Evolution of a Paleogene sedimentary reservoir: insights from heavy mineral analysis in the Transylvanian Basin, Romania

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The Transylvanian Basin is an intra-Carpathian, post-Cenomanian sedimentary basin, surrounded by the Eastern and Southern Carpathians and the Apuseni Mountains. The present-day topography of the Apuseni Mts. developed mainly during the Late Cretaceous, making it a possible source area for the Paleogene siliciclastic sediments. During the Paleogene, its constituents, the Tisza and Dacia tectonic units moved continuously towards northeast because of the 'continental escape' of the AlCaPa terrane along the Periadriatic-Balaton lineament. The Tisza-Dacia plate and – on the top of it– the Transylvanian Basin reached their current positions in the Miocene as a result of subduction rollback and counterrotating microplates. The main uplift phase of the Eastern Carpathians occurred in Miocene times, meaning that this area did not certainly have a high relief and erodibility in the Paleogene.

The Paleogene siliciclastic formations of the Transylvanian Basin are mainly immature, indicating that its provenance area cannot be far away. Based on U-Pb geochronology on detrital zircons, Cretaceous banatites (82-76 Ma), which also occur in the Apuseni Mts., were reworked during the Lutetian-Maastrichtian. In the Early Oligocene–Eocene, coexisting chromian spinel, serpentine and mafic lithoclasts indicate a primary source from ophiolitic rocks. Starting with the Middle Priabonian sediments, Permian ages appear, which are presumably related to rhyolites. In the Priabonian to Early Rupelian sediments zircon U-Pb ages of 37-32 Ma, together with sub-idiomorphic titanite, apatite and hornblende enrichment in the heavy mineral fraction suggest a syngenetic magmatism, probably of 'Periadriatic' or Dinaric origin. The 400-300 Ma ages of the Variscan orogeny are not dominant, but the Ordovician and Neoproterozoic U-Pb zircon ages are common. Titanite geochemistry was used to further distinguish the probable source areas and obtain a complete picture of the Paleogene paleogeography evolution.