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Topographic analysis across the active to post-orogenic decaying Carpathian mountain range

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The Carpathians mountain range is an arcuate mountain range in Eastern Europe. One of the most interesting aspects of the range is that it records a diachronous pattern for the cessation of the subduction/convergence forces around its arc. The South-Eastern part of the Carpathians, known as the Vrancea zone, is still active with evidence of recent seismicity and neotectonic movements. The north-western part has been inactive since approximately 18-16 Myrs; this contrast allows for the investigation of the different topographic responses of a mountain range from active subduction to post-orogenic decay. The Carpathians show a relatively constant climate across its 1500 km but involves different geological domains with crystalline massifs, flysch units, volcanic rocks and the foreland basin.

We explore how the different topographic responses are directly linked to the lithology and geological history of the Carpathian in syn- and post-orogenic stages of mountain building. This presentation will show the result of topographic analyses highlighting the different responses between the active and inactive sections of the Carpathians. These topographic analyses are based on river profile analyses: slope/area plots, Chi value and Chi steepness, swath profiles and their relationships to faults and lithological boundaries. The relevance of these parameters on such large-scale mountain range will be discussed. We also compare the distribution of river steepness with thermochronological and seismic data.

We illustrate how topographic data highlights the different tectonic regions by clearly showing where subsidence or aggradation occurs in the foreland basin and by showing potential drainage pattern reorganisation after the cessation of the convergence forces. Interestingly, the Vrancea zone is sharply separated from the inactive part but the potential reorganisation pattern appears to follow more progressive reorganisation through the mountain range.