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Relationships between shortening at the plate boundaries and development of the backarc basins: Neogene architecture and evolution of the Transylvania Basin

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Formation and evolution of back-arc basins are related with the dynamics of orogenic movements in convergent settings, as a response to ongoing subduction processes. Despite the overall regional convergent movements, the local deformation inside these basins reflects large scale subsidence, sometimes with apparently no direct connection with clear extensional episodes, basin opening structures or thermal events.

One such well constrained case study is the Neogene evolution of the Transylvania basin, in the central-eastern part of the Carpathians system. The most apparent feature is the up to 4km of Neogene (Badenian – Pannonian) sediments, deposited during the Middle to Late Miocene shortening episodes of the external Carpathians. The evolution of the basin culminated at the moment of Carpathians collision, when the entire basin was uplifted and subsequently eroded. Despite paleogeographyc connections and affinities with the Pannonian basin, the Neogene evolution of Transylvania relates mostly to a back-arc system with little to no such large (trans)tensional deformations as those affecting the neighbouring western basin.

This study represents a detailed analysis of the internal architecture of the Neogene Transylvanian basin, with particular focus on the geometry and timing of deformations, precise subsidence patterns and correlation with the active Carpathians shortening processes. This was achieved on the basis of the seismic interpretation of a large

number of industrial seismic lines and wells correlated with subsidence modeling studies. A number of main horizons have been analyzed and integrated in structural maps corresponding to the key stages of subsidence and basin evolution during the Middle and Late Miocene.

Our analysis demonstrated that no major extensional structures can be found to accommodate the large subsidence during this time interval. Significant deformation occurred however during late Miocene in the NW part of the basin, where a right-lateral stepping en-echelon array develops as a result of a regional dextral strike-slip, reactivating an inherited late Cretaceous-Eocene structure on the western flank of the Puini basin. Minor, up to 50m offset normal faults are however widespread in the basin particularly during the Middle Miocene and post-Pannonian. These faults accommodate in most cases large scale tiltings of the basin floor taking place consecutively along the Piennidic, South Carpathians and East Carpathians margins. Salt migration started in the upper of the Middle Miocene and accelerated during the late Miocene. Post-collisional structures are represented mostly by large folds, locally amplified by punctual salt diapirism, and localised Pliocene-Quaternary faulting. The later relate either to shallow salt thrust decollements, such as the Cenade fault system, or to cross-cutting basement involved thrusts, formed as a result of reactivating Cretaceous-Eocene structures along the South Apuseni Mountains margin.