

1. The Booze - Val-Dieu blocks system which was subsident during the Lowermost Devonian, the Upper Frasnian and the Famennian, but which formed a high from the Siegenian to the Middle Frasnian and during the Dinantian.

2. The Souvré block, only subsident during the Givetian (?) and the Frasnian, which formed an emerged high during most of the Devonian and the Dinantian. Famennian palaeokarsts affect the Frasnian limestones in this block.

3. The Hermalle-sous-Argenteau blocks system which was evolving as the Souvré block during most of the Devonian but which was subsident from the Uppermost Devonian. Collapse breccias related to the palaeokarsts affect the Frasnian limestones.

4. The Bombay blocks system, evolving almost as the Hermalle-sous-Argenteau blocks system.

5. The Maastricht blocks system («Maastricht grabben») deeply subsident at least from the Frasnian and characterized by the deposition of more than 1000 m of Dinantian carbonates.

These units have been capped by Namurian and Westphalian deposits of locally variable thickness.

In this block faulting model, important lateral changes in the deposits do not necessarily need a large transitional area but can occur on both sides of syndimentary active faults. Thus the Eodevonian of the Booze - Val-Dieu blocks system (observed in the Bolland borehole) might stop sharply, perhaps during its deposition, at the boundary with the Hermalle-sous-Argenteau, Souvré and Bombay blocks systems where no Lower Devonian is known. In this case, neither a bevel of the deposits to the north nor the erosion of the whole of the Lower Devonian deposits supposedly present on the positive parts of the Brabant Massif (here the Hermalle-sous-Argenteau, Souvré and Bombay blocks systems) would have to be considered.

On the other hand, a similar evolution in the sequence of the deposits in closely nearby areas suggests that these latter belong to a common block (or blocks system). Thus, the Chertal area and the Booze - Val-Dieu area which show a similar stratigraphical sequence probably belong to the same block system, suggesting that there was not an important displacement along the Asse Fault which is actually between the two areas.

CARBONATE FACIES AND BIOSTRATIGRAPHY IN THE UPPER DEVONIAN OF THE INDE-SYNCLINORIUM

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See The Givetian-Frasnian boundary at the southern border of the Inde Synclinorium, this volume : 165-170.

COMPARED SEDIMENTOLOGY IN THE UPPER CARBONIFEROUS OF THE INDE- AND WURM SYNCLINORIUM, W. GERMANY

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This volume : 171-176.

REWORKING OF PALYNOMORPHS AS A TOOL FOR PALEOGEOGRAPHIC RECONSTRUCTION : AN EXAMPLE IN THE LOWER DEVONIAN

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The subject of the talk is developed in the article printed in the present volume : «Paléogéographie de l'Eodévien ardennais et des régions limitrophes».

LATERAL DISTRIBUTION OF MIOSPORES AS A TOOL FOR ASSESSMENT OF PALEOGEOGRAPHIC DISTANCES

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Miospore assemblages with similar list of species content can be observed from far distant localities, often within a same paleophytogeographic belt, and cannot therefore be used for assessment of paleogeographic distance. However quantitative data may help if they are computed from a lateral sequence of contemporaneous samples. Indeed the miospore concentration in sediments (in number of miospores/gr. of sediment) decreases sharply, but progressively from very near-shore to off-shore environments.

Thus, there is some relationship between the miospore concentration of a sediment and the distance between where it has been deposited and the shore-line. Difficulties in the reconstruction of such paleoenvironments arise however from the need of accurate datations by independent (paleontological) controls and of suitable sediments for palynomorphs.

RELATIONS BETWEEN INDE- AND WURM SYNCLINE (AACHEN COAL DISTRICT, F.R.G.)

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Wurm syncline and Inde syncline form two parts of the Aachen Coal District. They are situated on the northern flank of the Venn Anticlinorium and are separated by the Devonian of the Aachen Anticline. Within the Wurm Syncline strata of Namurian to Westphalian B age are exposed. Within the Inde Syncline a stratigraphic sequence is known which ranges from Upper Devonian to the Westphalian A/B boundary.

The Aachen Anticline is dissected by the Aachen Overthrust and some accompanying thrusts, which have a lithostratigraphic throw of up to 1.4 km. South of the Inde Syncline another important thrust system is exposed : the Venn Thrust. This thrust system has a maximal throw of up to 4.000 m : the Ordovician of the Venn Anticline has been moved above Namurian strata.

The Aachen Thrust System and the Venn Thrust are regarded to be the eastern prolongations of the nappe-like thrusts well-known from the northern border of the Ardenne in Belgium and northern France (Faille du Midi, Faille Eifélienne).

The tectonic style of the Wurm Syncline is that of an intensively special-folded monocline forming the northern flank of the Aachen Anticlinorium. The Inde Syncline, however, has the shape of a northward tilted box-fold. The tectonic situation of the Inde Syncline in general is determined by its position between the two mentioned thrust belts.

Due to seismic results a nappe interpretation for the Aachen Thrust System has been favoured during the last years. An intensive seismic reflector in about 4 km depth has been interpreted as a detachment horizon, which outcrops at the surface to the north in the Aachen Thrust.

However, connected to this nappe interpretation for the Aachen Thrust is a number of problems not solved until today. First of all, the question about the origin or root zone of the nappe is highly problematic. Likewise, there is no determination of the eastern border of the Dinant nappes in the hanging wall of the Aachen Thrust which has to be expected in the Rhenan Uplands south of the Lower Rhine Embayment. The sedimentary basins of the Siegerland continue towards west right into the Dinant nappe.

On the other hand there is no indication of an allochthonous position of the eastern Rhenish Massif in relation to the Ruhr Carboniferous for instance.

Thus a more detailed investigation of the eastward and downward extensions of the Aachen Thrust is necessary. It can be observed that the amount of throw of the Venn Thrust System as well as of the Aachen Thrust diminishes with depth. Within the axis culmination of the Venn Massif, where deeper tectonic stockwerks are exposed, the Venn Thrust disappears within Revinian strata. Analogous the throw of the Aachen Thrust is much smaller in the exposures in the Geul Valley on the Belgian-Dutch border than in the Aachen area. Finally a deep boring at Grand Halleux in the Belgian Ardenne exposed a structural style that in a smaller scale is well known from the Ruhr Carboniferous too. Following this point of view the root zone of the Aachen Thrust and its transition into folds has to be expected still on the northern flank of the Venn Anticlinorium.

The most eastward hints to the existence of the Aachen Thrust come from a number of borings situated within the Jackerath Horst in the center of the Lower Rhine Embayment. These borings revealed a tectonic setting which is quite similar to that of the Aachen area: intensively folded strata of Lower Westphalian and Namurian age bordering Upper Devonian strata in the hanging wall of the Aachen Thrust. According to these borings and other exploration results within the basement of the Lower Rhine Embayment the Velbert Anticline east of the Rhine is the continuation of the Aachen Anticline and the Remscheid-Altena Anticline that of the Venn Anticline. Within the Devonian strata of the Velbert Anticline no significant overthrusts are known; likewise the thrust tectonics within the Remscheid-Altena Anticline are of small importance, too. So in the direction of strike the same substitution of thrusts by folding is to be observed as it has been towards depth. This confirms the conception that folds and overthrusts have been formed syngenetically and in close mechanic relation to each other.

This concept of the development of thrusts is reflected by the stratigraphic development of the Aachen area, too. Based on palaeogeographic investigations and a comparison of the stratigraphic sequences within the Wurm and Inde areas it is evident that the sedimentary conditions of these basins during the Namurian and Lower Westphalian A have been similar. Within the Upper Westphalian A, however, a progressive differentiation of the facial development of Wurm and Inde syncline becomes remarkable.

Finally, in the upper part of the Westphalian A a conclusive comparison between the strata of both synclines is no longer possible. So it is conclusive that during the Namurian and the

Lower Westphalian A there was only one sedimentary basin for both the Wurm and Inde Synclines. During the Upper Westphalian A the approaching Variscan front created a barrier between these areas, that later, during the orogenic development, has been transformed in the Aachen Anticline. Under the specific tectonic conditions at the southern border of the Brabant Massif which restrained folding, and depending on stockwerk tectonic conditions this anticline simultaneously has been the nucleus for the development of the Aachen Thrust. So, although there are the above mentioned relations to the nappe-like thrusts of the Ardenne the Aachen Thrust seems to be more likely a fault of the «folded overthrust» type.

According to this interpretation it is possible to project the tectonic section through Wurm and Inde Syncline towards top and depth applying rules which have been developed for this type of faults within the Ruhr Carboniferous. From this model an orogenic shortening of the area can be deduced which reaches an amount of about 60%. Thus the areas of Wurm and Inde Syncline, which today are about 10 km apart, originally had a distance of about 25 km during time of sedimentation.

STRATIGRAPHICAL AND SEDIMENTOLOGICAL COMPARISON BETWEEN INDE- AND WURM AREA

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CONCLUSIONS

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The recognition of tools for the assessment of paleogeographic distances formed the theme of this meeting, that was attended not only by students and staff of the geological institutes of Aachen and Liège, but also by geologists from Brussels, Ghent, Bonn, Hannover, Krefeld and Maastricht. Several approaches have been discussed, varying from the comparison of structural styles or tectono-sedimentary evolution in nearby or distant areas to the use of purely paleontological methods.

An interpretation of the structural relationship between the Inde Syncline (south of the Aachen Thrust) and the Wurm Syncline (north of the Aachen Thrust) was presented by V. Wrede. This author argued that the root of the Aachen Thrust is to be found north of the Venn Anticline, and he concluded that the present-day distance between Wurm and Inde synclines is only slightly less than the original one. However, in the discussion it was pointed out that analysis of seismic profiles through these areas has yielded a completely different interpretation. Thus the study of structural styles does not necessarily result in an irrefutable answer as far as palinspatic relationships are concerned.

Various authors have focussed their attention on the tectono-sedimentary evolution of different (nearby or distant) areas. Comparable trends in the Devono-Dinantian of the Visé/Booze-Val Dieu/Bolland regions (NE of Liège) are used as an argument for the original proximity of these geological structures north and south of the Aachen-Midi Thrust (E. Poty).