Magnetic susceptibility records for global stratigraphic correlations? New constraint in the context of carbonate platform reconstruction (Middle Devonian, Ardennes)

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Abstract

This study undertakes a multi-disciplinary approach (sedimentology, magnetic susceptibility, geochemistry and hysteresis magnetic measurement) to increase our understanding of the Ardennes Givetian platform (Belgium and France) and to address a major question on the reliability of the magnetic susceptibility (MS) records for global correlations of marine carbonate records. Sedimentological analyses on two successions lasting millions of years, reveal an extended diversity of shallow- to off-reef palaeoenvironmental settings across the platform and allow to constrain the main sea-level fluctuations and associated environmental changes throughout the Givetian in Ardennes. The comparison of the two MS profiles allows to provide correlations, despite the long distance between the sections and their different sedimentological background. However, the comparison of the MS profiles from the Ardennes with contemporaneous data from the Rhenische Schiefergebirge (Germany) does not show any evidences of correlation, challenging studies that present the MS signal as a global correlation tool. These outcomes are crucial because they have repercussions on future global and regional stratigraphic issues as well as for paleoclimatic reconstructions. Here, we provide new evidences outlining that autogenic processes, which operate at long time scale, modulate the MS signal and have a strong influence over the magnetic susceptibility records that can leads to the absence of correlation within long-term MS trends.

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