

## Post-orogenic uplift of the Polish Carpathian foredeep: quantitative analysis of compaction and seismic data

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Miocene marine sediments, deposited in the Carpathian Foredeep basin in Poland, were subjected to post-orogenic erosion, which differentially affected entire orogen-foredeep system. Amount of Miocene foredeep basin-fill erosion and total amount of uplift of the system, as well as their lateral distribution is a matter of dispute. The main aim of a presented study was quantitative analysis of post-orogenic uplift and erosion of the basin. Two methods of erosion measurements were used: (1) comparative analysis of compaction curves across the basin and (2) extrapolation of erosionally truncated seismic horizons and extrapolation of thickness trends of several basin-fill units.

Comparative analysis of compaction curves was conducted using well log data, mainly acoustic log (DT) and neutron-gamma log (NEGR), which allowed for porosity – depth trends calculation. This analysis was applied to 79 wells. For certain sub-regions of the basin characteristic, local compaction curves were observed. Their comparative analysis, related to regional reference curves, allowed for estimation of erosion magnitude for each bore-hole. As a result increasing erosion from outer, distal part towards inner, proximal part of the foredeep basin was clearly established. In the outer zone of the basin erosion reached 0–100 (200) m on average. In the eastern part of proximal zone of the basin (east of Wisłoka river), along the Carpathian front, erosion estimated from compaction curves might reach values of approx. 400–500m. In the central part of inner zone (i.e. near orogen front) of the basin (between Dunajec and Wisłoka rivers) erosion also could be as high as 400 m. Based on compaction curves for the western part of the basin (west of Tarnów town) its inner zone was a subject to lesser ero-

sion, approximated for 200–300 m.

Measurements of amount of erosion by means of extrapolation of erosionally truncated seismic horizons and extrapolation of thickness trends in general allows for similar results, although values tend to be higher than calculated from compaction curves. Characteristic feature of lateral distribution of erosion calculated with this method is its gentle increase towards south and SW in the distal, outer part of the basin, and very rapid increase towards orogen in proximal, inner zone of the basin. Amount of erosion for the eastern part of the basin might be estimated with this method for ~0–100 m and ~400–600 m in the distal and proximal zones respectively. For the central part of the basin the method allows for higher erosion than calculated with compaction curves, and might reach values higher than 500–600 m in the inner-most part of the basin. For the western part of the basin the method was not used. In cases when results obtained from both methods are not consistent, compaction curves analysis was assumed to be more precise.

Based on lateral distribution of amount of erosion, lateral distribution of topographic elevation of basin-fill marine sediments and eustatic sea-level changes, total post-orogenic uplift of the Outer Carpathians foreland in Poland was quantitatively estimated. The amount of uplift changes from ~200–400 m in the distal zones of the basin to more than 600 m in its proximal zones. The uplift is related here to mechanism of post-orogenic isostatic rebound of all the orogen-foredeep system, as well as to elastic relaxation of flexurally bounded foreland plate. Relative importance of both mentioned mechanisms is a subject to ongoing research.