

Interactive comment on “Precessional and half-precessional climate forcing of Mid-Devonian monsoon-like dynamics” by D. De Vleeschouwer et al.

D. De Vleeschouwer et al.

dadevlee@vub.ac.be

Received and published: 19 October 2011

The authors are thankful to Anonymous Referee #2 for pointing out the need to provide some arguments that demonstrate the usefulness of facies and proxy for this study's purposes. This kind of information may certainly not be lacking in the manuscript, and so the following arguments will be added to the revised version of the paper.

Indeed, important lateral sedimentological differences are reported for the studied Hanonet Formation. The studied La Couvinoise section is interpreted to be deposited on a multiclinal carbonate ramp. Whereas a contemporaneous section (Les Monts de Baileux), few kilometers further to the west, demonstrates a fore-reef setting. The

C1636

major divergence between both sections in terms of sedimentary dynamics does not allow suitable high-resolution correlations based on sequence stratigraphy. However, MS revealed itself to be a powerful tool to establish accurate stratigraphic correlations between the two sections (Mabille and Boulvain, 2007). This argument demonstrates that the MS signal we used for time-series analyses is robust to lateral sedimentological and facies variations.

Reviewer #2 asks for one or two examples in more modern and/or well-dated situations where similar facies and methods yield similar results. Therefore, we will cite Kroon et al. (2000), who uses the magnetic susceptibility record of Site 1006 on the western platform edge of the Great Bahama Bank for cyclostratigraphic purposes in the Miocene and the Pliocene. They report pulses of shallow carbonate input into the Florida Strait once every precessional cycle during the Miocene and perhaps two pulses per cycle in the early Pliocene. The analogy with our result from the Middle-Devonian is remarkable. Moreover, at Site 1062, drilled on the flank of a mud wave at the base of the Bahama Outer Ridge, Pleistocene magnetic susceptibility data have been successfully used for correlation to an isotope stack for low latitudes (Grutzner et al., 2002), driven by astronomical forcing. But also in Mesozoic and Paleozoic carbonate sediments, astronomical cycles have been recognized in magnetic susceptibility series: e.g. in the Jurassic by Boulila et al. (2008a; 2008b; 2010a; 2010b) and in the Middle-Devonian by Ellwood et al. (2011a; 2011b)

Diagenesis is undoubtedly an important factor in the studied Middle-Devonian MS signal. However, it seems that for the Eifelian and Givetian in the southern border of the Dinant Synclinorium, diagenesis did not obliterate the primary signal, as the MS signal is strongly related to depositional environment. Moreover, an estimate of detrital quartz content in thin section demonstrates a strong correlation between the abundance of detrital quartz and MS values. While the detrital quartz does not carry the MS signal, it is a good indicator of the detrital input and thus it is certain that MS is correlated to detrital input and not entirely controlled by diagenesis (Mabille and Boulvain, 2007).

C1637

The MS measurements were made on a KLY-3 Kappabridge device. Three measurements were made on each sample, and the average MS value was taken to construct the time-series. Samples were weighed with a precision of 0.01g (a detailed description of the methodology can be found in da Silva and Boulvain, 2006).

References

Boulila, S., Galbrun, B., Hinnov, L. A., and Collin, P. Y.: Orbital calibration of the Early Kimmeridgian (southeastern France): implications for geochronology and sequence stratigraphy, *Terra Nova*, 20, 455-462, DOI 10.1111/j.1365-3121.2008.00838.x, 2008a.

Boulila, S., Hinnov, L. A., Huret, E., Collin, P. Y., Galbrun, B., Fortwengler, D., Marchand, D., and Thierry, J.: Astronomical calibration of the Early Oxfordian (Vocontian and Paris basins, France): Consequences of revising the Late Jurassic time scale, *Earth Planet Sc Lett*, 276, 40-51, DOI 10.1016/j.epsl.2008.09.006, 2008b.

Boulila, S., de Rafelis, M., Hinnov, L. A., Gardin, S., Galbrun, B., and Collin, P. Y.: Orbitally forced climate and sea-level changes in the Paleoeceanic Tethyan domain (marl-limestone alternations, Lower Kimmeridgian, SE France), *Palaeogeogr Palaeocl*, 292, 57-70, DOI 10.1016/j.palaeo.2010.03.026, 2010a.

Boulila, S., Galbrun, B., Hinnov, L. A., Collin, P. Y., Ogg, J. G., Fortwengler, D., and Marchand, D.: Milankovitch and sub-Milankovitch forcing of the Oxfordian (Late Jurassic) Terres Noires Formation (SE France) and global implications, *Basin Res*, 22, 717-732, DOI 10.1111/j.1365-2117.2009.00429.x, 2010b.

da Silva, A. C., and Boulvain, F.: Upper Devonian carbonate platform correlations and sea level variations recorded in magnetic susceptibility, *Palaeogeogr Palaeocl*, 240, 373-388, 2006.

Ellwood, B. B., Algeo, T. J., El Hassani, A., Tomkin, J. H., and Rowe, H. D.: Defining the timing and duration of the Kacak Interval within the Eifelian/Givetian boundary GSSP, Mech Irdane, Morocco, using geochemical and magnetic susceptibility patterns,

C1638

Palaeogeogr Palaeocl, 304, 74-84, DOI 10.1016/j.palaeo.2010.10.012, 2011a.

Ellwood, B. B., Tomkin, J. H., El Hassani, A., Bultynck, P., Brett, C. E., Schindler, E., Feist, R., and Bartholomew, A.: A climate-driven model and development of a floating point time scale for the entire Middle Devonian Givetian Stage: A test using magnetostratigraphic susceptibility as a climate proxy, *Palaeogeogr Palaeocl*, 304, 85-95, DOI 10.1016/j.palaeo.2010.10.014, 2011b.

Grutznher, J., Giosan, L., Franz, S. O., Tiedemann, R., Cortijo, E., Chaisson, W. P., Flood, R. D., Hagen, S., Keigwin, L. D., Poli, S., Rio, D., and Williams, T.: Astronomical age models for Pleistocene drift sediments from the western North Atlantic (ODP Sites 1055-1063), *Mar Geol*, 189, 5-23, 2002.

Kroon, D., Williams, T., Pirmez, C., Spezzaferri, S., Sato, T., and Wright, J. D.: Coupled early Pliocene-Middle Miocene bio-cyclostratigraphy of Site 1006 reveals orbitally induced cyclicity patterns of Great Bahama Bank carbonate production, in: *Proceedings of the Ocean Drilling Program, Scientific Results*, edited by: Swart, P. K., Eberli, G. P., Malone, M. J., and Sarg, J. F., 2000.

Mabille, C., and Boulvain, F.: Sedimentology and magnetic susceptibility of the Upper Eifelian - Lower Givetian (Middle Devonian) in southwestern Belgium: insights into carbonate platform initiation, in: *Palaeozoic Reefs and Bioaccumulations: Climatic and Evolutionary Controls*, edited by: Alvaro, J. J., Aretz, M., Boulvain, F., Munnecke, A., Vachard, D., and Vennin, E., Geological Society Special Publications, London, 109-124, 2007.

Interactive comment on *Clim. Past Discuss.*, 7, 1427, 2011.

C1639