Keywords: Micropores, Middle Famennian, Eastern Belgium, Pyroclastic

Abstract. At the type locality of the Exenus Formation, a % thick diapiric interval is present in the upper part of the formation. A new model of diapiric formation combining the Southern Lancashire Sequence and the Northern Lancashire Sequence is proposed. The diapiric interval is characterized by a series of well-defined diapirs, each consisting of a diapiric core and a diapiric rim. These diapirs are associated with a series of fault-bounded foreland basins, which in turn are associated with a series of fault-bounded foreland basins. The diapiric interval is also characterized by a series of fault-bounded foreland basins, which in turn are associated with a series of fault-bounded foreland basins. The diapiric interval is also characterized by a series of fault-bounded foreland basins, which in turn are associated with a series of fault-bounded foreland basins.
1. INTRODUCTION

The Ourthe valley is the type area where, in 1882, Mourlon subdivided the Famenian Stage. During the last 25 years, the middle and late Famenian of this area has been intensively studied by Thorez and collaborators.

The Esneux Formation is the lowest formation of the mostly silty and sandy lithostratigraphic group named «Psammites du Condroz» (middle and late Famenian) and overlies the shaly «Schistes de la Famenne» (early Famenian). The Esneux Formation is succeeded by the nodular limestones of the Souverain-Pré Formation. At the type locality of Esneux village (fig. 1), a 8 m thick claystone unit is present in the upper part of the Esneux Formation (fig. 2), a few metres below the nodular limestones of the Souverain-Pré Formation. These limestones contain the early marginifera conodont Zone (Bouckaert et al., 1971, Bless et al., 1974 and Dreesen et al., 1986). This section was investigated many years ago in an attempt to characterize the assemblage of miospores of the Esneux Formation (Bouckaert et al., 1968, 1971, Becker et al. 1974 and Bless et al., 1974). The sampling then focused only on the siltstone and sandstone part of the sequence and resulted in the definition of the (GH) gracilis-hirtus Zone (Bouckaert et al., 1971 and Becker et al., 1974).

During a recent visit by two of us (V.A. & M.S.) to the type locality at Esneux Village in 1991 sampling was undertaken in the claystone part of the sequence between the overlying limestones and the previously investigated siltstone-sandstone sequence in order to refine the position of the limit between the (GH) gracilis-hirtus Zone and the succeeding (GF) gracilis-famenensis Zone. The latter zone, recently renamed by Streel et al. 1987, was known from the Comblain-la-Tour Formation (Bless et al., 1974), 32 m above the nodular limestones of the Souverain-Pré Formation in the same valley. Another aim of the study is to compare the miospore assemblage with possibly similar assemblages in Eyelorussia.

2. DESCRIPTION OF THE MIOSPORE ASSEMBLAGE

Six samples (9 to 14) were collected and processed from the 8 m thick claystone interval. Two samples (2 and 4) were remacerated from the previous collection in the siltstone-sandstone interval. All the samples yielded very brown, sometimes almost black, miospores. They also contain acritarchs which are generally better preserved than the miospores. The most important miospore taxa for stratigraphy are listed and their distribution within the samples is shown (fig. 2). All these taxa, but two, are present in almost all samples, including the typical Samarisporeta sp. cf. Acanthotreutes hirtus in Becker et al. 1974 (characteristic of the GH Zone).

Of particular interest are two taxa known only from the upper half of the section. There are two varieties of Grandispora famenensis, (1) a distinctive species bearing mammillate ornaments, G. famenensis var. famenensis which first appears in sample 13, just above the base of the claystone bed and (2) G. famenensis var. minuta, a variety with reduced ornamentation which appears at sample 4, 11 m below sample 13. Of course, the sampling below sample 14, at the base of the claystone bed, is too scarce to allow an accurate limit for the inception of G. famenensis var. minuta to be established. The rare miospores recorded in the siltstone 4 indicate that this lithology is not suitable for miospore fossilisation and preservation. Indeed the occurrence of G. famenensis var. minuta was not noted in the previous investigation of that sample. However sample 2, taken in a claystone bed almost 14 m below sample 4, is rich in miospores and lacks any varieties of G. famenensis. Therefore, we have to conclude that the first appearance of G. famenensis is to be found in the interval between samples 4 and 2. This first occurrence and the absence of the index species of the succeeding (VCr) versusibilis-cornuta Zone suggest that the base of the (GF) gracilis-famenensis Zone has to be lowered to at least the level of sample 4 in the upper part of the Esneux Formation.
Photographs x 500, except where otherwise stated.
The miospore locations in the slides are based on England finder graticule coordinates.

PLATE 1

1,2. *Samarisporites* sp. cf. *Acanthotriletes hirtus* Naumova Streel in Becker et al., 1974

1. Slide 11(1) : G56
2. Slide 10(1) : Z56

3. *Samarisporites* sp.
   Slide 12(2) : 051

   4. Slide 14(1) : H37
   5. Slide 11(1) : Q55/2

   Slide 11(3) : M38/4

7. *Auroraspora solisorta* Hoffmeister, Staplin and Malloy 1955
   Slide 11(3) : G44

8. *Lophozonotriletes lebedianensis* Naumova 1953
   Slide 2(1) : R33/3

9,10. *Diplanospora rugosa* (Naumova) Byysheva 1985
   9. Slide 13(2) : Y36/2
   10. Slide 12(2) : S40

11. *Diducites versabilis* (Kedo) Van Veen 1981
    Slide 11(2) : E35

    Slide 2(2) : X22/2

    Slide 9(1) : T46

    Slide 9(1) : F38/2

   15. Slide 10(2) : X50
   16. Slide 11(1) : O50/4

   17. Slide 11(4) : Z48/2
   18. Slide 11(3) : W52/3
   19. Detail of the fig. 18 (x2000)
PLATE 2

1-4. *Grandispora gracilis* (Kedo) Streel *in* Becker *et al.* 1974
   1. Slide 12(2) : L55
   2. Detail of the fig. 1 (x2000)
   3. Slide 11(1) : E56
   4. Detail of the fig. 3 (x2000)

   5. Slide 13(1) : U35
   6. Slide 12(2) : F40/4
   7. Detail of the fig. 6 (x2000)
   8. Slide 13/2 : G42
   9. Detail of the fig. 8 (x2000)

   10. Slide 9(2) : W46/1
   11,12. Detail of the fig. 10 (x2000)
   13. Slide 11(4) : L46/3
   14. Detail of the fig. 13 (x2000)

   15. Slide 13(2) : J51
   16. Slide 13(1) : N40
   17. Detail of the fig. 16 (x2000)
   18. Slide 13(1) : P41
   19. Detail of the fig. 18 (x2000)
3. AGE OF THE MIOOSPORE ASSEMBLAGE AND LATERAL CORRELATION

In the Pripyat Depression, in Byelorussia, the succession of first appearances of *G. famenensis var. minuta* and *G. famenensis var. famenensis* has also been demonstrated (Avkhimovitch et al. 1988). The former taxon occurs in the lowest subdivision (*famenensis-minutus* Subzone), the latter in the highest subdivision (*lupinovitchi* Subzone), of the *Corispora varicornata* Assemblage-acme Zone. However, the duration of time separating these two subzones in Byelorussia is unfortunately yet unknown. In terms of correlation with the conodont biozones, the first occurrence of *G. famenensis var. minuta* is correlated there with the upper part of the *rhomboidea* conodont Zone. However, by definition, *Palmatolepis rhomboidea* is also present in the lowermost part of the *Palmatolepis marginifera* Zone, therefore, this correlation might be questioned because the conodont faunas in Byelorussia have not yet been revised and their correlation with the miospore assemblage explained. In a section of the Hoyoux valley studied recently (Bode, pers. comm., 1991) at Modave-Pont de Bonne, 25 km to the west of the Ourthe valley, the conodont early *marginifera* Zone is present in the upper part of the Esneux Formation. Therefore it might be that the upper part of the Esneux Formation in the type locality has the same age as the upper part of the Esneux Formation at Modave-Pont de Bonne. Alternatively, it might be that the upper limit of this formation is diachronous and that the upper part at Modave-Pont de Bonne has the same age as the upper part of the Souve-rain-Pré Formation at Esneux. Diachronity of formations is well known in this area from the work of Thorez et al. (1977). It is therefore concluded that the base of the (GF) *gracilis-famenensis* Zone should probably be correlated with the late *rhomboidea* Zone or with the early *marginifera* Zone, rather than with the late *marginifera* Zone as formerly proposed by Bouckaert et al., 1971 and Becker et al. 1974. In conclusion it appears that the first occurrence of *G. famenensis* seems to be a good marker even for long distance correlation in Europe.

4. ACKNOWLEDGMENT

We are grateful to Dr. K. Higgs (Cork) for reviewing this paper and to M. Giraldo for technical assistance.

5. REFERENCES


