Note

The inner shelf of North Cape, Norway and its implications for the Barents Shelf-Finnmark Caledonide boundary

CHRIS TOWNSEND

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It is suggested that an E–W trending lineament mapped along the north coast of Finnmark, north Norway (Vorren et al. 1986), may be the offshore extension to the Trollfjord–Komgelv Fault. This would indicate that this fault has been active subsequent to the Caledonian Orogeny, controlling sedimentation, with subsidence to the north. Additionally, the boundary between the Barents Shelf and the Finnmark Caledonides may be a broad zone, of which only the offshore portion has been active in Cenozoic times.

C. Townsend, Cambridge Arctic Shelf Programme, Dept. of Earth Sciences, University of Cambridge, Huntingdon Road, Cambridge CB3 0DJ, U.K.

This short note has been inspired by a recent paper by Vorren et al. (1986), who have studied the Cenozoic aged sedimentation along the inner shelf of North Cape, north Norway, from shallow-seismic mapping. Vorren et al. (1986) produced a good description of the geometry of these Cenozoic aged deltaic sediments, but made little comment on the associated tectonics. However, as I

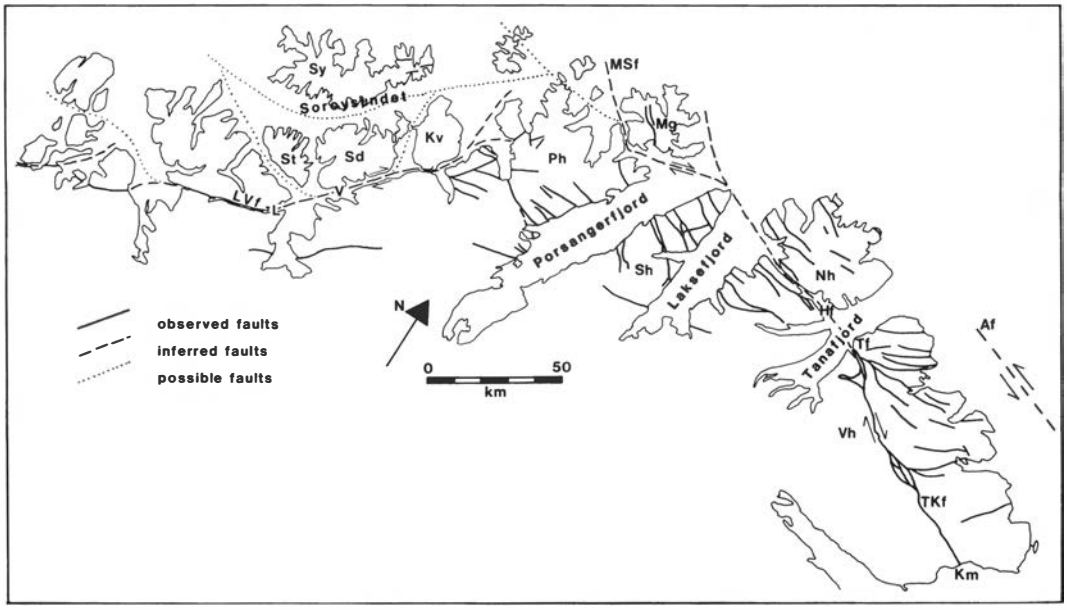

Fig. 1. Map of Finnmark, outlining the position of the steeply dipping faults which have been observed, inferred or which may form lineaments (possibly faults), compiled from the maps of Passe (1978), Hayes (1980), Rice (1982), and Sigmond et al. (1984). See Fig. 2 for abbreviations.

am a structural geologist interested in the fault systems of the Finnmark region, I believe that the seismic mapping of Vorren et al. (1986) has far-reaching consequences for the structure of the north coast of Finnmark, in particular the Trollfjord–Komagelv Fault and the orientation and type of boundary between the Barents Shelf and the Finnmark Caledonides. This note aims to interpret the structure inferred by the shallow seismic mapping of Vorren et al. (1986) and put it into a regional perspective.

There are three structural observations about the north coast of Finnmark which can be stated from the study of Vorren et al. (1986).

(1) A prominent lineament has been detected which has an approximate E–W trend (see Figs. 1b & 6 of Vorren et al. 1986). This feature is an escarpment; it marks the point at which the sub-marine deltas diverge; it is the line across which sediment thickness rapidly increases northwards; and the upper regional unconformity suddenly increases in depth across it. Sedimentary rocks (of Carboniferous (?) age) occur to the north of this lineament, whereas to the south only Caledonian basement is detected.

(2) The base of the escarpment has been observed to be faulted along the lines 7 and 24 of Vorren et al. (1986).

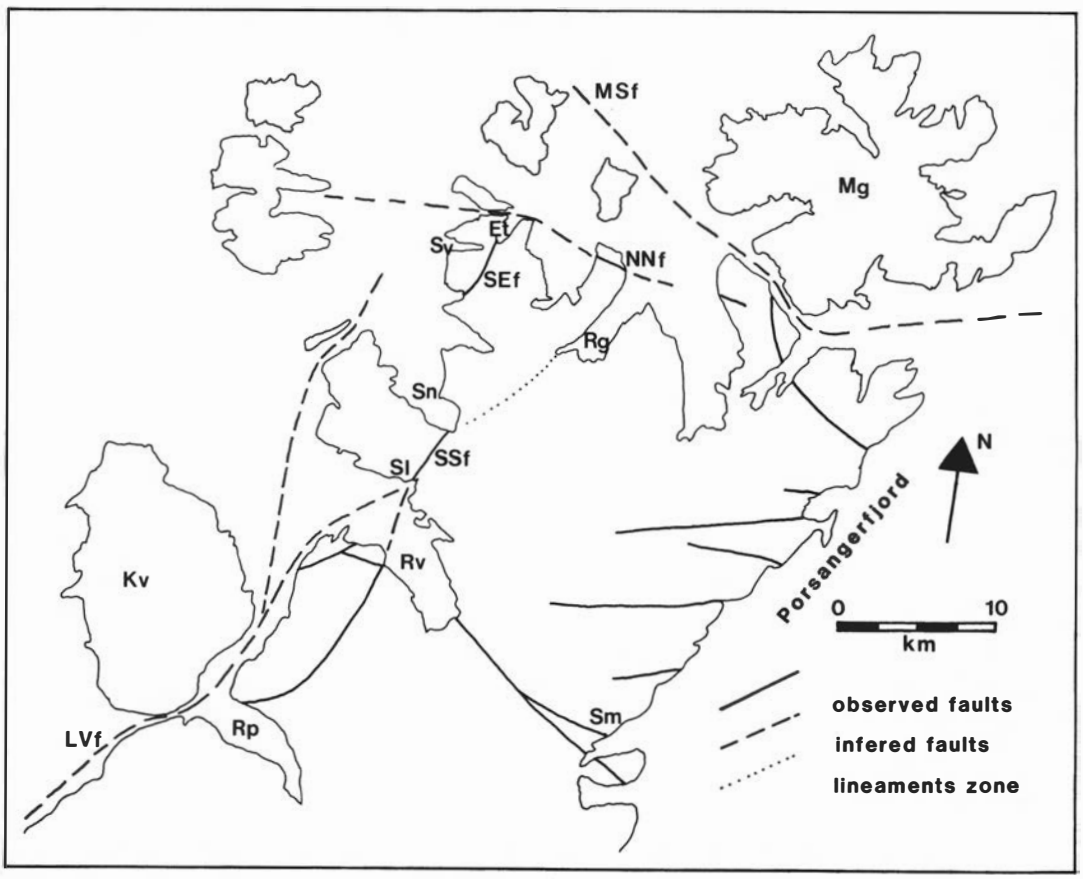

Fig. 2. A more detailed map of Porsangerhalvøya, Finnmark, outlining the position of vertical faults, many of which have a strike-slip or extensional displacement, after Passe (1978), Hayes (1980) and Rice (1982). Abbreviated fault names; Af = Austhavet fault, LVf = Langfjord–Vargsund fault, MSf = Magerøysundet fault, NNf = Njoal Neset fault, SEf = Selvika–Eiterfjord fault, SSf = Snøfjord-Slatten fault, and TKf = Trollfjord-Komagelv fault. Abbreviated local names; Et = Eiterfjord, Hf = Hopsfjord, Km = Komagelva, Kv = Kvaløya, L = Langfjord, Mg = Magerøy, Nh = Nordkynnhalvøya, Ph = Porsangerhalvøya, Rg = Ryggefjord, Rp = Repparfjord, Rv = Revsbotn, Sd = Seiland, Sh = Sværholthalvøya, Sl = Slatten, Sm = Smørfjord, Sn = Snøfjord, St = Stjernørya, Sv = Selvika, Sy = Sørøya, Tf = Trollfjord, V = Vargsund, and Vh = Varangerhalvøya.

(3) In the profiles across the Hjelmsøya and Måsøy Deltas several significant steps occur along the boundary between the basement and the younger rocks.

The geology of east Finnmark is dominated by a major strike-slip fault, the Trollfjord–Komagelv Fault (Fig. 1), which has had a Proterozoic to Lower Paleozoic displacement of over 500 km, according to the palaeomagnetic evidence of Kjøde et al. (1978). Other faults have also been mapped between Tanafjord and Porsangerhalvøya with a similar orientation to the Trollfjord–Komagelv Fault (Passe 1978; Hayes 1980; Rice 1982; Sigmond et al. 1984) and a series with a NE–SW trend along the northwest coast of Finnmark (see Figs. 1 & 2). The offshore continuation of the Trollfjord–Komagelv Fault has not yet been convincingly detected (Gabrielsen 1984). Gabrielsen (1984) suggested that to the north of Magerøy the fault has a WNW–ESE trend parallel to that of east Finnmark. However, on Nordkynnhalvøya, the Trollfjord–Komagelv Fault changes its orientation to almost E–W (Fig. 1).

In view of the E–W and WNW–ESE trending faults of Finnmark, I would like to put the following points forward for discussion about the lineament detected by Vorren et al. (1986):

(1) The lineament which Vorren et al. (1986) mapped is possibly the offshore continuation of the Trollfjord–Komagelv Fault or maybe a splay from this major fault.
(2) To the north of this lineament, subsidence has occurred during several phases since the Caledonian Orogeny, largely controlling sedimentation. Subsidence rarely occurs without faulting, which would suggest that the lineament is a fault.
(3) It is possible that there are more faults present within the basement complex than have been recognised on the shallow seismic records. These faults may form the prominent steps along the boundary between the basement and the younger sediments, and they may be detected by seismic mapping to greater depths.

These points would have several implications for the Trollfjord–Komagelv Fault in that they would indicate that the fault has been active more recently than the Caledonian Orogeny and that the boundary between the Finnmark Caledonides and the Barents Shelf region is possibly considerably wider than previously recognised. The width of this boundary may be as large as 50 km with only the offshore portion reactivating after the Caledonian Orogeny.

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