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A consistent magnetic polarity stratigraphy of Plio-Pleistocene fluvial sediments from the Heidelberg Basin (Germany)

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Deep drillings in the Heidelberg Basins provide access to one of the thickest and most complete successions of Quaternary and Upper Pliocene continental sediments in Central-Europe [1]. In absence of any comprehensive chronostratigraphic model, these sediments are so far classified by lithological and hydrogeological criteria. Therefore the age of this sequence is still controversially discussed ([1], [2]).
In spite of the fact that fluvial sediments are a fundamental challenge for the application of magnetic polarity stratigraphy we performed a thorough study on four drilling cores (from Heidelberg, Ludwigshafen and nearby Viernheim). Here, we present the results from the analyses of these cores, which yield to a consistent chronostratigraphic framework.
The components of natural remanent magnetisation (NRM) were separated by alternating field and thermal demagnetisation techniques and the characteristic remanent magnetisations (ChRM) were isolated by principle component analysis [3]. Due to the coring technique solely inclination data of the ChRM is used for the determination of the magnetic polarity stratigraphy. Rock magnetic proxies were applied to identify the carriers of the remanent magnetisation. The investigations prove the NRM as a stable, largely primary magnetisation acquired shortly after deposition (PDRM).

The Matuyama-Gauss boundary is clearly defined by a polarity change in each core, as suggested in previous work [4]. These findings are in good agreement with the biostratigraphic definition of the base of the Quaternary ([5], [6], [7]). The Brunhes-Matuyama boundary could be identified in core Heidelberg UniNord 1 and 2 only. Consequently, the position of the Jaramillo and Olduvai subchron can be inferred from the lithostratigraphy and the development of fluvial facies architecture in the Rhine system. The continuation of the magnetic polarity stratigraphy into the Gilbert chron (Upper Pliocene) allows alternative correlation schemes for the cores Viernheim and Heidelberg.

All things considered, the application of magnetic polarity stratigraphy on Pliocene and Pleistocene fluvial sediments from the Heidelberg Basin provides a consistent and independent chronology and opens the perspective for global correlations where other approaches hardly come to results.

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