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GEOLOGY AND INFORMATICS

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GIBS stands for the Geological Information System for the Belgian Geological Survey.
We will concentrate on the geological aspects to formulate some requirements for GIBS.

Until 1950 the Archives, publications and the geological map were the only sources to get geological information. Since 1950 geology appealed to a lot of other domains like physics, chemistry, electricity, water, . . . to explain a geological phenomena. This evolution involved a lot of data which couldn't anymore be integrated in the existing Archives system. So there is need for a good management system which integrates all those kind of data.

The organization of the Archives is based on geographical localization, which is indeed an important access-criterium. But also other questions like «I only want recent descriptions», or «I'm not interested in the opinion of a certain author» should get a quick answer.

Making an interpretation like a profile on the computer has many advantages: coloring and adapting colors is no problem, extracting only one aspect or a certain detail is quite easy, and limits can be adapted as well on the whole profile as on an extract. All those drawing-facilities can be performed in a minimum of time.

Until now geologists usually visualized their ideas of the underground in 1 or 2 dimensions because it demands a lot of drawing-experience and time to do this in 3 dimensions. With the quick evolutions of CAD (Computer Aided Design) this will change: explaining a wedge-out of a certain layer is much easier on a 3-dimensional model than on different sections. So geologists will be able to visualize their ideas immediately in 3 dimensions instead of working with sections and building up the model in their imagination.

Modeling and simulations to test the ideas of the underground will be often used tools; in the domain of water these facilities are already common on the Belgian Geological Survey.
Again, building models and evaluating simulations would be much more spectacular in 3 dimensions.

The Belgian Geological Survey tried to use the DASCH-system, but with no real success.
DASCH is based on the principle of formatted data: all descriptions of layers have to be in the terminology of an official accepted list. Although, the actual Archives contain no descriptions or interpretations in a formatted form. To achieve this goal the BGS started the following process:

all archivesnumbers will be scanned and treated with OCR-techniques (Optical Character Recognition) to get textual the same content available, in GIBS as in the existing Archives;

by this all subtleties which would be lost if only formatted data were accepted will be available for future users.

For an efficient selection-process, formatted data are necessary. The user will be able to enter those to the system. To do this he could get help of Artificial Intelligence.

GEOLOGICAL RECONNAISSANCE IN THE SUBSURFACE OF THE NORTH BELGIUM : RECENT RESULTS BY THE BELGIAN GEOLOGICAL SURVEY

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Recent investigations by the BGS in cored boreholes revealed remarkable new insights in the paleogeography of the prospected sequences. Two boreholes are described in a different structural and stratigraphic setting: the Molenbeersel well (BGS geol. archive nr. 49W226) in the Rur Valley Graben north of the Campine Basin, and the Wervik K12 well (BGS geol. archive nr. 96W81) at the presumed western extension of the Namur Synclinorium south of the Brabant Massif. Both wells were drilled for geological reconnaissance by the BGS and the Flemish Water Distribution company (VMW) respectively, and cored in wireline PQ in the studied sections.

Molenbeersel

The carbonate succession (1223-1283 m) can be split up into two megasequences, corresponding to the Maastrichtian and the Paleocene. The onset of the Cretaceous transgression thus is much younger than in the adjoining area outside the graben.
The lower megasequence is mainly composed by bioclastic wackestones and biopeloidal packstones. A decrease in glauconite/detrital quartz content, in bioturbation and in the

presence of clay/organic rich interlayers towards younger strata is present. The top (1256,65 m) is characterised by an erosive contact.
These strata reflect deposition in an open marine subtidal environment.

The upper megasequence starts with bioturbated bioclastic packstones/grainstones. Several porous and karstified horizons occur. Subsequently homogeneous, bioclastic grainstones are present, typically composed by a hash of open marine bioclasts and reworked crustose coralline algae fragments. At the top of the sequence algal bindstones occur; they are intercalated within pseudonodular crystalline chalk with bituminous interlayers and pore fillings. This succession reflects deposition in an open marine subtidal setting with a shallowing upward trend.
The two megasequences yield different cementation histories. These are much more complex than the diagenetic evolution affecting the paleocene-cretaceous sequence on the Brabant platform and Campine basin. Early cementation occurred in a marine setting, while late dissolution and cementation relates to a meteoric realm. An early dissolution stage affected most of the aragonitic components and created a network of small dissolution channels. However, these pores are occluded in a later stage by blocky calcite. According to the stable isotope data cementation by the blocky calcite occurred at shallow depth. The present porosity distribution relates mainly to a late dissolution stage and the creation of secondary porosity. Dissolution agents were meteoric water and carbocylic acids liberated near organic rich interlayers.
These results confirm the depositional basin model and the inversion tectonics structure developed by Martin Bless and his school (Bless, Felder & Meessen, 1987).

Wervik

The Upper Devonian traversed in the Wervik K12 borehole is mainly composed of Frasnian dolostones (interval 207-228m) and Famennian fine grained sandstones to siltstones (interval 178-207 m). The cementation and mineralisation history of these units is very complex but the most peculiar feature is the presence of exotic allochems and oolithes in the basal Famennian beds.

These isotropic pale brown spherical or irregularly corroded allochems with microlithic textures and similarly isotropic spastolithic or crushed «oolithes» are probably derived from a vesicular basic volcanic glass affected by submarine alteration (halmyrolysis).
Some vesicles are empty («spherical bubble shards»). They were compressed after transport and burial. Other vesicles are filled to form amygdales. These «oolithes» underwent a devitrification and chloritisation after transport. This discovery could shed a new light on the origin of the oolithic ironstones of the Famennian in Belgium. Indeed conodonts recovered from the 206,97 m level can be assigned to the Middle-Upper *Palmatolepis triangularis* Zone. This can be correlated to the first horizon of oolithic ironstones of Lower Famennian age in the Synclinoria of Namur, Verviers and Dinant (Dreesen, 1982). A transformation from volcanic «oolithes» into chloritic oolithes present in these ironstones seems plausible.

Petrographic analysis indicates a palagonitisation of strongly vesicular volcanic glass («gel-palagonite»), which implies a synsedimentary submarine volcanic activity with high gas pressure. This should have occurred on the Brabant Massif close to the Ashgill volcanic arch, and confirms the important epeirogenic movement and fracturation affecting the Brabant Massif during Middle and Upper Devonian times.

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SEAM DEVELOPMENT AND VITRINITE REFLECTANCE

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The degree of coalification of organic matter has since long been expressed in units of vitrinite reflectance (% Rm). It has been demonstrated that % Rm depends strongly on the thermal history of the organic matter. % Rm data from the Carboniferous in the Netherlands show that the observed coalification trends cannot be explained by geothermal modelling alone. Deviations from the expected downward coalification trends in boreholes have been observed in whole seam samples as well as in subsamples from coal seams.

The deviations can be explained either by postulating differences in the composition of the tanatacoenosis derived from the original peat-swamp environment, or by differences in the degree and process of biochemical degradation following the deposition of organic matter.

There is evidence that especially the postdepositional degradation - being responsible for the selective elimination of organic matter and the constitution of vitrinite precursors - may influence the ultimate vitrinite reflectance values.

It is suggested that the redox-potential of the ambient watermass, which in turn controls the microbiological activity after deposition, may influence the chemical composition of the organic matter and hence the optical properties, i.e. the vitrinite reflectance as well.

ZONED CALCITE CEMENTS : THEIR OCCURRENCE AND INFLUENCE ON THE Mn/Fe RATIO OF VISEAN LIMESTONES OF THE CAMPINE-BRABANT BASIN, BELGIUM

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The Visean limestones of the Campine-Brabant Basin, north of the London-Brabant Massif (Belgium) are characterized by zoned calcite cements which formed early in the diagenesis. Primary occlusion of the pores took place in an oxidizing marine environment and later in meteoric and/or marine pore waters under slightly reducing and shallow burial conditions.

Voluminous isopachous and radiaxial fibrous calcites and bladed cements precipitated in a marine oxidizing environment. Further growth of the bladed calcites occurred under more reducing conditions, as demonstrated by the higher