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Late Cretaceous evolution of a collisional hinterland, South Carpahtians, Romania: constrains from heavy mineral assemblages

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During the Late Cretaceous time, along the Carpathians, Apuseni and the Eastern Alps, on the top of the upper plate, sedimentation continued in the so called "Gosau type" basins formed during syn-collisional extension. The facies association of Cretaceous Gosau sediments may vary from terrestrial alluvial sediments to turbiditic ones, with stratigraphic ages ranging from Upper Turronian to Maastrichtian. In the Haţeg basin, continental Maastrichtian deposits accumulated synchronously with uplift of the surrounding areas and orogenic collapse. In the present study we use the mineralogy and chemistry of heavy mineral assemblages in order to discriminate between different source, which may fed the basin at that time. The study relates the stratigraphy of the Maastrichtian continental deposits from the Haţeg basin with potential source areas and asses the contributions of the upper (represented by the Getic/Supragetic units and the banatitic magmatic/subvolcanic rocks) and the lower plate (represented by the Danubian unit) to the total sediment budget. The data are interpreted in the light of the previous studies on palaeocurrent directions, sedimentology and clay mineralogy of the palaeosols. The heavy mineral associations consist of garnet, hematite, magnetite, ilmenite, rutile, staurolite, kyanite, epidote, apatite, titanite, tourmaline and zircon. The general pattern shows different source areas with contrasting metamorphic grades for the northern and southern part of the basin. The sediments of the northern and central sectors of the basin show a high proportion of garnet, staurolite and kyanite and a low proportion of epidote, supporting an amphibolite-facies metamorphic source area, which is compatible with the lithology of the Getic upper plate on which the basin formed. The samples with abundant amphibolite-facies heavy mineral components have high proportions of magnetic Fe-Ti-oxides with complex exsolution/intergrowth features. These oxides belong to the hematite-ilmenite solid-solution series and are indicating a high-grade metamorphic and/or igneous source area. Southwards the heavy mineral spectra change to epidote-rich reflecting exhumation and erosion of the greenschist metamorphic rocks of the Danubian lower plate during updoming and core-complex formation. The study shows that for the northern and central parts of the basin, the Getic upper plate is the main source for the sediments. During the Maastrichtian, for the sediments situated along Sibişel and Râul Bărbat valley, due to increasing relief in the hinterland and exhumation of the lower plate, the Danubian unit fed the basin. In addition, investigations of palaeosol types and stable isotope composition of calcretes and vertebrate remains concluded that climatic conditions changed toward more cooler/humid conditions during deposition of the sequence along the Sibişel valley. Changing of the climatic conditions and increasing humidity in the area between the mountains and the sea was most probably related to regional uplift, with mountains acting as a barrier for the moisture, thereby resulting in increasing precipitation/river input.