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The effect of iron related diagenetic processes on magnetic properties of marine sediments: case study from NE Mediterranean shelf.

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The magnetic properties of marine sediments are potentially impacted by bacterial respirations that lead to dissolution of detrital magnetic minerals and precipitation of authigenic ones. While on one hand geochemical depth profiles have enabled detection of diagenetic zones associated with distinctive respiration processes and on the other hand, magnetic depth profiles revealed variations related to early diagenesis, the link between these two types of records has remained mainly indirect. Here we report a composite magnetic-geochemical record from a 6-meter long core collected from the Eastern Mediterranean continental shelf. Concentration of sulfate, methane and ferrous iron were measured in association with IRM, ARM, susceptibility, and demagnetization of NRM and ARM. The composite record shows that the magnetic properties of the sedimentary column are controlled by the diagenetic zones: The uppermost zone is characterized by enhancement of magnetic properties owing to precipitation of authigenic magnetic minerals due to the “classical” bacterial iron reduction process. The sulfidic zone shows a reduction in magnetic parameters related to dissolution of titanomagnetite. Most surprisingly, we observe significant enhancement of the magnetic properties at the methanogenic zone below sulfate-methane-transition-zone (SMTZ) associated with increase in dissolved ferrous iron, at depths which were assumed to be magnetically inactive.