Primary and tectonic basement-cover relationships in northernmost Vestranden, central Norwegian Caledonides

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Unconformities between the granitoid basement and metasedimentary rocks have been recognized in the Folda–Vikna area of northernmost Vestranden, Norway. The rocks, which are autochthonous in relation to the basement, are represented by two geographically isolated exposures of conglomeratic psammites. The conglomeratic rocks are tectonically overlain by a dominantly supracrustal sequence, the Folda cover. This cover sequence displays a highly irregular lithological variation. The most complete lithostratigraphy is found in the eastern part of the Folda–Vikna area, while many rock types have been sheared out in the west. The tectonic relationships between the Folda cover and other cover sequences as well as the basement have been strongly disturbed by folding, metamorphism and late strike-slip faulting. Despite this Caledonian reworking and the lack of fossils in the Folda cover, some conclusions can be drawn regarding its tectonostratigraphic position and possible correlation with tectonic units farther east. Most previous work correlates the Folda cover with the Seve Nappes of the Upper Allochthon. In contrast, this paper argues that the Folda cover must occupy a higher tectonic position.

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In the Scandinavian Caledonides, Precambrian granitoid gneiss basement extends from the exposed front of the orogen in the east, via various antiformal windows and culminations, to the Vestranden hinterland along the western coast of Norway (Gee et al. 1985). Above this basement, the principal allochthonous nappe units thin westwards. Most of them wedge out completely, but some reappear far in the west as lenticular bodies (Gee 1978). In the hinterland, units that are high in the tectonostratigraphy may therefore rest immediately atop or closely above Precambrian crystalline rocks of the Parautochthon and /or the Lower Allochthon (Gee et al. 1985).

In Bindal and the Folda–Vikna area of northernmost Vestranden (Fig. 1), these Precambrian basement rocks are structurally overlain by and folded into a heterogeneous, mostly tectonically-emplaced cover of metasedimentary and metaigneous rocks. In the higher units of this cover, there are granite bodies of a kind which is not found in the basement (Nordgulen & Schouenborg in press; Schouenborg 1988). Much of the cover is thus allochthonous. The highest units form part of the Helgeland Nappe Complex (HNC), which rests immediately atop the cover sequences of Vestranden. In the Folda–Vikna area (Fig. 1), the status of the cover rocks (autochthonous or allochthonous in relation to the basement) has been much disputed over the years (cf. Schouenborg 1986 and references therein).

Vestranden is an area of polyphase tectonothermal activity, comprising isoclinal folding, thrusting, high-grade metamorphism and late cataclasis, making it difficult to interpret the tectonostratigraphy (Birkeland 1958; Ramberg 1973; Råheim 1972). Accordingly, most of the basement-cover contacts are concordant as a result of Caledonian deformation (Bryhni & Brastad 1980; Rutland & Nicholson 1965). However, there are also sites in north-central and northern Trøndelag where original discordant relationships between basement and overlying metasedimentary rocks can be established despite Caledonian overprinting (Gee 1980, this study).

The present paper treats the critical geological relationships of the various cover units in the Folda–Vikna area of northernmost Vestranden, describes their relationships with the basement

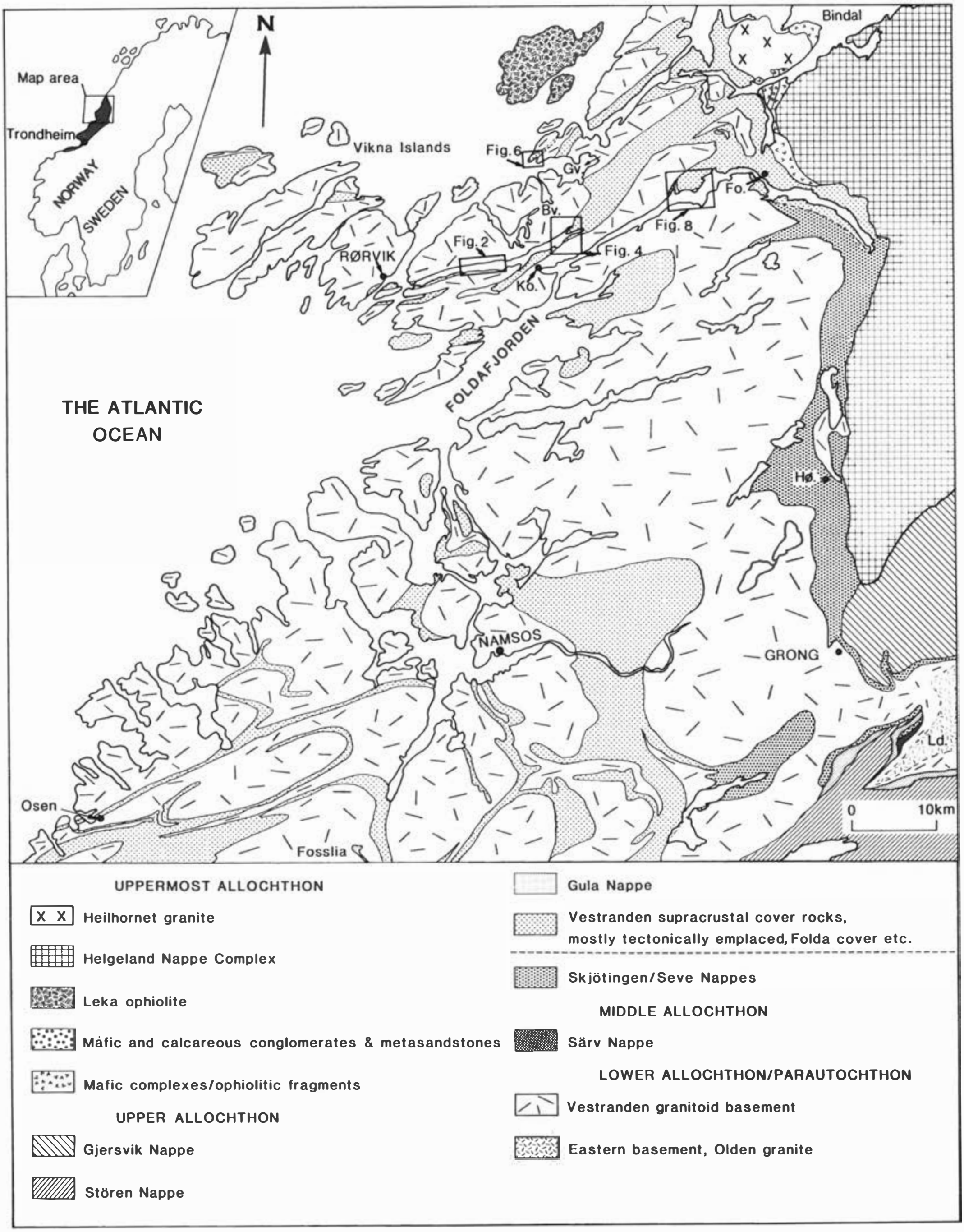

Fig. 1. Geological map outlining the main tectonic units of west-central Scandinavian Caledonides. The part of the figure south of Foldafjorden is largely based on an unpublished compilation of the bedrock geological map sheet Namsos 1:250 000 (Solli pers. comm. 1988). Vestranden is the shaded area on the inset map. The tectonic position of the Vestranden supracrustal rocks is not determined. Some may be equivalents of the Skjötingen/Seve Nappes, while others are of a higher position. That is the reason why different patterns are used without fixed boundaries. The areas of Figs. 2, 4, 6 and 8 are also marked. Abbreviations: Bv = Blåvatnet, Gv = Gravik, Ko = Kolvereid, Fo = Foldereid, Hø = Høylandet, Ld = Lurudal.

and discusses possible correlation with the well-established tectonostratigraphy of the Scandinavian Caledonides.

Tectonostratigraphy

The basement of the Folda–Vikna area is dominated by granitoid, migmatitic gneisses, paragneisses and, in places, augen gneisses. These rocks are overlain by various cover sequences (Birkeland 1958; Kollung 1967; Schouenborg 1986, 1988). Banded, heterogeneous supracrustal rocks and amphibolites of uncertain stratigraphic position occur interlayered with the gneisses. These rocks have been affected by at least one of the migmatization events affecting the granitoid basement.

Atop the basement, three cover sequences have been identified. The lowermost unit unconformably overlies the basement. It consists of an isolated exposure of psammites containing a polymictic conglomerate and is referred to as the 'Fosså formation' (Fig. 2). A probable correlative of the 'Fosså formation' is the 'Horven formation' (Fig. 4), another isolated exposure of metasedimentary rocks comprising similar psammitic rocks. These metasedimentary rocks are imbricated with the basement and tectonically overlain by the Folda cover. Migmatite veins in this subjacent basement never cross the contacts with the Folda cover (Schouenborg 1986). This cover sequence consists of garnet-rich micaceous gneisses and schists, meta-sandstones, greyish-green calc-silicate gneisses, metapelites, marble, mafic dykes and scarce, isolated, small ultramafic bodies. These rocks were metamorphosed in the upper amphibolite facies (Kollung 1967; Schouenborg 1986).

In northernmost Vestranden, these lithologies are overlain by the HNC. The HNC is separated from the Folda cover by a complex fault zone

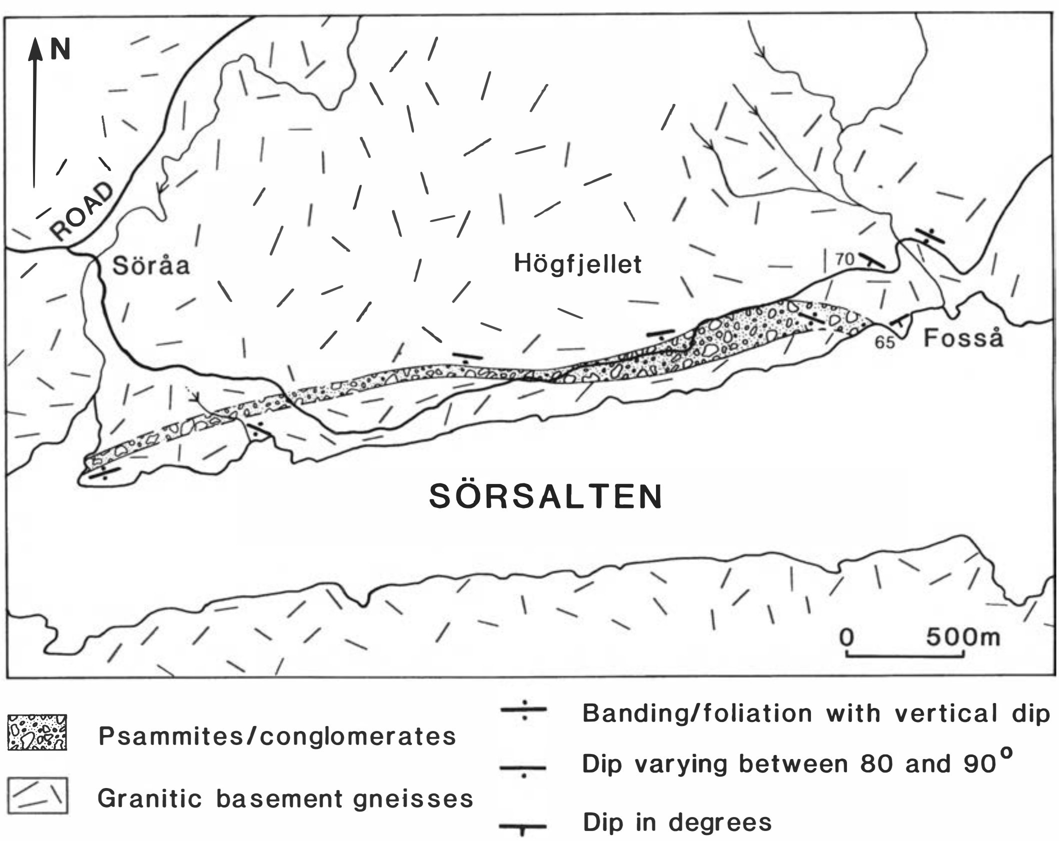

Fig. 2. Geological sketch map of the Fosså–Söråa area north of the Sörsaltenfjord. Location is shown in Fig. 1.

characterized by large-scale imbrication including granitoid rocks and ophiolitic fragments with associated greenschist metasedimentary rocks, all belonging to the HNC (Nordgulen & Schouenborg in press). The Heilhornet Pluton (Fig. 1) cuts this imbricated contact (Husmo & Nordgulen 1988). The pluton also intrudes supracrustal rocks of the Folda cover. However, it does not penetrate the orthogneisses of the Vestranden basement. The southwestern part of the HNC in the area considered here has also been described by Roberts et al. (1983), Thorsnes (1987), Husmo & Nordgulen (1988) and Nordgulen & Schouenborg (in press) and will not be described further here.

Lowermost cover rocks

The 'Fosså formation'. – At Fosså (Fig. 2), ca. 12 km east of Rørvik (Fig. 1), an isolated exposure of psammites and conglomerates can be traced

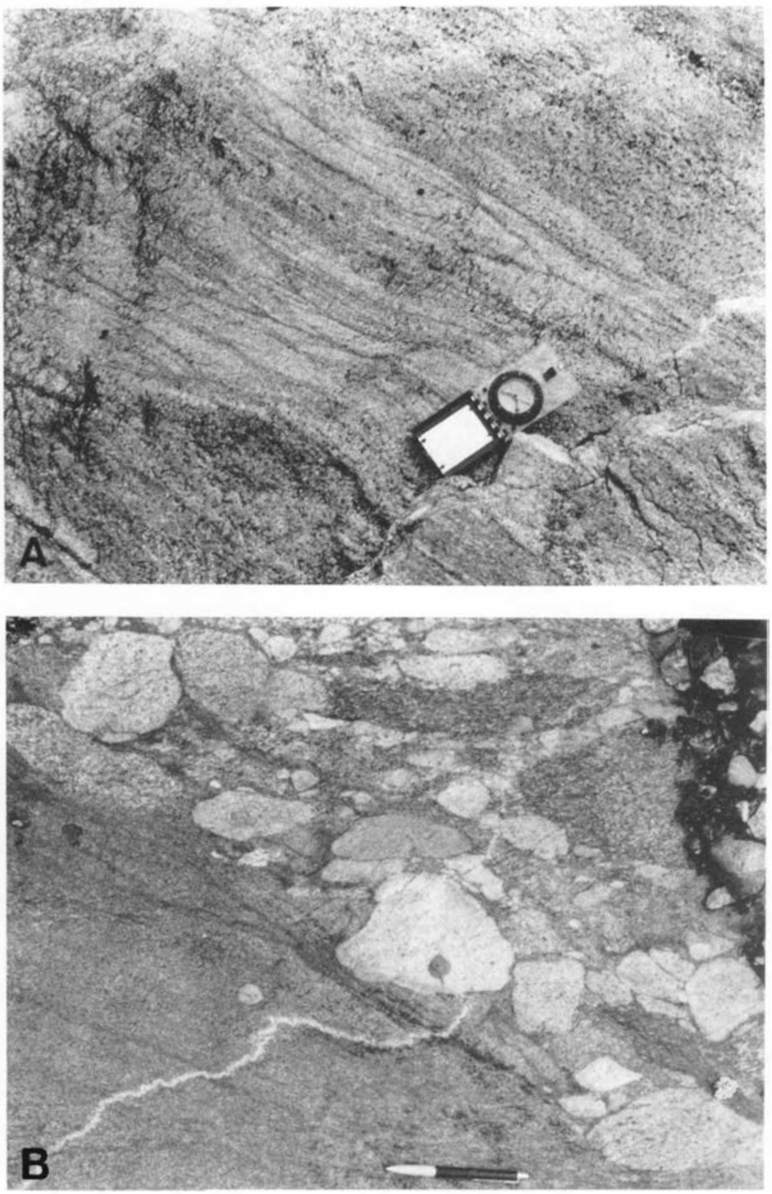

Fig. 3. Photographs of the Fosså formation. A. Exposure of a low-strain zone with probable cross-bedding. B. Alternating layers of metasandstone and basal conglomerate with rounded and angular clasts. C. Pegmatite veins and neosomes in a strained zone of metasedimentary rocks close to the basement. D. High-strain zone with rodding of conglomerate clasts.

continuously for 6 to 7 km along strike. The rocks are exposed particularly well along the road between Fosså and Søråa. They feature local unconformable relationships with the gneissic basement. The latter has predominantly granitic to granodioritic compositions and is, in places, feldspar porphyritic. Locally, ca. 1.5 m thick mafic dykes are oriented subparallel to the gneiss foliation without intruding the metasedimentary rocks. Late pegmatites ranging from tens of centimetres to 1 m in width cross-cut both the basement and the cover rocks.

Apart from the conglomerates, the Fosså metasedimentary sequence consists of greyish-white subarkoses and light-grey arkoses reaching 70 m in thickness. Quartz, K-feldspar and plagioclase are the main minerals; in places, secondary muscovite and magnetite are also abundant constituents. Variation in feldspar content is responsible for a distinct compositional layering.

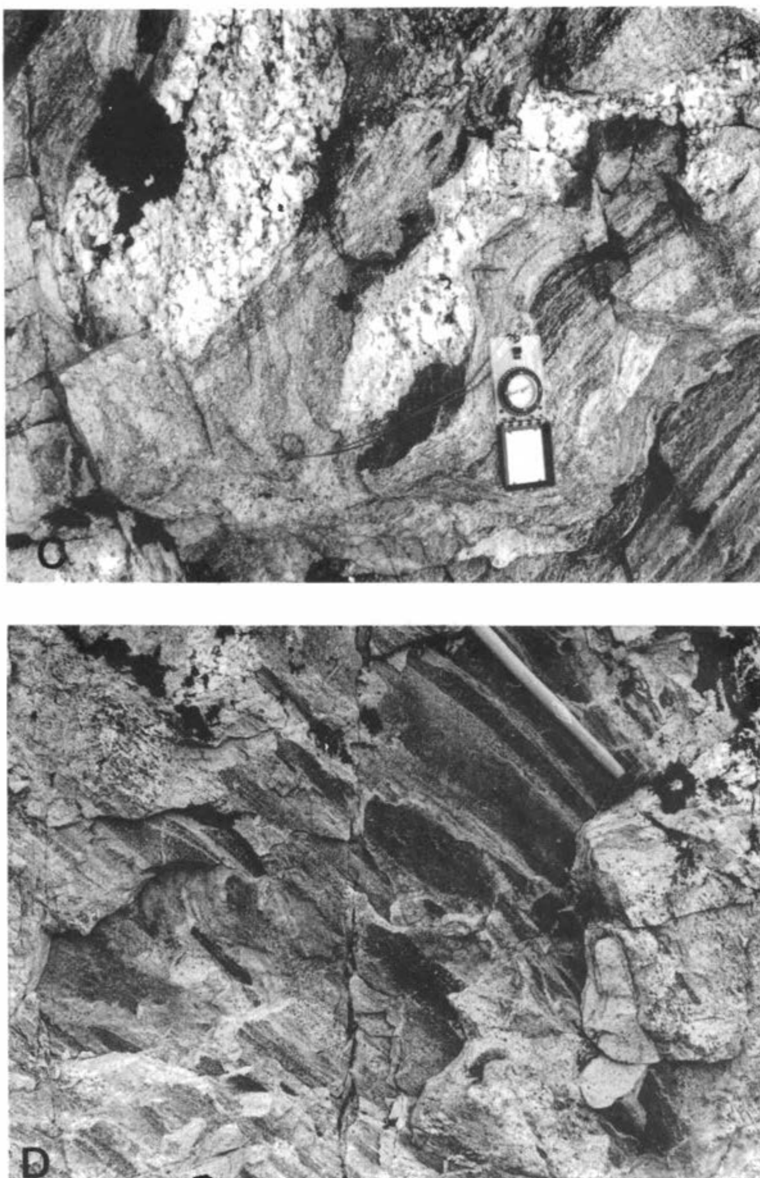

Fig. 3 (cont.)

In the hinge of a tight, steeply E-plunging fold, possible relict cross bedding is exposed (Fig. 3A). A schistosity is particularly prominent in the fold limbs where the metasedimentary rocks are developed as flagstones. At two localities along the road, conglomerate pebbles and boulders are exposed at the contact with the basement gneisses (Fig. 3B).

Twenty-one clasts were examined in thin section. The clasts are made up of granitic-granodioritic rocks, similar to the basement beneath the unconformity, as well as of arkosic and subarkosic rocks. Most metasedimentary clasts are fine-grained, while those of granitic-granodioritic composition are usually fine- to medium-grained. Migmatite neosomes can sometimes be found in the conglomeratic layers close to the basement contact (Fig. 3C). All rocks are extensively recrystallized. Quartz-grains frequently show triple points. Antiperthite, microcline string-perthite and myrmekite are common in all granitoid and metasedimentary clasts. Epidote and chlorite are found frequently in the basement rocks as products of later metamorphism.

Locally, the metasedimentary rocks and basement gneisses are highly sheared and display a strong ESE-plunging lineation and a nearly vertical, E–W trending foliation. In these zones, the clasts are strongly elongated. Boulders and pebbles originally ranging in diameter from some centimetres to a few decimetres are in places stretched out to rods reaching one metre in length (Fig. 3D).

Polymictic conglomerates have not been found elsewhere in the Folda–Vikna area.

The 'Horven formation'. – At Horven (Fig. 4), 10 km ENE of the Fosså formation, a cover unit of psammitic rocks ranging in composition from reddish arkoses to white quartz-arenites is tightly interfolded with mainly granodioritic basement gneisses. The most quartz-rich rocks tend to make up ridges, whereas the arkoses and gneisses form topographical depressions. Both faulting and iso-

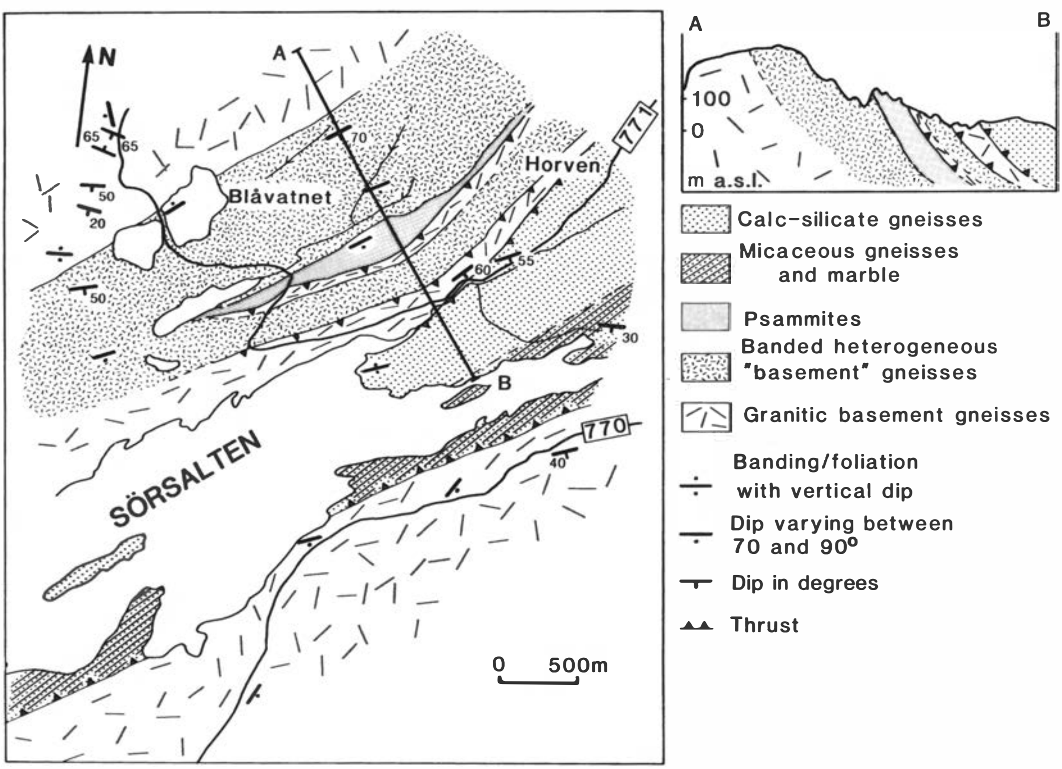

Fig. 4. Geological map of the Horven area at the inner part of the Sörsaltenfjord (Fig. 1). The figure also shows a simplified profile across the basement-cover contacts. Note the vertical exaggeration.

clinal folding of the cover and basement rocks contribute to the metre-scale alternation observed in the field.

The contacts between the granodioritic rocks and the metasedimentary rocks are apparently concordant (Fig. 5A). Some contacts lack traces of deformation and could be primary, others have been affected by faulting and the original relationships are difficult to assess. Bedding is still preserved in many of the psammites. In addition, two types of pebbles are present in these metasedimentary rocks. Pebbles, composed of quartz and some fibrolite (Dag Bering pers. comm. 1988), reaching 5 cm in diameter, usually occur close to the basement contact (Fig. 5B). These pebbles may represent a monomictic conglomerate. The second type represents a pseudoconglomerate. It has been produced by the rotation of sheared and broken fragments of thin quartz-rich layers in the metasedimentary rocks (Fig. 5C).

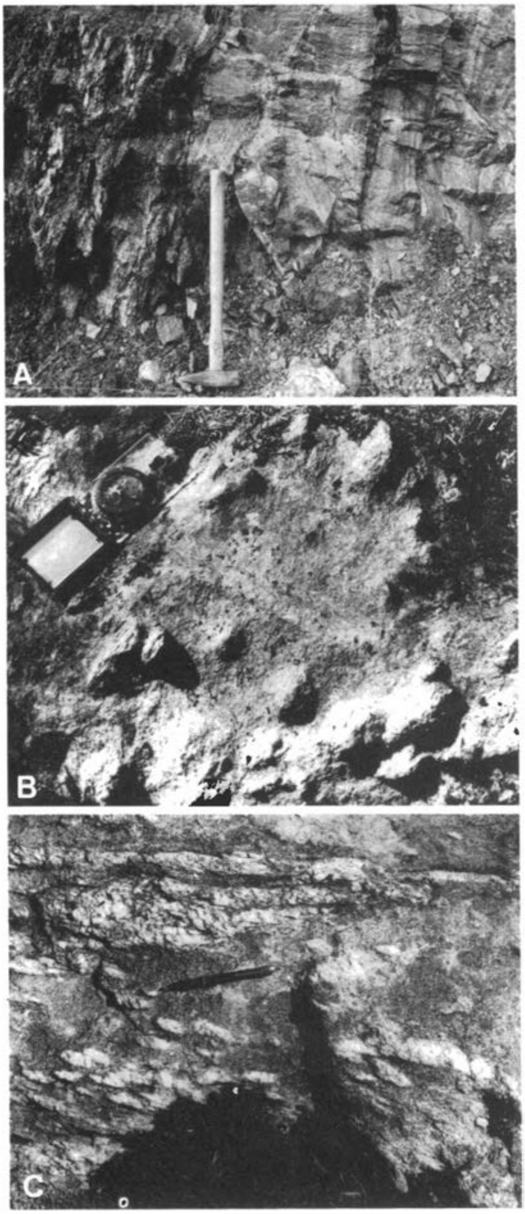

Fig. 5. Photographs of the Horven formation. A. Apparently concordant contact between quartzites to the right of the hammer and heterogeneous 'basement' gneisses (Blåvatnet type) to the left. B. Quartz-pebbles in the psammites close to the basement. C. Quartz-pseudopebbles produced by shearing of minor quartz-veins or quartz-layers.

The metasedimentary rocks and the granodiorites have been welded together during migmatization. The arkoses display evidence of partial melting such as the development of neosome veinlets. They can only be recognized as arkoses due to their high contents of quartz, reaching 70% by volume in most samples.

A coarsening of the metasedimentary rocks has developed at their immediate contacts with the basement. This happened prior to the development of a penetrative Caledonian foliation. The foliation, which is best exposed in the basement rocks and the arkoses, strikes NE–SW and dips steeply SE.

To the south, the metasedimentary rocks at Horven are overlain tectonically by slices of migmatized granodioritic basement rocks, supracrustal rocks of uncertain tectonostratigraphic position (Blåvatnet type, see below) and metasedimentary rocks of the Folda cover (Fig. 4).

Local outcrops of pebbly psammites similar to those at the Horven locality are present 7 km northeast of the 'Horven formation' along the direction of strike.

The Folda cover

An allochthonous rock sequence has been identified in the Folda–Vikna area by tectonic and metamorphic discontinuities against the basement (Schouenborg 1986). In contrast to the metasedimentary rocks described above, the migmatization recorded in the basement did not affect the Folda cover. Metamorphic assemblages and garnet–biotite thermometry indicate that post-thrusting metamorphism of the Folda cover at the most reached the almandine–amphibolite facies metamorphic grade (Kruhl 1984; Schouenborg 1986). Furthermore, the Folda cover contains trondhjemite dykes not present in the basement beneath (Schouenborg 1988).

Due to the frequent irregular variation in the lithologies of the Folda cover there has been some uncertainty as to which rocks should be included in this unit. The most complete lithostratigraphy is found in the east, whereas many lithologies are lacking in the west. In general, the Folda cover consists of the following rocks: garnet–biotite gneisses/schists at the base followed by greyish-green calc-silicate gneisses, quartzites, marble, metapelites, quartzo-feldspathic gneisses, mafic dykes, scarce minor ultramafic rocks and micaceous schists (Kollung 1967; Schouenborg 1986).

To illustrate the complex and sometimes ambiguous relationships between the Folda cover and the basement, two key localities are described below.

The Eiternes – Sandvika area (Fig. 6). – A supracrustal sequence of intensely folded marble and quartz-rich metasedimentary rocks (Fig. 7A) occurs in the northern part of the 'Eiternes–Sandvika' locality. In some places, slices of mylonitic calc-silicate rocks are present at the immediate basement contact. Subsequent to their emplacement, these rocks became tightly infolded in a basement of heterogeneous, migmatized, granodiorite gneisses.

A migmatitic banding in the basement gneisses is cut by younger migmatite veins (Fig. 7B) that do not penetrate the cover rocks. There is a marked concentration of strain towards the contact between the metasedimentary rocks and the migmatized basement (Fig. 7C). Recrystallized augen mylonites occur in the basement rocks abutting on the isoclinally folded cover sequence. The fold-axes trend approximately E–W and are horizontal or plunge gently to the east. The style of folding changes southwards, away from the marble and the quartz-rich metasedimentary rocks, to become more gentle and open. This change roughly coincides with a moderately E-dipping and variably striking zone of cataclastic deformation within the basement ca. 50 m south of the contact with the metasedimentary rocks. Pseudotachylites and late high-angle faults, some of them conjugate, cut across all structures and complicate the deformation pattern.

Towards the southwest, the basement is overlain by gently folded, greyish-green calc-silicate gneisses and garben-schiefer. A zone of metre-scale imbrication separates these calc-silicates

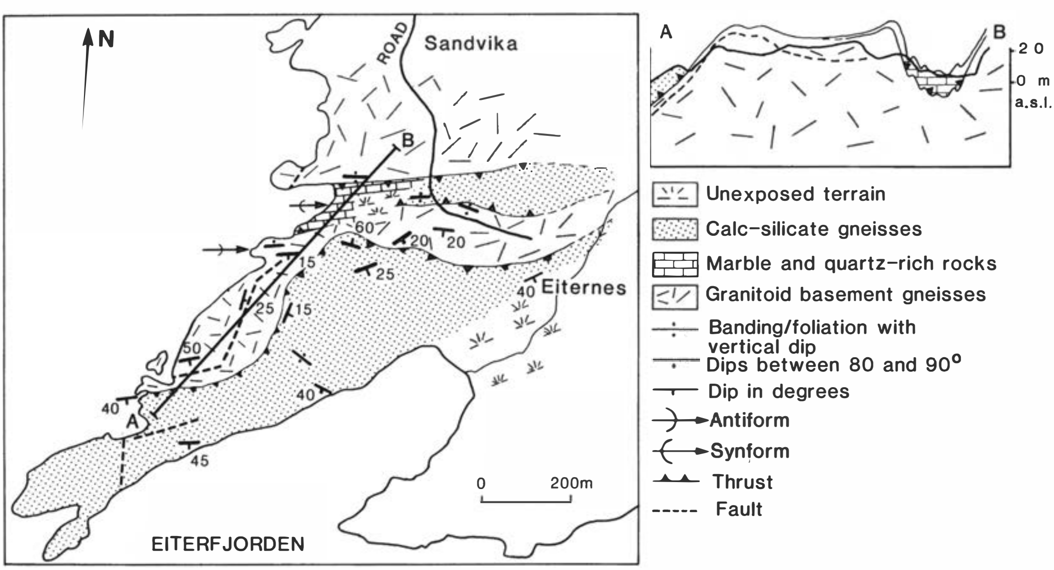

Fig. 6. Geologic sketch map of the Eiternes–Sandvika area (Fig. 1). The figure also shows a simplified profile across the basement-cover contacts. Note the vertical exaggeration.

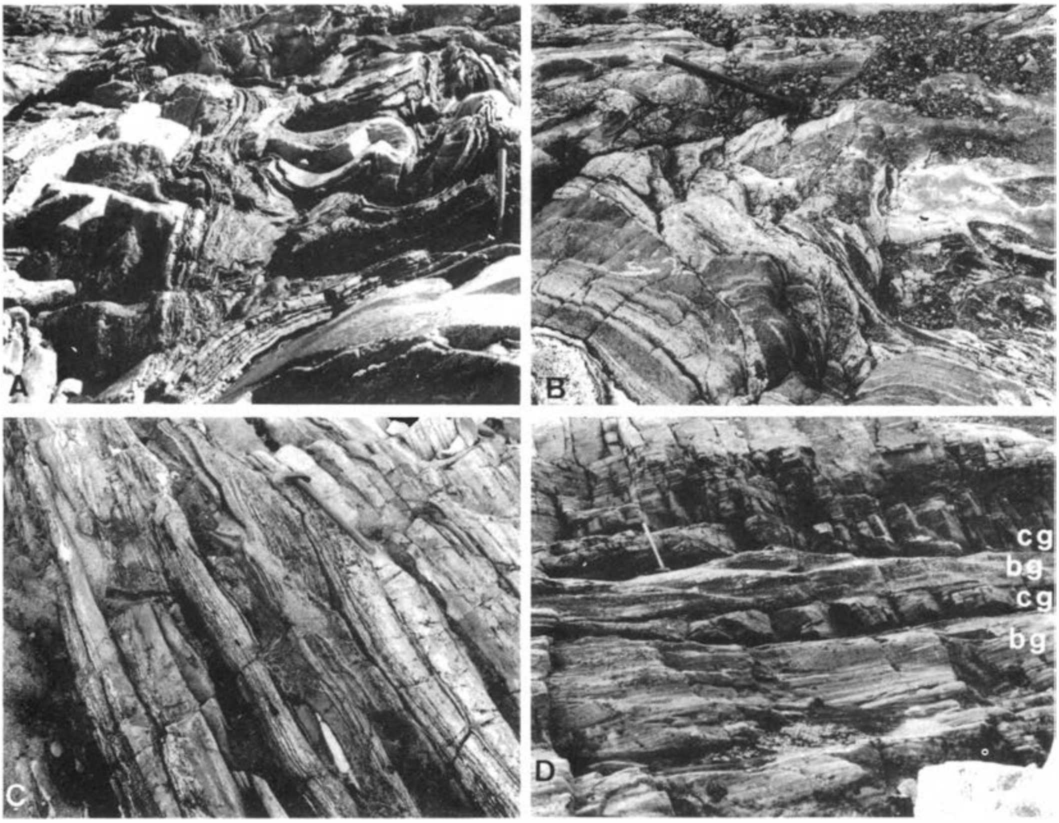

Fig. 7. Photographs of the Eiternes–Sandvika area. A. Intensely folded marble, mica-gneisses and heterogeneous, granitoid, basement gneisses. B. Two generations of migmatization in the basement. The older, Precambrian, migmatite banding is partly destroyed by a younger, probably Caledonian, migmatization event. C. Highly strained basement rocks parallel to the contact with the cover unit, ca. 4 m from the rocks in Fig. 7B. Quartzites and mica schists to the right of the hammer and heterogeneous basement gneisses with migmatite veins to the left. D. Metre-scale imbrication of calc-silicate cover gneisses (cg) and basement gneisses (bg).

from the underlying granitoid basement gneisses (Fig. 7D). All rocks along the contact are strongly foliated.

These calc-silicate gneisses are similar to those of the Folda cover, which makes it plausible that all of the above mentioned cover rocks belong to this cover sequence.

Årfor and Årforholmen (Fig. 8). – At Årfor, 10 km west of Foldereid, an observed tectonic repetition of a basement cover contact indicates imbrication. Basement and cover rocks are multiply folded into tight, upright NE–trending folds, with wavelengths reaching 4 km. Small-scale isoclinal folding and/or late faulting that could account for the repetition of the rock units are absent.

The supracrustal sequence at Årfor is dominated by garnetiferous mica-schist, followed upwards by greyish-green calc-silicate gneisses and marble.

The lowermost mica-schist is apparently missing on Årforholmen island. Here, calc-silicate gneisses and the overlying marble display a penetrative foliation concordant with the contact towards subjacent migmatized basement gneisses (Fig. 9A). The actual basement-cover contact is covered by drift. The granitoid basement gneisses are less intensely foliated than the cover (Fig. 9B).

The original relationship between the granitoids and the metasedimentary rocks on Årforholmen has been altered by ductile faulting. It is sometimes difficult to differentiate between the

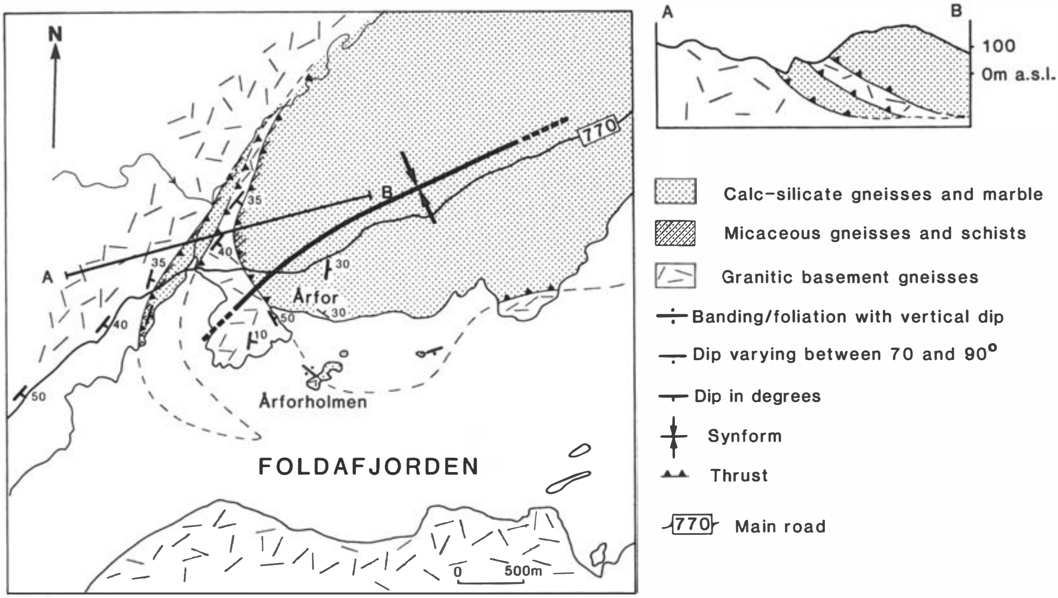

Fig. 8. Geologic sketch map of the Årfor area. ca. 10 km west of Foldereid (Fig. 1). Note the large cover synform. The figure also shows a simplified profile across the basement-cover contacts. Note the vertical exaggeration.

effects of thrusting and later faulting. However, 3–4 m away from the contact, the metasedimentary rocks display a shear fabric (Fig. 9C) which corroborates the interpretation of an originally tectonic basement-cover contact.

The exposures of mica-schist, calc-silicate gneiss and overlying marble at Årfor and around Foldereid are typical of the Folda cover at most basement-cover contacts in the area. At higher levels in this cover sequence, the strongly deformed succession shows a frequent irregular alternation between metapelites, metagreywackes, amphibolites, quartzo-feldspathic gneisses, sulphide-rich garnet-staurolite mica-schists and marble with interlayered calc-silicate gneisses. This chaotic alternation is partly attributed to Caledonian deformation, which makes it impossible to restore the lithostratigraphy of the upper part of the Folda cover. It is also difficult to establish whether this cover unit forms one single tectonic unit, but no profound tectonic break has been recognized so far.

Rocks of uncertain stratigraphic position

In earlier papers (Schouenborg 1986, 1988), most supracrustal rocks in the Folda–Vikna area were included in the Folda cover in accordance with the previous mapping by Kollung (1967). However, the relationships between some of these supracrustal rocks and the basement rocks as well as the clearly allochthonous Folda cover are not always straightforward. Basal conglomerates and arkoses are absent. No intrusive contacts with supracrustal xenoliths in the basement granitoids or granitoid apophyses in the supracrustal rocks have been recognized.

The contacts between these rocks and the basement have been modified by migmatization and deformation. At Blåvatnet (Fig. 1) for instance, migmatite veins in the basement continue into metasandstones and mafic dykes (Fig. 10A). At Gravik (Fig. 1), black amphibolitic rocks with dark-green calc-silicate veinlets carry migmatite veins of light grey granodiorite gneisses (Fig. 10B). A large proportion of the rocks belonging to this uncertain category are garnet–biotite rich gneisses with white migmatitic veinlets.

Discussion

In the central Scandinavian Caledonides, the number of concordant basement-cover contacts

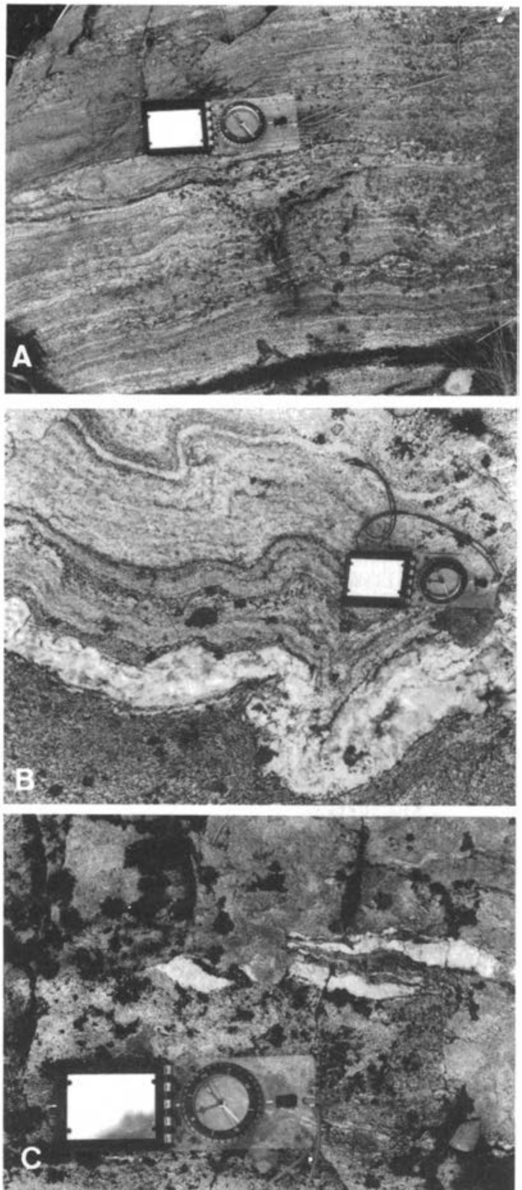

Fig. 9. Photographs of the basement-cover contact on Årforholmen (Fig. 8). A. Penetrative foliation in calc-silicate gneisses close to the granitoid basement. B. Less intensely foliated basement gneisses showing a folded migmatitic banding. C. Sheared calc-silicate gneisses with sigmoidal boudins of small pegmatites.

increases towards the western, interior part of the orogen (Bryhni & Brastad 1980; Rutland & Nicholson 1965). This concordancy has previously led several authors to doubt whether it was possible to discriminate between allochthonous and autochthonous cover in west-central Norway (Birkeland 1958; Kollung 1967; Ramberg 1973; Råheim 1972).

However, in 1977, Gee demonstrated that the east-Caledonian Offerdal, Särv and Seve nappes could be traced into northern Trøndelag. This interpretation was followed by Andréasson & Johansson (1983) recognizing Särv-type metasedimentary rocks tightly infolded in the Vestranden orthogneisses.

In recent years, several additional, previously unknown supracrustal units have been identified in northwesternmost Trøndelag (Boyd 1986; Johansson et al. 1987; Möller 1988; Schouenborg 1986). Despite intense Caledonian reworking in this area, correlation with the principal nappe units farther east has been proposed. Johansson et al. (1987) described supracrustal rocks at Fosslia, 30 km east of Osen (Fig. 1). The rocks are similar to those of the Gula Nappe of the Upper Allochthon in the Snåsa region (cf. Fig. 1 in Andréasson & Johansson 1983). In the Hemnefjord–Orkanger area west of Trondheim (Fig. 1), Tucker (1986) correlated the Songa Nappe, mainly composed of psammites and dolerites, with the Särv Nappe of the Middle Allochthon. Immediately to the south of the Vestranden area, Krill (1980) and Krill & Sigmond (1987) have confirmed the previous interpretations by Gjelsvik (1951) and Hernes (1956) of a cover sequence almost uninterrupted from Surnadalen in the east to the coast in the west. These cover units correlate with the Särv and Seve Nappes of the Middle and Upper Allochthons (Krill 1980; Krill & Sigmond 1987).

At least three different cover sequences can be differentiated in the Folda–Vikna area. Two of these are informally referred to as the Fosså formation and the Folda cover, whereas the third is the western part of the Helgeland Nappe Complex (HNC).

Locally, unconformities between the basement and some cover rocks have been preserved. One example is the Fosså formation, composed of subarkoses, arkoses, flagstones and a polymictic conglomerate carrying boulders of gneisses similar to the underlying basement. This conglomerate-bearing unit forms an isolated exposure which makes it difficult to correlate it with basal sedimentary cover rocks elsewhere. However, correlation of the Fosså formation with the psammitic rocks of the Horven formation is likely, although the latter lacks polymictic conglomerates

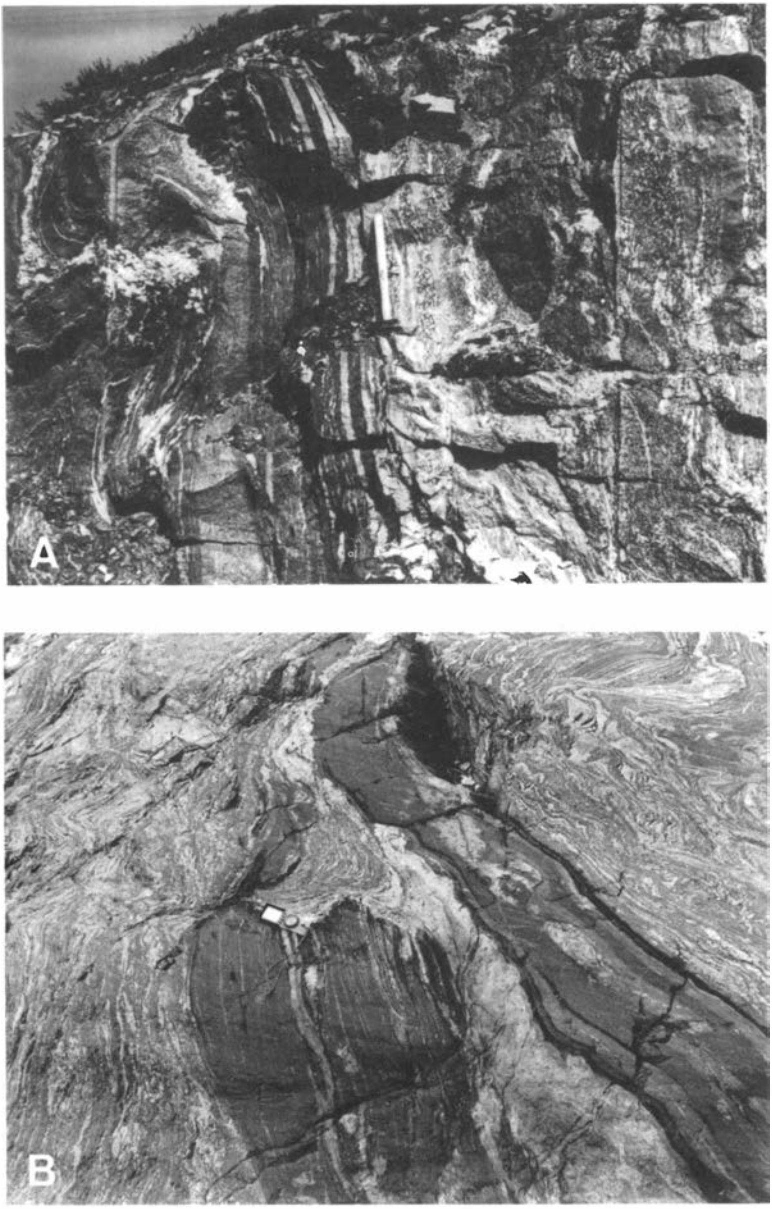

Fig. 10. Photographs of supracrustal rocks of uncertain stratigraphic position, affected by migmatization in common with the basement. A. Supracrustal rocks with migmatite veins at Blåvatnet (Fig. 1). B. Hornblende-rich gneisses with calc-silicate veinlets intruded by heterogeneous migmatitic gneisses at Gravik (Fig. 1).

and includes a characteristic, intensely migmatized, reddish arkose absent in the Fosså formation. The otherwise similar lithologies, tectonostratigraphic positions and the proximity of these units along strike speak in favour of such a correlation.

The Fosså formation also resembles Vendian sedimentary rocks, including conglomerates and psammites, in basement windows and along basement-cover contacts elsewhere in the Scandinavian Caledonides (e.g. Gee 1974, 1980). Locally, the primary sedimentary contacts have been preserved (e.g. Björklund 1987; Lindqvist 1984; Walser 1980; this study). A correlation between these preserved non-conformities and the Fosså formation is tempting, but without fossil dates or some other age information it remains speculative.

Caledonian deformation and metamorphism had considerable influence on the original basement-cover relationships and the lithostratigraphy in the Folda–Vikna area. Despite the cryptic appearance of some contacts between the basement and the Folda cover, the allochthonous nature of the latter has previously been demonstrated (Schouenborg 1986, 1988). The complexity of the basement-cover contacts at the localities Eiternes and Årfor exemplifies the difficulties there are in discriminating between thrusting and later ductile faulting. Caledonian deformation has also affected the lithostratigraphy of the Folda cover, which is everywhere structurally disrupted. The upper parts display a highly irregular lithological variation.

The lack of uniform lithostratigraphies, applicable to all parts of Vestranden, has made single characteristic formations and rock associations important for correlation with the well established tectonostatigraphy in the east. One example is the Namsen Group (Seve Nappes of the Upper Allochthon) in the Grong–Lurudal area (Fig. 1). This group contains characteristic garnet–kyanite mica schists (Gale 1975; Kollung 1979). It has also been thought to represent a unit of the HNC (Gustavson 1973; Kollung 1979; Ramberg 1967; Råheim et al. 1979). The Namsen Group has been traced discontinuously to Høylandet, 20 km north of Grong (Fig. 1, Leif Johansson pers. comm. 1988), and farther north along strike. A few kilometres southeast of Foldereid, these garnetiferous mica schists reach several hundred metres in thickness. The garnets enclose a sigmoidal foliation and have idioblastic overgrowths. Quartz segregations, with associated aggregates of kyanite reaching 5 cm in size, occur close to the thrust contact with the underlying basement. Similar relationships have been described in Andréasson & Johansson (1983) from the Lurudal area. From field observations alone, it has not been possible to determine whether the contact between the garnetiferous mica schists and the overlying Folda cover is depositional or tectonic.

On the tectonostratigraphic map of the Scandinavian Caledonides (Gee et al. 1985), the Seve Nappes, which include the Namsen Group, are extended northwards into the Folda–Vikna area. On that map, the Folda cover is shown as the lower part of the Upper Allochthon. However, the tectonostratigraphic position of the Folda cover is still unsettled.

The tectonic contact between the Folda cover and the HNC (Uppermost Allochthon) was intruded by the Heilhornet Granite in the late Ordovician, 444 ± 11 Ma ago (Nordgulen & Schouenborg in press). This date imposes considerable constraints on the possible correlation of the Folda cover with other tectonic units. Emplacement of the HNC atop the Folda cover must have commenced prior to granite emplacement in the late Ordovician (Husmo & Nordgulen 1988; Nordgulen & Schouenborg in press). In the units tectonostratigraphically between the Seve Nappes and the HNC, deposition of the youngest sediments of the Lower and Middle Köli Nappes had not been completed until the early Silurian (Getz 1890; Kulling 1933). According to Dallmeyer & Gee (1988), thrusting of the Lower and the Middle Köli Nappes over the Seve Nappes commenced soon after the deposition of these sedimentary rocks. In consequence, a contact between the HNC and an equivalent of the Seve Nappes could not have been stitched by granite as early as the Ordovician. Thus, provided that the Folda cover constitutes a single tectonic unit, it must have a higher tectonostratigraphic position than the Seve as well as the Lower and Middle Köli Nappes.

Assembly of tectonic units higher than the Lower and Middle Köli could have started before the Silurian, which does not outrule a correlation between the Folda cover and the Upper Köli Nappes. Metamorphic and lithological similarities exist between the Folda cover and the Gula Nappe of the Trondheim Nappe Complex, corresponding to part of the Upper Köli (Stephens et al. 1985). The tectonostratigraphic position of the Folda cover, overlying the Namsen Group, is also similar to that of the Gula Nappe immediately overlying the Seve Nappes in the Lurudal area. Still, a definite correlation requires detailed structural work in the upper part of the Folda cover and additional dating in all of the higher tectonic units.

Conclusions

(1) Both autochthonous and allochthonous (Schouenborg 1986) supracrustal cover rocks have been recognized in the Folda–Vikna area.

(2) The autochthonous Fosså formation is composed of psammites and a basal conglomerate which were affected by *in situ* Caledonian migmatization.

(3) The allochthonous Folda cover probably forms one unique tectonic unit. No profound tectonic break has so far been found in this formation.

(4) The Namsen Group (Seve Nappes) in the Grong area appears to be present in the eastern Folda–Vikna area where it is structurally overlain by the Folda cover. The Folda cover itself cannot correspond to the Seve Nappes as the Folda cover and the HNC were stitched by granite in the late Ordovician, ca. 444 Ma ago, and the Lower and Middle Köli Nappes, tectonically above the Seve, display fossil evidence of early Silurian age (Getz 1890; Kulling 1933).

(5) A correlation between the Folda cover and a higher tectonic unit than the Middle Köli Nappes is therefore suggested.

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