

300 MILLION YEARS OF BASIN EVOLUTION: BURIAL, EXHUMATION AND EROSION OF THE UKRAINIAN DONBAS

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The Ukrainian-Russian Pripyat-Dniepr-Donets Basin is a large intracratonic rift structure formed during the Late Devonian. It is situated at the southern margin of the Precambrian East European Craton, adjacent to the Hercynian Tethyan belt in the Black Sea area and the Alpine Caucasus orogen. With a sediment thickness of up to 20 km, it is one of the deepest sedimentary basins of the earth. The eastern part of the Pripyat-Dniepr-Donets Basin – called Donbas foldbelt – is strongly folded and inverted. Its structure is characterised by WNW-ESE trending folds including the Main Anticline, a prominent, almost symmetrical fold with steeply dipping limbs, situated above the former rift axis. The exact timing of inversion is still under debate, but may have taken place during a major erosion period during the Permian, or in response to Alpine tectonics during the Late Cretaceous to Early Tertiary. The structure of the Donbas foldbelt was recently investigated by seismic reflectance and refraction in the frame of the international collaborative DOBRE project, revealing that inversion occurred at the crustal scale as a mega-pop-up, which involved a major detachment fault through the entire crust and an associated back-thrust.

For this study we combined fission track analysis and vitrinite reflectance measurements along two profiles following the DOBRE transect across strike and the Main Anticline along strike. Our goal is to gain insights into the thermotectonic evolution associated with burial, exhumation and erosion of the Donbas foldbelt, particularly with respect to the timing of basin inversion and formation of the Main Anticline. Our data revealed that

maximum burial was reached during the Sakmarian (ca. 275 Ma), followed by a major erosion period during the Late Permian, probably related to the build-up of stress emanating from the Variscan Caucasus / Uralian orogens. The extent of Permian erosion, however, was less pronounced than previously assumed, and net Permian erosion of the Ukrainian shield was certainly less than the 10 km suggested by Stovba and Stephenson (1999). During the Early Triassic, parts of the basin were affected by a thermal event with heat flows up to 200 mW/m², probably related to Triassic igneous and also extrusive magmatic activity. No significant burial or erosion affected the south-western margin of the basin after the Late Triassic, implying that this part of the basin remained tectonically quiet. The formation of the Main Anticline can be placed between Permian main coalification and the Late Cretaceous and was probably associated with Cimmerian compression during the Late Triassic / Early Jurassic, corresponding to the first stage of basin inversion. Parts of the basin were also affected by a Late Jurassic thermal overprint related to magmatic activity. During the Late Cretaceous (~70 Ma) the main basin axis was tilted and exhumed, resulting in a second major erosion period and the second stage of basin inversion.

Stovba, S.M. & Stephenson, R.A., 1999: The Donbas foldbelt: its relationship with the uninverted Donets segment of the Dniepr-Donets Basin, Ukraine. – *Tectonophysics* 313, 59–83.