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# The transition between active plate margins to intraplate deformation: the role of inherited collisional zones in generating strain concentrations during post-collisional times, a comparative geological study in the Romanian Carpathians

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The post-collisional evolution of a locked orogenic belt reflects the effect of subsequent deformations taking place in a system which should be considered of intra-plate type. The lithospheric anisotropy inherited from the subduction times can concentrate strain and induce large-scale deformations far away from the active plate margins. This anisotropy is furthermore dynamic, because of deep mantle processes related with the subducted slab in the post-collisional times, such as thermal re-equilibration or increasing the slab dip. The interplay between slab behaviour and intra-plate stresses can create complicated near-surface deformation patterns, particularly in highly bended orogenic areas with significant lateral variations in the mechanical properties of the upper and/or lower plates. These post-collisional deformations can be observed in orogenic areas through abnormal foredeep geometries and contrasting patterns of vertical movements created in a relatively short time interval. A comparative structural study between two types of strain concentrations during post-collisional times focuses the SE part of the Carpathians chain. Here, two formerly active subduction zones, the Transylvanides and the Outer Dacidian trough are characterised by thrust reactivation and (crustal) folding, respectively, during the intraplate stage following the major thrust emplacement.

Following the Triassic-Early Cretaceous continental rifting and subsequent Albian-Late Cretaceous subduction and continental collision, the double vergent orogen de-

veloped at the contact between Tisza and Dacia plates is dominated by significant subsidence in the Paleogene post-collisional times. During the late Eocene, a regional moment of contraction is recorded in the locked orogen domain related to the translation and clockwise rotation of the Tisza-Dacia block around the Moesian domain. This is recorded in a complex pattern of strain partitioning at the active plate margin, related to core-complexes, 100km of dextral translation and transpression. In the intraplate domain, the late Eocene shortening is concentrating into the orogenic anisotropy inherited from the Cretaceous times, significant thrusting being recorded into the subsurface of Transylvania basin (re)activating the main plate boundary contact.

Late Miocene to Quaternary post-collisional studies demonstrated large-scale subsidence in front of the SE Carpathians and significant differential vertical motions along and across the arc. Following a generalised subsidence period acting in latest Miocene – Pliocene times, the intra-plate folding due to the Quaternary inversion of the locked collisional system appears to accommodate a $\sim$5km ESE-ward movement of the SE Carpathians and its foreland in respect to the neighbouring units. This rather limited amount of intra-plate shortening creates a comparable amount of uplift in the external thin-skinned orogenic units and subsidence in the foreland, while opposite sense of strike-slip movements are observed towards the margins of the system. This entire deformation is created as a result of the Quaternary inversion of the entire Carpathians-Pannonian system, driven by the movement of the Adriatic indentor. Interestingly, the intraplate effects of this deformation are one magnitude higher at $\sim$500km away from the active plate margin than elsewhere, as a direct result of the intra-plate stress concentration into the large scale anisotropy inherited from the external Carpathians nappe emplacement times.

Both collisional areas record subsidence in the frontal sole thrust areas in the immediate post-collisional, intraplate times and both of them concentrate the strain during the first postdating contractional moment. The way in which the strain is furthermore internally partitioned is a direct result of mechanical behavior and plates rheology, as well as of the inherited orogenic patterns.