# Magnetic susceptibility correlation of km-thick Eifelian–Frasnian sections (Belgium–Czech Republic)

F. Boulvain, A.-C. da Silva, C. Mabille, G. Poulain[1], J. Hladil, M. Gersl, L. Koptikova, P. Schnabl[2]

1 Pétrologie sédimentaire, B20, Université de Liège, Sart Tilman, 4000 Liège, Belgium
2 Institute of Geology AS CR, v.v.i. Rozvojova 269, 165 00 Prague 6, Czech Republic

Bulk magnetic susceptibility (MS) measurements on sedimentological samples for correlations and reconstruction of climatic or sea-level variations from all geological periods became widely used in the last decades. Studies dealing with the origin of magnetic minerals in sedimentary rocks generally suggest a lithogenic origin for magnetic minerals. The amount of these minerals is supposed to be in relation with sea level changes. A marine regression, increasing erosion rate, increases lithogenic inputs and MS. A transgression has the opposite effect.

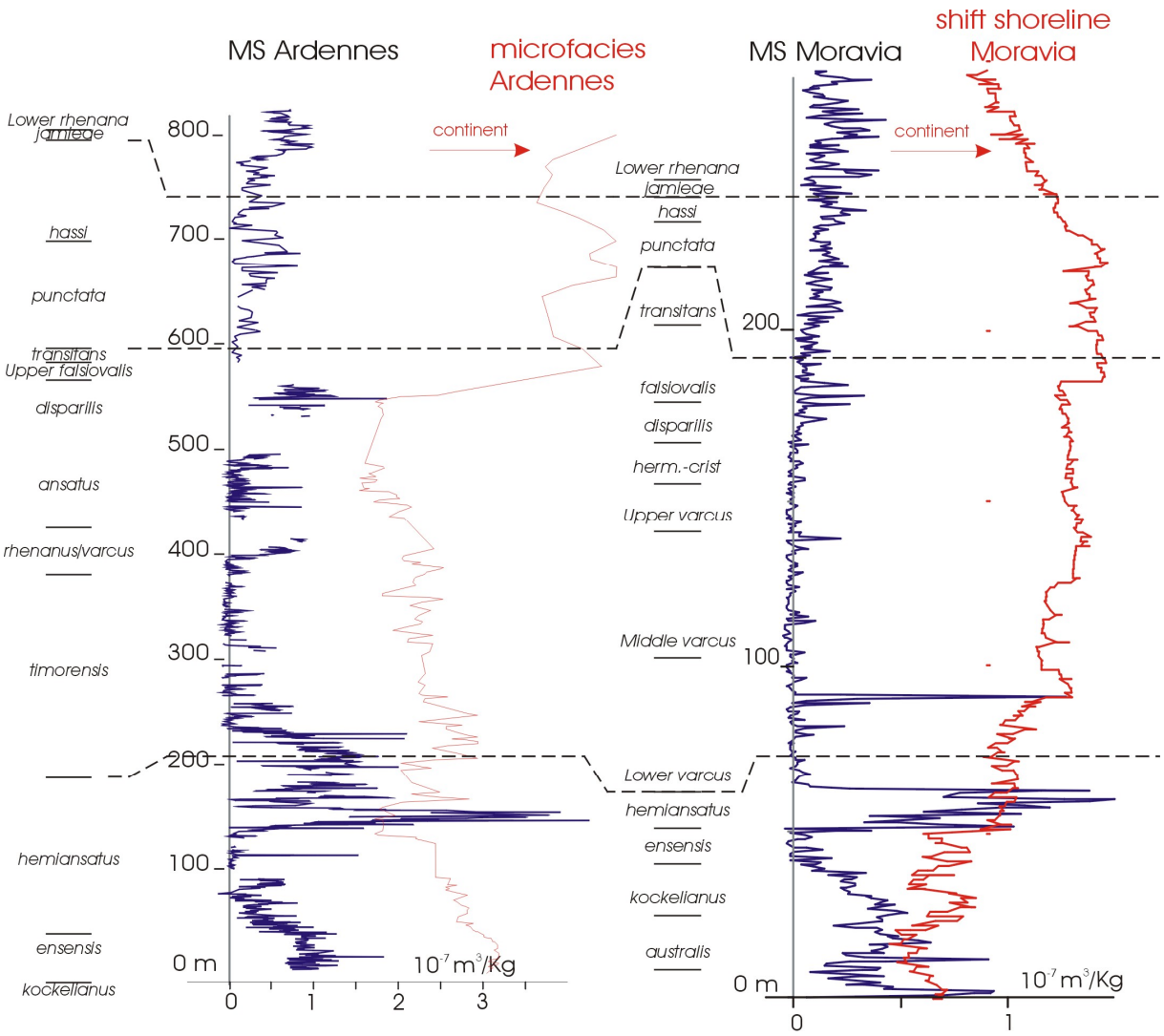
We propose a reflection on a very large scale about the link between MS and environmental parameters. This compilation of MS data and environmental backgrounds from two carbonated Devonian sections (Belgium and Moravian Karst) during different stages (Eifelian, Givetian, and Frasnian), is based on 1590 individual samples or multiply sampled (averaged) nodes.

Belgian sections start with an Upper Eifelian mixed detrital-carbonated outer ramp, followed by a well-developed Givetian carbonated platform with environments ranging from external crinoidal facies to stromatoporoid-dominated biostromes and to lagoonal facies (*Amphipora* floatstone, algal packstone, intertidal mudstone and laminated peloidal packstone and palaeosols). After the demise of the carbonate factory at the beginning of the Frasnian and the generalization of argillaceous sedimentation, the Middle Frasnian is characterized by the succession of three carbonate mound levels, starting in quiet aphotic water and ending in shallow zone.

Moravian section encompasses very pure carbonate facies of a large reef-rimmed carbonate platform complex. Inside this, the stratal successions are dominated by dark-grey, thin bedded and rhythmically deposited *Amphipora* banks which alternate with thicker and lighter intervals built by stromatoporoid–coral banks. The concentrations of non-carbonate impurities do not exceed 3 wt.% (often much less). Almost all this material was originally eolian dust, and was delivered to hundreds kilometres wide, very shallow platform–lagoon areas from distant sources over the ocean channels. Inputs of argillaceous or clayey sediments are absent, and detrital rims at few and gradually covered cliffs of crystalline basement rocks are rare. The major vertical accretion marked by biohermal shoals developed during the Frasnian.

However, both these sections show an extraordinary parallelism of MS curve, characterized by decreasing moderate values during the end of Eifelian (*australis–ensensis* conodont zones), a very strong increase at the beginning of Givetian (*hemiansatus* Zone), very low values during the major part of the Givetian (*varcus* Zone) and increasing moderate values during the end of Givetian and Frasnian (*disparilis*–Lower *rhenana* zones). There is evidently (and surprisingly) a number of MS stratigraphic patterns which can be used for detailed correlation across the Devonian carbonate basins in distant and separate paleogeographic locations.

As sedimentary environments are different in the two areas, an external basin-scale forcing parameter must be involved in MS variations.


MS Ardennes
microfacies Ardennes
MS Moravia
shift shoreline Moravia
continent
continent
Lower rhenana jamieae
hassi
punctata
transitans
Upper falsiovalis
disparilis
ansatus
rhenanus/varcus
timorensis
hemiansatus
ensensis
kockelianus
australis
falsiovalis
herm.-crist
Upper varcus
Middle varcus
Lower varcus
800
700
600
500
400
300
200
100
0 m
200
100
0 m
10-7 m3/Kg
0
1
2
3
10-7 m3/Kg
0
1