

Note

Late Jurassic sedimentary bedrock north of Utsira, offshore western Norway

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Recent shallow marine investigations have revealed ca. 150 km² of Late Jurassic sedimentary bedrock north of Utsira in an area previously mapped as crystalline basement. The rocks, which are characteristically truncated by a marked regional planar angular unconformity further offshore, continue to rise well above this level into shallower waters. This shallower remnant is very unusual in Norwegian coastal waters not just because it survived the full force of the erosional event, but also because it is in lateral continuity with Jurassic rocks on the Continental Shelf.

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This Note is offered as a contribution to our knowledge of the bedrock geology in the coastal areas offshore western Norway. About 115 km of shallow seismic profiles were run west of Karmøy in 1988 as part of a coastal mapping programme (Fig. 1). Both digital (2.5 s record length) and analogue airgun data were collected using the Syledis Chain Sørlandet for positioning. These profiles revealed an area of sedimentary bedrock north of Utsira, closer to mainland Norway than previously supposed. A Late Jurassic age for the bedrock was confirmed from the analysis of a shallow borehole (27/9–U–1) which was drilled in May 1989 in position 59°24'14"N, 4°52'5"E with the M/S "Bucentaur". The water depth at the drilling location was 155 m and the hole was drilled to 176 m below the sea bed, having penetrated 45 m of Quaternary overburden. Details of the borehole are described by Rokoengen et al. (1989) in a confidential report that will be released at the end of 1992.

West of the Øygarden Fault Zone (Brekke et al. 1989) sedimentary deposits several kilometres thick ranging in age from Paleozoic to Quaternary are found, while the basement platform to the east has a much thinner sediment cover. From the geo-seismic cross section in Fig. 2 it can be seen that the bedrock surface in the western part of the study area is defined by a characteristic planar angular unconformity (Fig. 2, AU). This

regional erosional feature is dipping eastwards, towards mainland Norway, and has also been mapped in the northern North Sea between 60°30' and 62°N (Rokoengen & Rønningsland 1983). The nature of the erosional agent, however, is unclear. Both glacial (Sellevoll & Sundvor 1974) and fluvial/marine processes with later differential subsidence (Rokoengen & Rønningsland 1983) have been proposed.

Irrespective of the mode of occurrence, a very unusual feature in the study area is that the Jurassic subcrop is not, as elsewhere, completely truncated by the planar erosional surface, but continues to rise in a somewhat uneven fashion well above this level into shallower waters. The precise reason for this is not known, but clearly these rocks represent a Jurassic remnant that was somehow protected from the full rigour and downcutting of the regional erosive event.

Other Jurassic sediments in lateral continuity with rocks on the Continental Shelf do occur in a few shallow nearshore locations off Trøndelag (Rokoengen et al. 1988). Other nearshore sedimentary basins of supposed Jurassic age include Beistadfjorden (Vigran 1970; Oftedahl 1972), Frohavet (Oftedahl 1975), Trondheimsleia (Askvik & Rokoengen 1985) and west of Lista (Holtedahl 1988). With the exception of the Lista basin, all of them are graben structures totally confined within the basement.

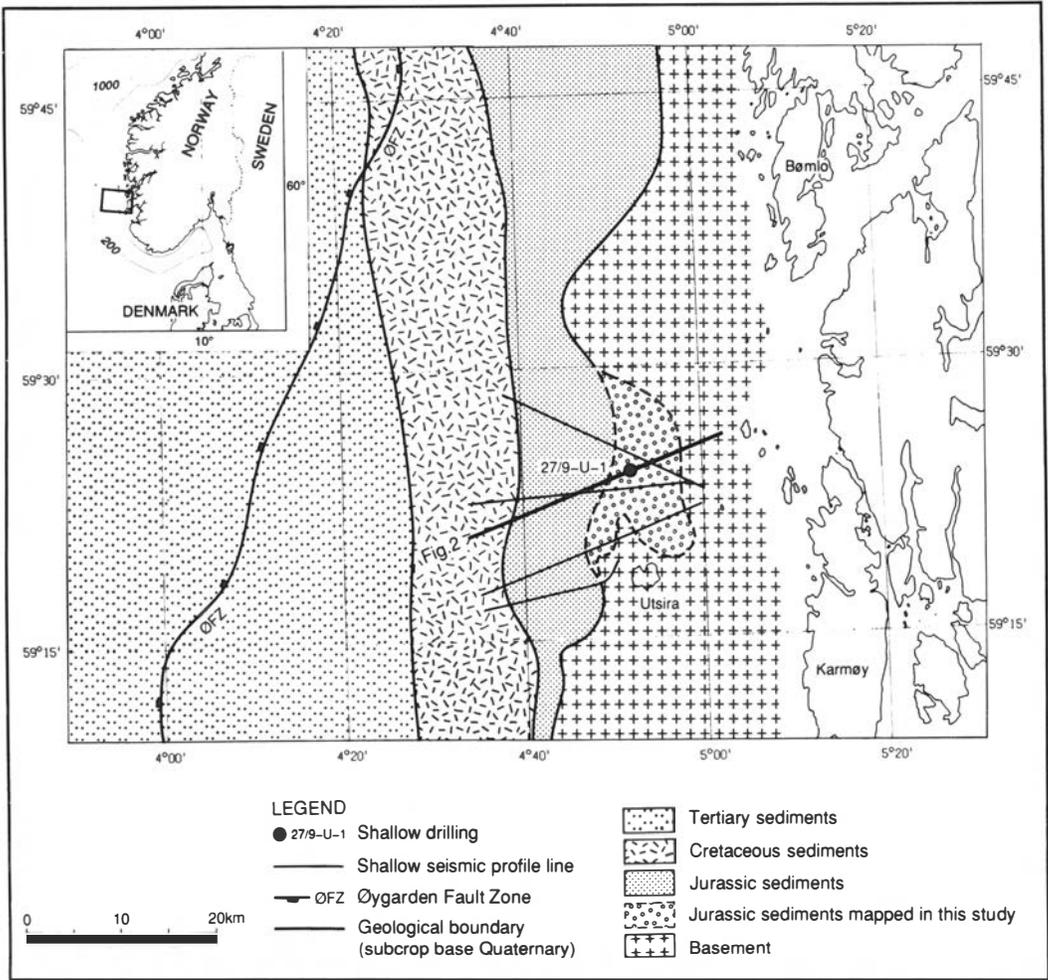
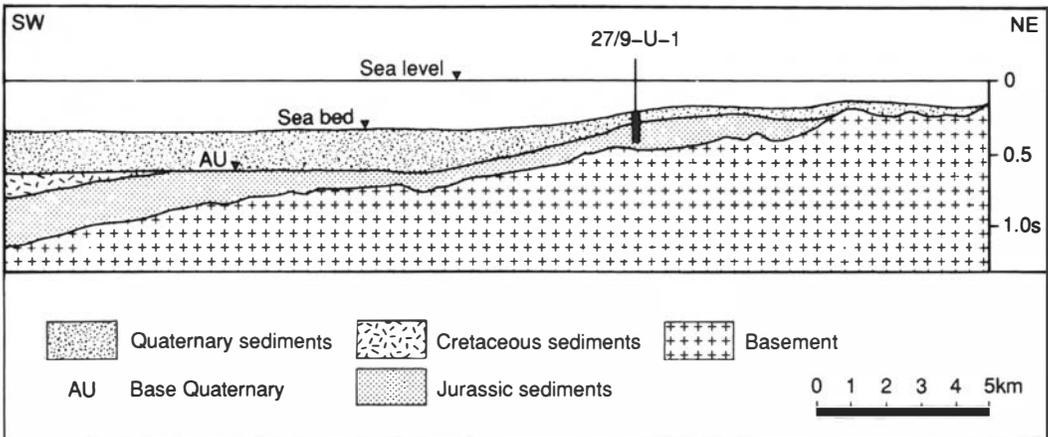


Fig. 1. Map of bedrock geology offshore Karmøy, including the locations of shallow seismic profiles and borehole 27/9-U-1. (The geo-seismic profile used for Fig. 2 is also indicated.)



Besides the novelty and significance of the Jurassic remnant, another interesting feature in the offshore area west of Utsira is the greater than 200 m thickness of overburden above the planar angular unconformity (Fig. 2). This situation, which is found northwards to 62°N (Rokoengen & Rønningsland 1983; Rise et al. 1984), is in sharp contrast to the Mid-Norwegian Continental Shelf, especially off Trøndelag and Nordland, where areas with sparse overburden are normally found in the coastal areas with thick deposits occurring along the edge of the continental shelf (Rise et al. 1988).

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Fig. 2. Schematic geo-seismic profile west of Karmøy showing the truncation of Jurassic and Cretaceous sedimentary bedrock by the planar angular unconformity (AU) and the irregular shoreward continuation of the Jurassic above this level through 27/9-U-1.