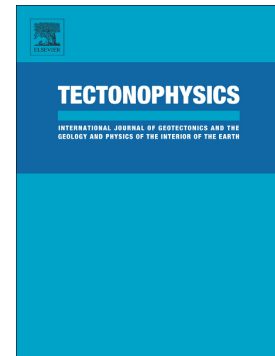


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# Cenozoic structural evolution, thermal history, and erosion of the Ukrainian Carpathians fold-thrust belt

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## ABSTRACT

The Carpathians are part of the Alpine-Carpathian-Dinaridic orogen surrounding the Pannonian basin. Their Ukrainian part constitutes an ancient subduction-accretion complex that evolved into a foreland fold-thrust belt with a shortening history that was perpendicular to the orogenic strike. Herein, we constrain the evolution of the Ukrainian part of the Carpathian fold-thrust belt by apatite fission-track dating of sedimentary and volcanic samples and cross-section balancing and restoration. The apatite fission-track ages are uniform in the inner—southwestern part of the fold-thrust belt, implying post-shortening erosion since ~12–10 Ma. The ages in the leading and trailing edges record provenance, i.e., sources in the Trans-European suture zone and the Inner Carpathians, respectively, and show that these parts of the fold-thrust were not heated to more than ~100°C. Syn-orogenic strata show sediment recycling: in the interior of the fold-thrust belt—the most thickened and most deeply eroded nappes—the apatite ages were reset, eroded, and redeposited in the syn-orogenic strata closer to the fore- and hinterland; the lag times are only a few million years. Two balanced cross sections, one constructed for this study and based on field and subsurface data, reveal an architecture characterized by nappe stacks separated by high-displacement thrusts; they record ~340–390 km shortening. A kinematic forward model highlights the fold-thrust belt evolution from the pre-contractional configuration over the intermediate geometries during folding and thrusting and the post-shortening, erosional-unloading configuration at ~12–10 Ma to the present-day geometry. Average shortening rates between ~32–20 Ma and ~20–12 Ma amounted to ~13 and 21 km/Ma, respectively, implying a two-phased deformation of the Ukrainian fold-thrust belt.

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