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Paleomagnetic constraints on the kinematic evolution of the Romanian Carpathians

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As a part of a joint ISES project focusing on the kinematic evolution of the Carpathians, we report paleomagnetic and sediment source area results that help to constrain the paleogeographical evolution of the Romanian Carpathian chain. The first objective of this work is to establish a detailed geochronological framework for the Upper Miocene-Pliocene sedimentary deposits of the Romanian segment of the Carpathian foredeep. We concentrated our integrated stratigraphy work on the eastern and southern Carpathians and their corresponding foredeep basins.

The eastern Carpathian foredeep (Focşani Basin) contains thick and continuous sections that allow an unambiguous correlation to the polarity time scale for the interval between 7 and 2.5 Ma. The Upper Miocene to Pliocene sedimentary rocks display cyclic alternations with an average duration close to that of precession (21.7 kyr), indicating an astronomical forcing. The new age control permits the calculation of accumulation rates for each polarity zone, which shows a significant increase (more than double) at approximately 5.8-6 Myr. This increase closely coincides with the onset of the Messinian Salinity Crisis in the Mediterranean.

The sediment source area studies based on geochemical and petrological data suggest a shift of source area from a volcanic towards a metamorphic and sedimentary provenance at approximately 6 Ma. This change was caused by the uplift of the Carpathians and especially of the Eastern Carpathians nappe system. The only possible source area for the dominant volcanic clasts (feldspars and lithoclasts) from sandstones and arkoses could be the contemporaneous active volcanic arc from the northern and central part of the eastern Carpathians.

The sedimentary succession sampled in the southern Carpathians foredeep sections also produced exceptional magnetostratigraphic results that unambiguously correlate to the eastern Carpathians sequences. The ages obtained for the stage boundaries in the two areas are in good agreement and result in a new time scale for the Romanian Carpathian foredeep in which the Meotian/Pontian boundary is dated in the lower part of chron C3r at ∼5.8 Ma, the Pontian/Dacian boundary around C3n.3n (Sidufjall) at ∼4.9 Ma and the Dacian/Romanian boundary in the lower part of C2Ar, at ∼4.1 Ma. The age of the Sarmatian/Meotian boundary is still not well constrained but the magnetostratigraphic and the sediment source area data indicate an age not older than 8.5 Ma.