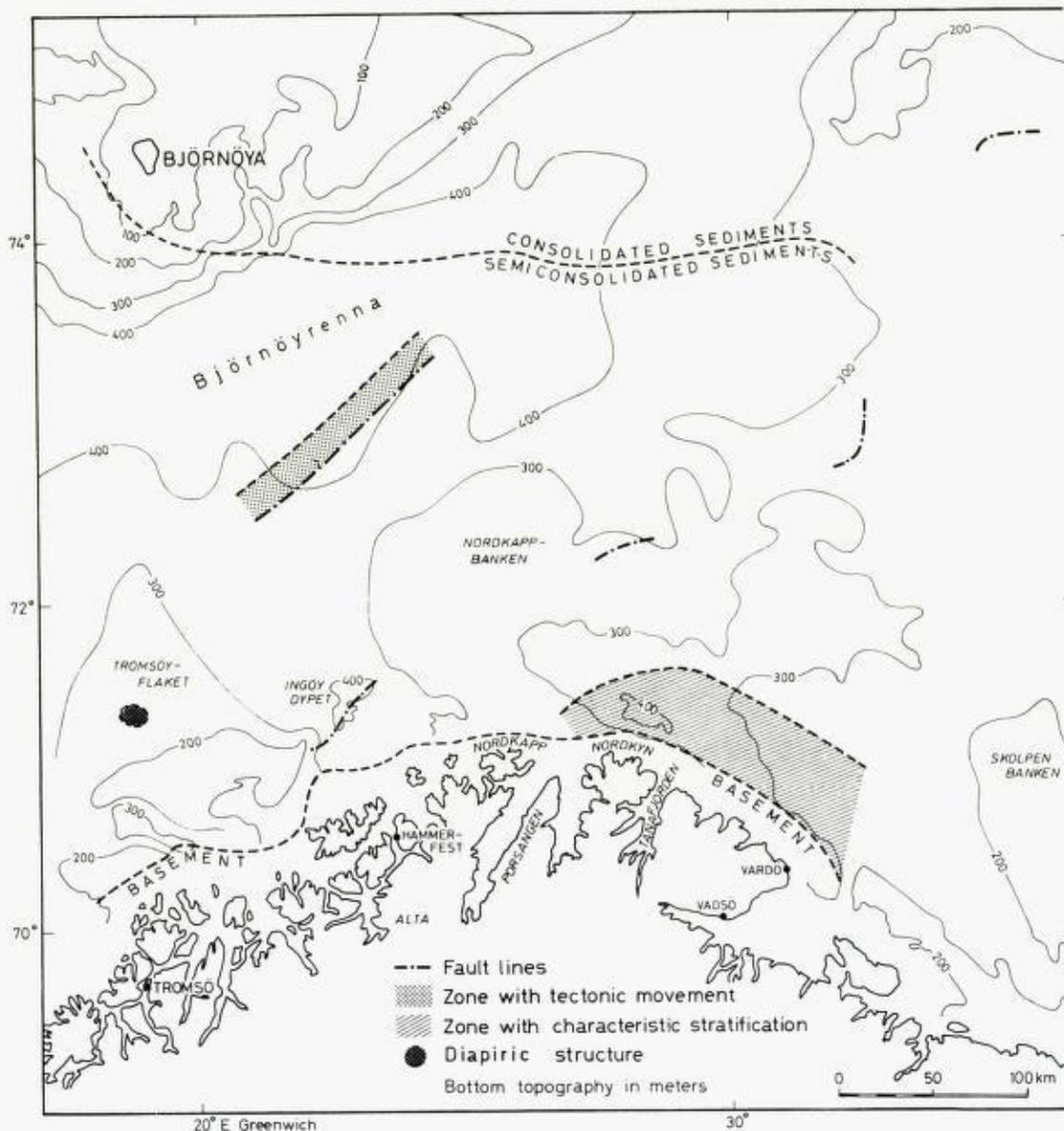


Fig. 2. Locations of structural features discussed in the text.

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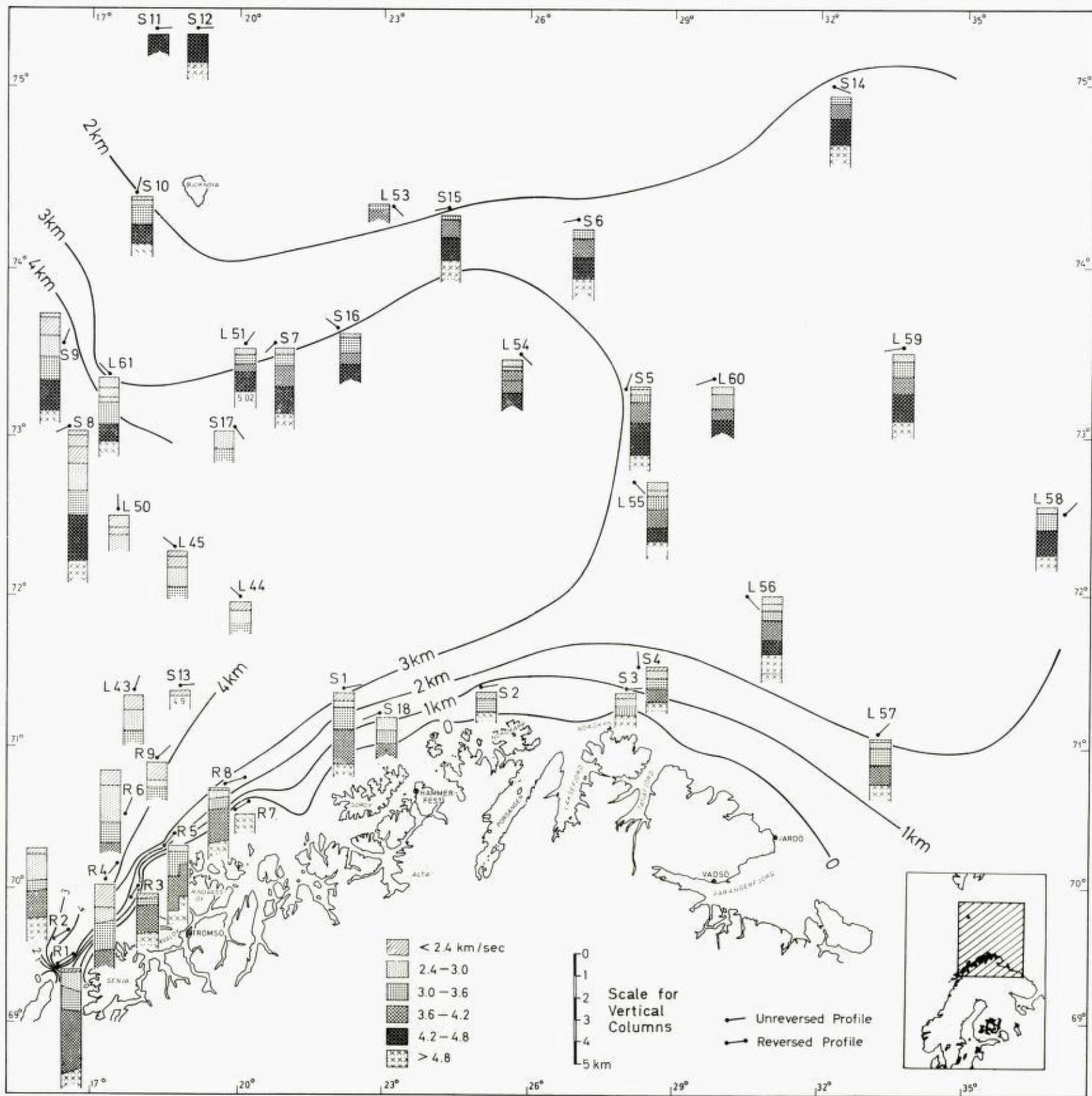


Plate 1. Map showing seismic refraction data and depths to acoustic basement.