Diversity and correlation of Givetian records in southern Belgium

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In a recent paper published in the frame of IGCP 580, BOULVAIN et al. (2010) compared two km-thick Eifelian-Frasnian sections from Belgium and Czech Republic using magnetic susceptibility (MS) technique. Regardless the very different background of palaeogeography, sedimentary rate, facies and local sea-level change history, a remarkable similarity in the MS long-term trends can be observed between these two sections. Publication of these results has left open questions on the nature of the long-term forcing parameters that were active at the inter-regional scale. In order to provide more example supporting long-term MS correlations and to better constraint the factors responsible of these MS trends, we have studied two time-equivalent sections (La Thure and Fromelennes-Flohimont) covering a large stratigraphic interval into the Belgian Givetian platform (Fig.1) using a multi-disciplinary approach (sedimentology, magnetic susceptibility and geochemistry). Distance between the studied sections is ~50 km and prior Variscan deformation it might have been two times more. Field and microfacies analyses allowed us to illustrate the high diversity of environmental setting (depositional models) that occurred throughout the Givetian in Belgium and to reconstruct the long-term sedimentary evolution for both sections. During the Middle and Upper Givetian the La Thure section is mainly characterized by internal platform environments with local occurrence of fore-reef deposit. Time-equivalent Fromelennes-Flohimont facies, located in a seaward location, are mainly corresponding to proximal reef and fore-reef deposits with local off-reef shale and marl. The mean MS values for the Belgian La Thure and Fromelennes-Flohimont sections are respectively $3.83 \times 10^{-8} m^3/kg$ and $4.67 \times 10^{-8} m^3/kg$. These averaged values of the signal measured on the rocks from Belgium are slightly lower than the $MS_{marine\ standard}$ of $5.5 \times 10^{-8} m^3/kg$ defined by ELLWOOD et al. (2011) on the basis of ~11,000 marine rocks samples. Considering the local extent of diagenetic component over the total MS signal in Devonian limestone in Belgium (DA SILVA et al. 2012, 2013) interpretation of the lower absolute MS values is perilous. Nevertheless, reasonable explanation might be the dominance of carbonated sedimentation during the Givetian, which diluted the MS carrying minerals. MS curves from these two sections show several large-scaled trends which are relatively well-correlated with evolution trends in siliciclastic input proxies such as Zr, Si, Al and Ti. Therefore, indicating an inherent link between MS and concentration in siliciclastic input. MS techniques can thus be used here as a proxy for changes in source or amount or type of weathering (RIQUIER et al. 2010). This observation also means that despite the remagnetization event characterizing Devonian limestone in Ardennes (ZEGERS et al. 2003) main trends in the MS signal still reflect some syn-sedimentary conditions (DA SILVA et al. 2013). Long-term MS trends from the La Thure and Fromelennes-Flohimont have been compared and a notable resemblance between curves can be highlighted despite distance, facies and thickness changes. Thus, our results support data from BOULVAIN et al. (2010) and support the use of MS technique as relevant tools for correlating long-term sedimentary records in carbonate platform setting. Concerning the long-term MS controlling parameters, the question is still open and under investigation but it is clear that (1) climatically driven mechanisms, responsible for the non-carbonate clastic input basinwards (2) uplift movement which are also responsible of large siliciclastic input delivery basinwards, (3) trade winds transporting dust and (4) second order eustatic variation (T-R cycles) are all external factors that could have play a role in the long-term variation recorded in the MS signal. In the present state of the art it is still difficult to discriminate what the weight of each of those external factors is.

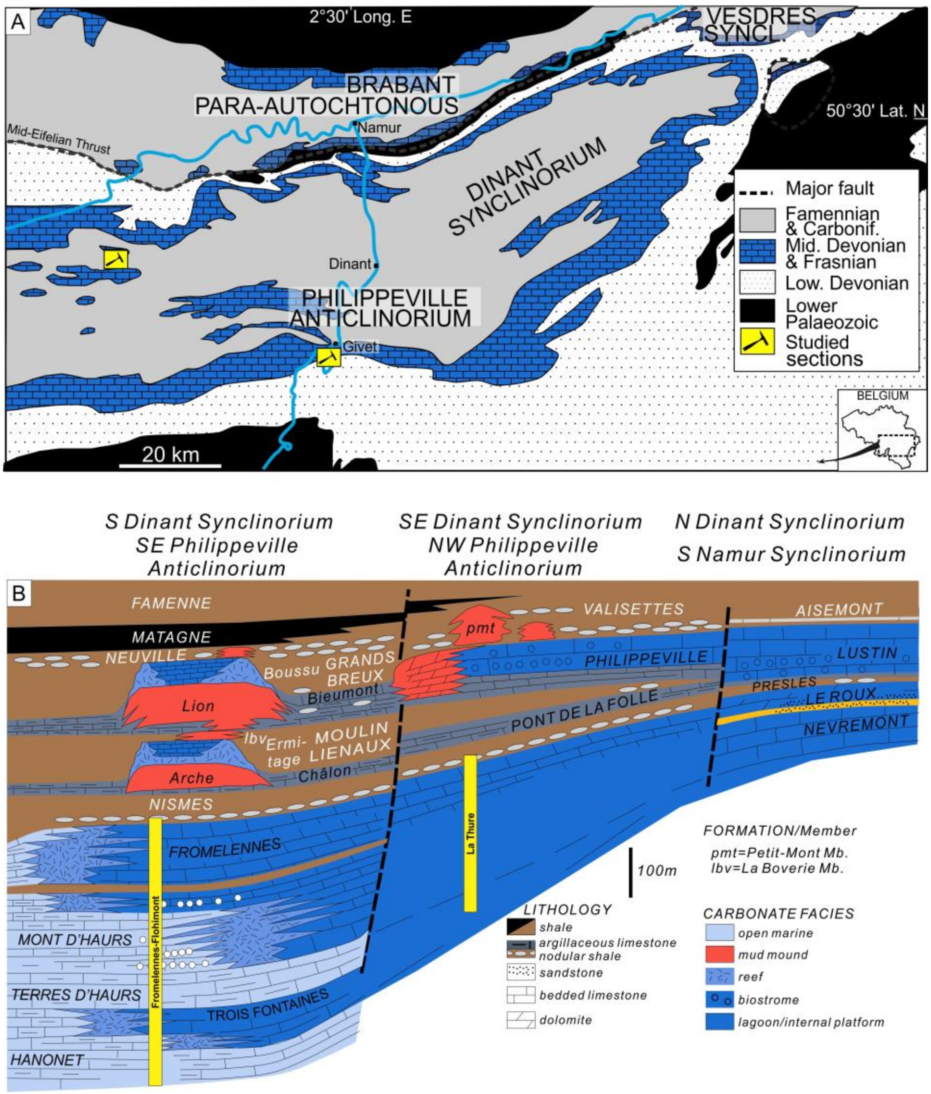

Fig. 1 **A** Simplified geological map of southern Belgium with location of the La Thure (NW of the Dinant Syncline and the Fromelennes-Flohimont (southern border of the Dinant Syncline) sections. **B** Integrated lithostratigraphical and palaeogeographical framework for the Givetian and Frasnian of Belgium. Relative position of the reefs shows the retrogradation-progradation patterns of the carbonate platforms (modified after BOULVAIN et al. 2009)

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