

APPENDIX 2

SDS Toulouse meeting 24/06/2002

Biostratigraphic correlation at the late or/and latest Famennian from Western, Central and Eastern European sections. State of the art.

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Correlation charts are provided connecting sections in northern France (Etrœungt area), eastern Belgium (Ourthe Valley), south-west Poland (Dzikowiec Quarry), Belarus (Pripjatsky Depression) and eastern Russia (Timan-Pechora). They are based on key species of ammonoids, conodonts, foraminifers, and miospores (Streel 2002). The emphasis is placed on the time-range corresponding to the Middle and Upper/Late *expansa* conodont Zone. A tenth of bio-markers is used for that purpose. The most documented sections for neritic facies are in the Ourthe Valley in eastern Belgium (Figs. 1 and 2) which can be correlated using conodonts and regression/transgression scheme (Sandberg et al. 2000 and Streel 2002, fig.1) with western USA. It can be correlated with the type Etrœungt in northern France, but lack ammonoids. The latter are however available in the Dzikowiec Quarry in south-west Poland (Figs. 3 and 4) where a succession of neritic to pelagic facies (Weber 2000) is noted in the corresponding time-range. The early and middle part of the *Kalloclymenia-Wocklumeria* Genozone are well known (since Schindewolf 1937) in this Clymeniid Limestone (Middle Wapnica Fm, 3m) of this quarry. The older shallow water "Main Limestone" (Lower Wapnica Fm, 30-40m) yields calcareous foraminifers (Gorecka & Mamet 1970) of the *Quasiendothyra kobeitusana* and *Quasiendothyra communis radiata* Zones, Phillipsastraeid rugose corals and stromatoporoid colonies (Berkowski 2001) and in thin intercalated shale layers of its upper parts, a pre-*lepidophyta* miospore flora (VF Zone). These are the only known definitive late Famennian survivors of colonial corals abundant in the reef facies of the Frasnian. They survived the Upper Kellwasser Event (Frasnian-Famennian boundary) but became extinct at the D/C boundary. The pre-*lepidophyta* zone belongs to the northern euramerican miospore assemblages (Streel & Loboziak 1996) known from Poland, Belarus, and Russia. The miospore succession was extensively described in the Pripjatsky Depression, Belarus and correlated with central and eastern areas of Russia (Avkhimovitch et al 1993), where conodonts and foraminifers are also well known, mainly in the Timan-Pechora region (Durkina in press and Streel 2002, table 2, p. 58).

Three groups of bioevents range from the Upper/Late *expansa* Zone to the lower part of the *praesulcata* Zone (Fig. 5). Group 6 provides excellent definitions of a base of late or latest Famennian and many geologists recommend it should correspond to the base of a latest subdivision in a four-fold Famennian.

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Ourthe Valley (Eastern Belgium)

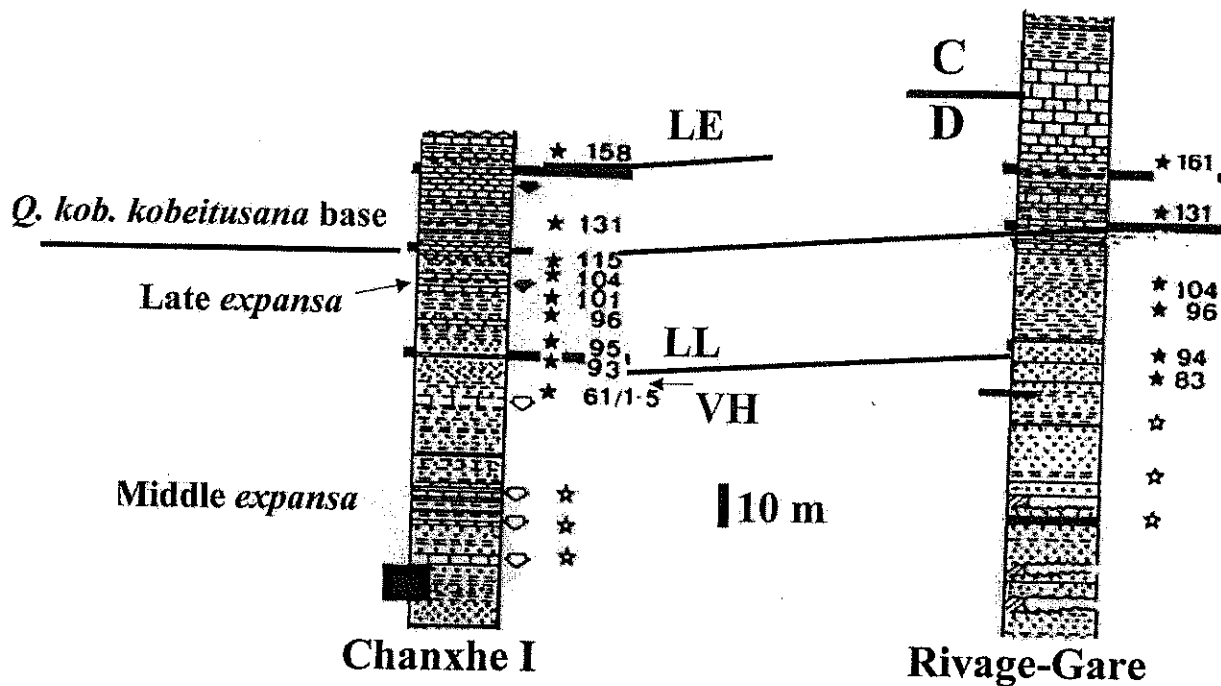


Fig. 1

Fig. 1 : Conodonts, foraminifers and miospores in the latest part of the Famennian in the Ourthe Valley (Eastern Belgium).

VH: *Apiculiretusispora verrucosa*-*Vallatisporites hystricosus* Zone ; LL : *Retispora lepidophyta*-*Knoxisporites literatus* Zone ; LE : *Retispora lepidophyta*-*Indotriradites explanatus* Zone.

Q.kob.kobeitusana : *Quasiendothyra kobeitusana kobeitusana* Zone, foraminifer which first occurs at the level of the entry of the miospore *Retispora lepidophyta minor*.

Fa2 in the Ourthe Valley (Eastern Belgium)

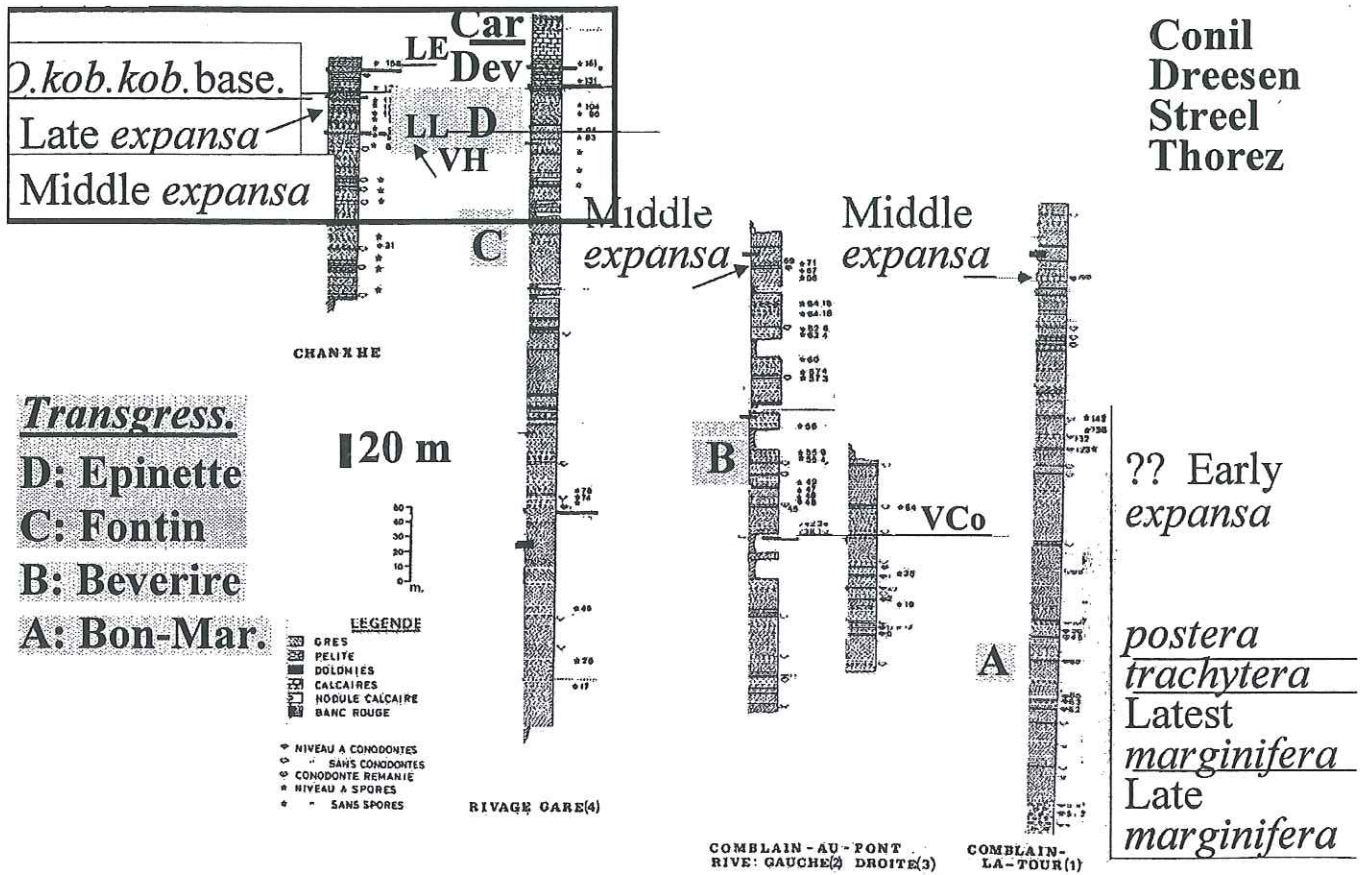


Fig. 2 : Conodonts, foraminifers and miospores in the late and latest part of the Famennian in the Ourthe Valley (Eastern Belgium), after several data from R. Conil, R. Dreesen, M. Streel and J. Thorez. VCo: *Diducites versabilis-Grandispora cornuta* Zone.

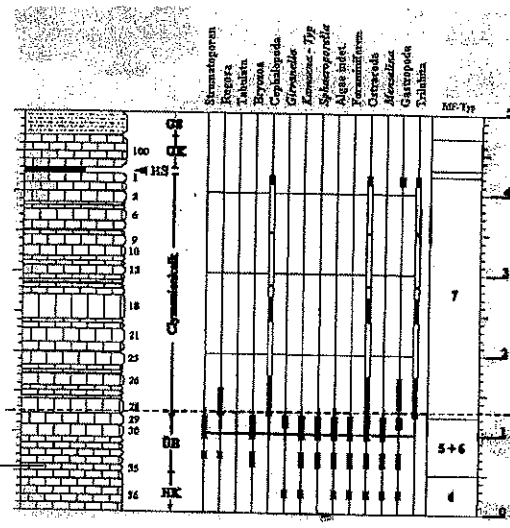
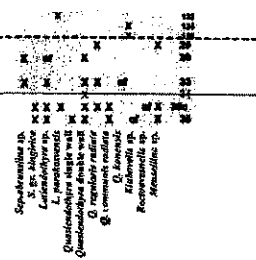
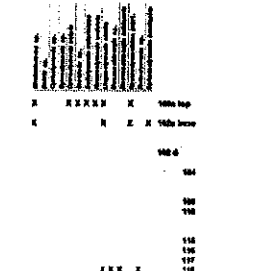
Other symbol as in fig. 1. Black rectangle refers to fig. 1; A/B/C/D: four transgressive pulses.

Dzikowiec Quarry, Sudetes Mts, Poland Middle section

Ammonoids: Dieter Korn

« *Wocklumeria* Stufe »
Balvia lens Zone
Muess. bisulcata Zone
Muess. sublaevis Zone

Q. kob.kobeitusana Zone
 ? *E.com. radiata* Zone



**Hans Martin Weber
 Dieter Weyer**

Foraminifers: Luc Hance

Lithology/Sedimentology

Fig. 3: Ammonoids and foraminifers zones in the latest part of the Famennian in the middle section of the Dzikowiec Quarry, Sudetes Mts, in Poland, after data from D. Korn and L. Hance. List of ammonoids and foraminifers to be published elsewhere.

Lithology, sedimentology and ranges of other faunas after data from H-M. Weber and D. Weyer.

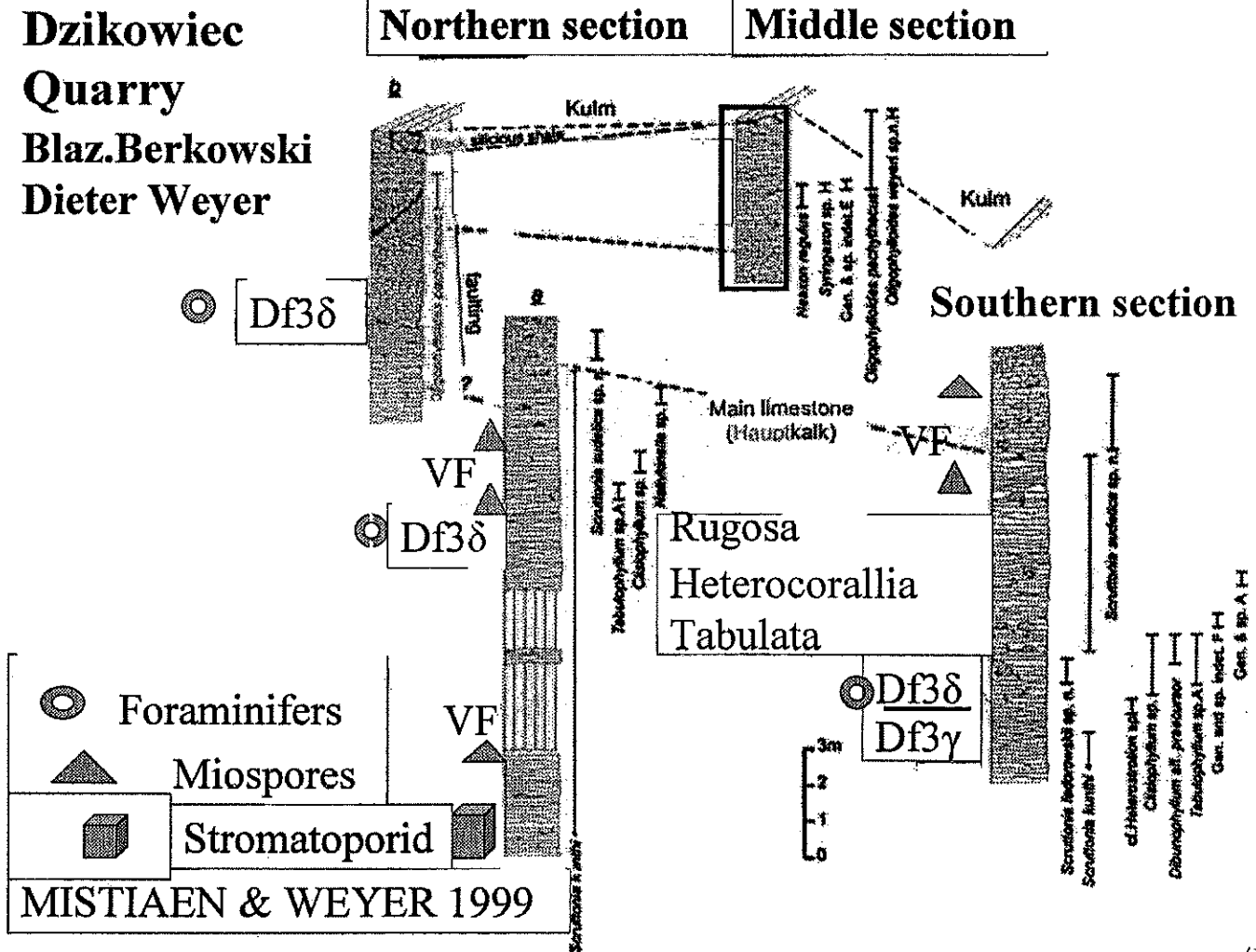


Fig. 4: Corals, foraminifers, miospores and stromatoporids in the late and latest part of the Famennian of the Dzikowiec Quarry, Sudetes Mts, in Poland, after data from B. Berkowski, L. Hance, B. Mistiaen, M. Strel and D. Weyer. Black rectangle refers to fig. 3

VF: *Diducites versabilis-Grandispora famenensis* Zone in Avchimovitch et al. 1993.

Df3δ : *Eoendothyra communis radiata* Zone

Df3γ : *Eoendothyra regularis regularis* Zone

- *7a Entry of conodont *Siphonodella praesulcata*, lower boundary of the Lower/Early *praesulcata* Zone (Ziegler & Sandberg 1984).
 - *7b Entry of miospore *Tumulispore malevkensis* (Maziane et al. 1999).
 - *7c Entry of acritarch *Gorgonisphaeridium winslowiae* (Maziane & Vanguetaine 1997)
 - *7d Base of Thuringian ecotype ostracode zones 8 in Groos-Uffendorde et al. (2000, fig. 5) (see also Blumenstengel 1997)
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- *6a Entry of foraminifer *Quasiendothyra kobeitusana kobeitusana* (Df3e Zone)
 - *6b Entry of conodont *Palmatolepis gracilis gonioclymeniae* (Ziegler & Sandberg 1984).
 - *6c Entry of miospore *Retispore lepidophyta* var. *minor* (Streel 1966, Maziane et al., 2002)
 - *6d Entry of ammonoid *Muessenbiaergia sublaevis* replacing (Korn & Becker) the rather rare *Sphenoclymenia brevispinosa* to characterise the lower boundary of the Wocklumeria Stufe-VI (Becker & House 2000)
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- *5 Entry of conodont *Bispathodus ultimus*, lower boundary of the Upper/Late *expansa* Zone (slightly below the base of the former Middle *costatus* Zone) (Ziegler & Sandberg 1984), previously proposed as the lower boundary of an Uppermost Substage of a fourfold Famennian (Streel et al. 1998). *B. ultimus* being unknown in the Great Basin and Rocky Mountain regions of North America, the lower boundary of the Upper/Late *expansa* Zone was defined, there, by the lowest occurrence of *Pseudopolygnathus marburgensis trigonicus*, *Polygnathus vogesi*, or *Protognathodus meischneri* (Sandberg 1979, p.97)

Fig. 5: Groups of bioevents related to the base of an uppermost Famennian. (from Streel 2002, tab. 1, slightly modified)