

# The Gudbrandsdalen Antiform - a major Late Caledonian structure

BRIAN A. STURT<sup>1</sup> & DONALD M. RAMSAY<sup>2</sup>

<sup>1</sup> Geological Survey of Norway, P.O.Box 3006-Lade, N-7002 Trondheim, Norway.

<sup>2</sup> Donald M. Ramsay, Geology Department, University of Glasgow, GL82 8QQ Glasgow, Scotland.

Strand (1951) recognised a significant late fold structure covered by basement, to the west of Vågåmo, which he called the **Lomskollen Anticline**. This fold has an approximately east-west trend, and a westward plunge. Strand considered it to be a structure of the same system that folds the Devonian rocks of western Norway. Indeed, Strand pointed out how the rocks in the intervening basement area contain structures which appear to be of the same generation. Recent re-mapping of the map-sheets Vågå, Otta, Vinstra, Skåbu, Hjerkin, Follidal and Alvdal have shown that Strand's Lomskollen Anticline is but a minor fold relating to a much larger fold which the authors propose to call the **Gudbrandsdalen Antiform**.

The remapping of the area has allowed a regional tectonostratigraphy to be established, essentially modified after Strand (1951). This is described in Sturt et al. (1991, 1995) and in Bøe et al (1993), and shown in Fig.1. The Sel Group can be traced in the core of a recumbent syncline - the **Jønndalen Syncline** - from Vågåmo northeastwards to beyond Røros. This fold is depicted in Fig.1 B-B' where it is refolded by later structures. The recumbent syncline is a D2 fold and the main pervasive foliation (S2) of the region is related to this structure. Both the D2 folds and the S2 schistosity are refolded by later D3 and D4 folds. The Gudbrandsdalen Antiform is a D4 fold, and would appear to be the last significant fold structure to be developed in the region.

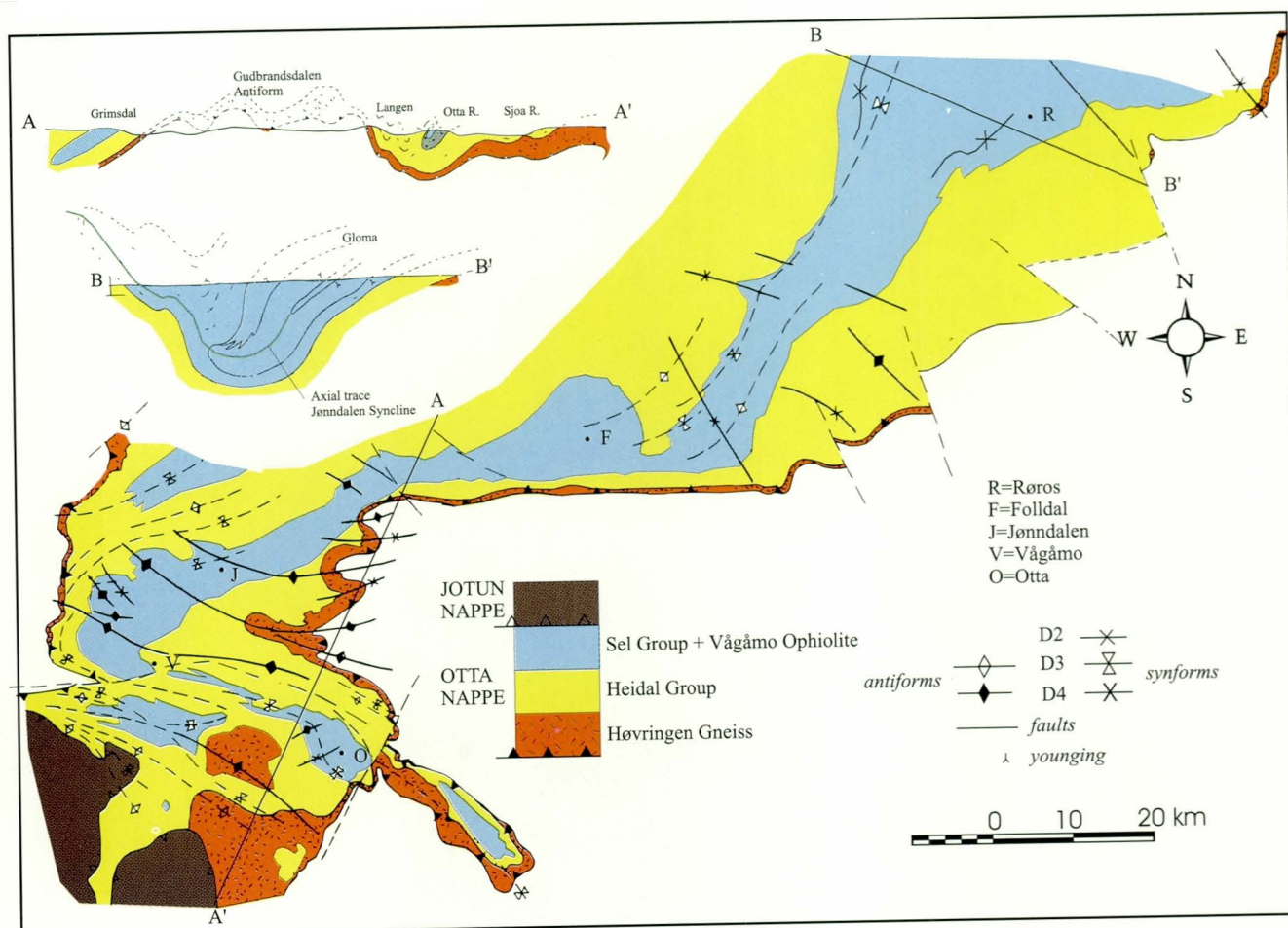


Fig 1. Simplified geological map of Otta-Røros Tract, emphasizing D3 and D4 folds, and with cross-sections A-A' and B-B'.

The Gudbrandsdalen Antiform is essentially a fairly simple structure which affects all the rocks of the area, deforming the tectonostratigraphy in a markedly arcuate pattern. It is an open, upright, westerly plunging fold with a sub-vertical axial plane and many, megascopic, congruent folds in its closure area (Fig 1, A-A'). A locally marked, axial surface, crenulation cleavage is developed, making an intersection lineation on earlier *s*-surfaces. The fold can be seen to decrease in amplitude in a westward direction (Fig 1). The D4 fold axes trend between E-W and ESE-WNW, and the folds are weakly non-cylindrical (Fig.2). In the western part of the area, near Vågåmo, the Gudbrandsdalen Antiform and its associated mesoscopic folds are seen to re-fold D3 (and earlier) structures. The axial traces of the D3 folds are clearly seen to wrap around these later folds (Fig.1). To the northeast of Vågåmo the D4 structures have a markedly cross-cutting relationship to the D3 structures, although in the southern part of the area the axes of the D3 folds have been rotated into parallelism or near-parallelism with the D4 structures. In the latter area these two fold-sets are often difficult to distinguish from each other as both the fold axes and the axial planes are now sub-parallel. The metamorphic grade associated with the folding is very low and probably does not exceed that of the anchizone/ lower greenschist facies.

## Discussion

The Gudbrandsdalen Antiform is a structure which dominates the map pattern of this region. To the south of this structure the complementary synform may well be seen in the great down-sag of the Jotun Nappe; this is a matter which will be addressed in coming field seasons. As Strand (1951) mentioned, the folding of this D4 generation appears to be

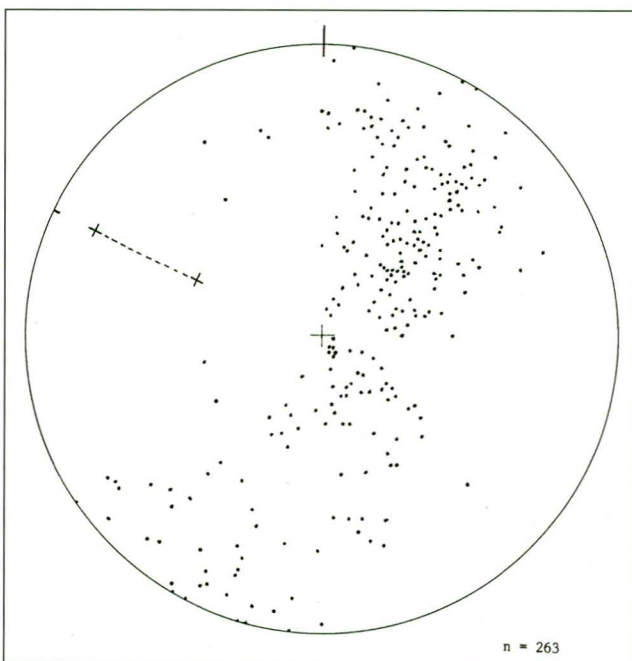


Fig 2. Stereographic plot of poles to S1/S2, 'x' s show range of great circle poles.

the same as that affecting the Devonian rocks of western Norway. The Gudbrandsdalen Antiform thus appears to be part of a regional set of E-W trending folds that would appear to be of Mid-Late Devonian age (Torsvik et al. 1986) and which relate to a component of N-S shortening. East of Røros, Lower Devonian sedimentary rocks at Røragen have also been involved in E-W folding (Roberts 1974). It is interesting that this major set of folds is not developed to any large extent north of the Møre-Trøndelag Fault Zone (MTFZ). However, as noted by Roberts (1983), and as can be seen from an inspection of the 1:1,000,000 Geological Map of Norway (Sigmond et al. 1984), this essentially E-W trending fold set, in western Norway, progressively rotates into parallelism with the MTFZ when moving northwards; an axial trend parallel to the folds that affect the Devonian rocks of Hitra and Smøla (Bøe et al. 1989).

In an even wider, regional context it is tempting to relate the formation of the Gudbrandsdalen Antiform to transpressional deformation between the MTFZ and the Tornquist-Teisseyre Suture during Late Devonian times.

## References

- Bøe, R., Atakan, K & Sturt, B.A. 1989: The style of deformation of the Devonian rocks on Hitra and Smøla, Central Norway. *Norges geologiske undersøkelse Bulletin* 414, 1-20.
- Bøe, R., Sturt, B.A. & Ramsay, D.M. 1993: The conglomerates of the Sel Group Otta-Vågå area, Central Norway: an example of a terrane-linking succession. *Norges geologiske undersøkelse Bulletin* 425, 1-24.
- Roberts, D. 1974 : Sedimentary, tectonic and metamorphic features of the Devonian of Røragen, Sør-Trøndelag. *Norges geologiske undersøkelse* 311, 89-108.
- Roberts, D. 1983 : Devonian tectonic deformation in the Norwegian Caledonides and its regional perspectives. *Norges geologiske undersøkelse* 380, 85-96.
- Sigmond, E. M. O, Gustavson, M. & Roberts, D. 1984 : Berggrunnskart over Norge - M. 1:1 million. *Norges geologiske undersøkelse*.
- Strand, T. 1951: The Sel and Vågå map areas. *Norges geologiske undersøkelse* 178, 1-116.
- Sturt, B.A., Ramsay, D.M. & Neuman, R.B. 1991 : The Otta Conglomerate, the Vågåmo Ophiolite - further indications of early Ordovician Orogenesis in the Scandinavian Caledonides. *Norsk Geologisk Tidsskrift* 71, 107-115.
- Sturt, B.A., Bøe, R., Ramsay, D.M. & Bjerkgård, T. 1995: Stratigraphy of the Otta-Vågå tract and regional stratigraphic implications. (Extended abstract.) *Norges geologiske undersøkelse Bulletin* 427, 25-28.
- Torsvik, T.H., Sturt, B.A., Ramsay, D.M., Kirsch, H.J. & Bering, D. 1986: The tectonic implications of Solundian (Upper Devonian) magnetization of the Devonian rocks of Kvamshesten, western Norway. *Earth and Planetary Science Letters* 80, 333-47.