

Late Cretaceous palaeoenvironmental and tectonostratigraphic reconstructions on the Polish sector of Peri-Tethys

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The study area is located in the central part of the Carpathian Foreland in Poland (Fig. 1), and the analysed interval includes mixed carbonate-clastic sediments of the Upper Cretaceous and the uppermost part of the profile of carbonate sediments of the Upper Jurassic. The sedimentation of the studied formations during the Late Jurassic and Cretaceous took place in the shelf zone of the northern, passive margin of the Tethys Ocean. The western Tethys, unlike its eastern margins, was not a single open ocean; rather, it covered many small plates, Cretaceous island arcs and microcontinents (Palcu & Krijgsman, 2023). The spatial range of the subbasins created between these islands was significantly limited, resulting in a large diversity of palaeoenvironments

and the mixed carbonate-clastic sediments of a shallow sea.

The entire Upper Jurassic to Cretaceous complex can be viewed as a carbonate platform that lasted almost until the end of the Late Cretaceous with an episode of Early Cretaceous erosion. The sedimentary cover formed at that time initially reached considerable thickness (presumably about 2,000 m). Dislocation and bathymetric differentiation within the carbonate platform initiated the development of a complex depositional environment. During the Late Cretaceous, the syndepositional activity of NW-SE dislocation sequences resulted in an extensive flexural deflection within the Upper Jurassic-Lower Cretaceous sedimentary complex and lowermost part of the Upper Cretaceous complex.

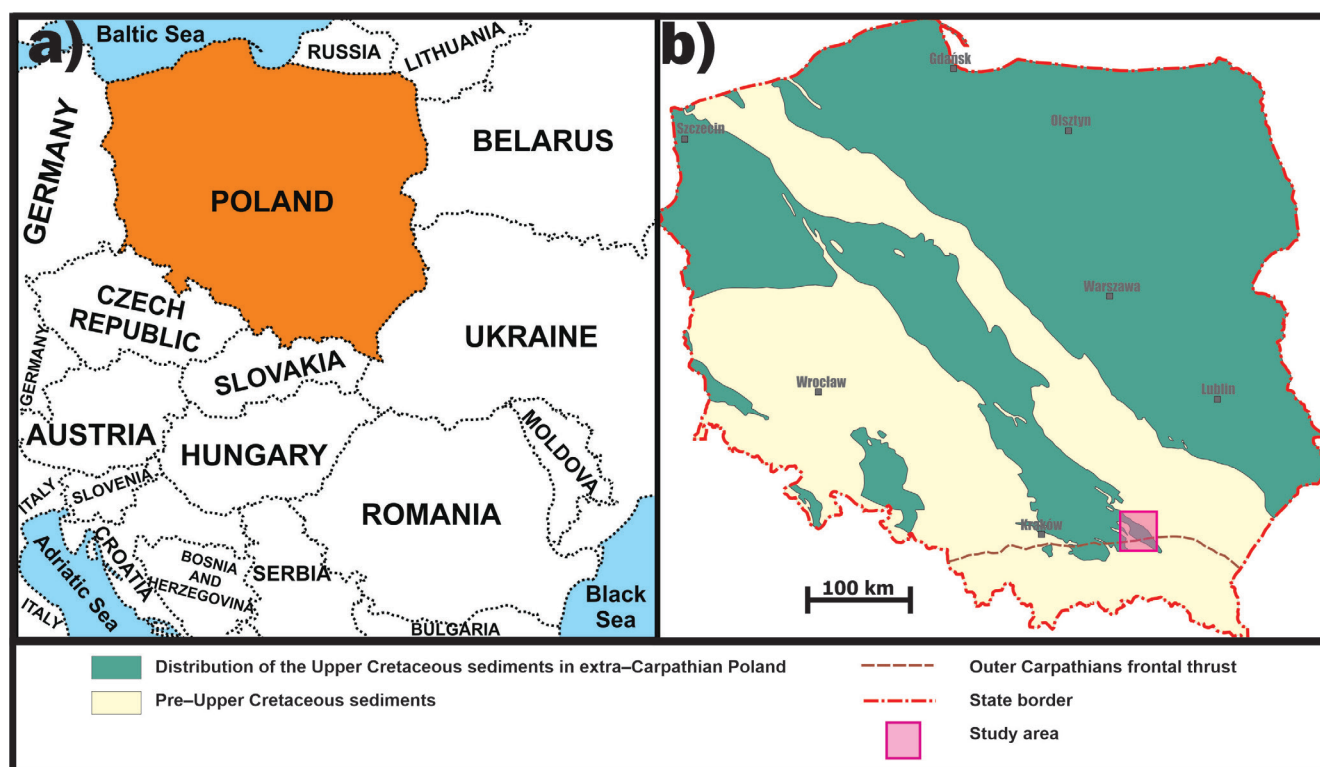


Fig. 1. Location of the study area: a) generalised outline of Central Europe; b) distribution map of the Upper Cretaceous formations in extra-Carpathian Poland (modified after Walaszczyk *et al.*, 1999).

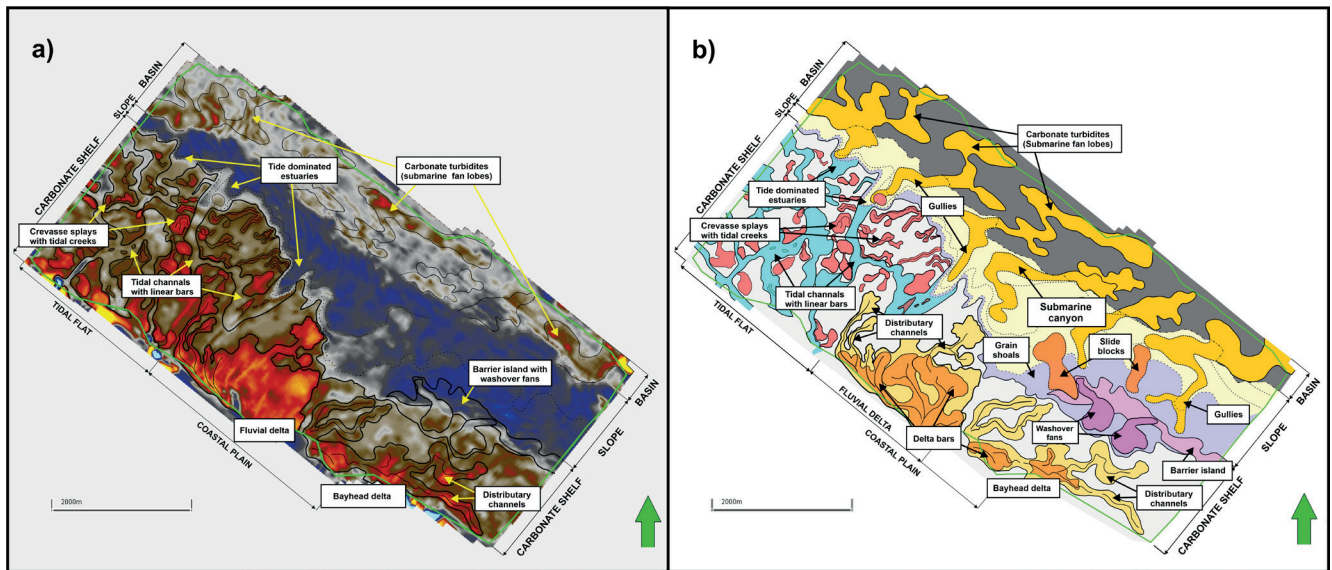


Fig. 2. Interpretation of the elements of palaeoenvironment for the correlated intra-Upper Cretaceous seismic horizon: a) based on the First Derivative attribute map; b) comprehensive model based on the analysis of several different seismic attribute maps (Łaba-Biel *et al.*, 2023).

The resulting accommodation space was filled with a complex of Upper Cretaceous carbonate formations within which there are intervals with a significant share of siliciclastic material. At the end of the Late Cretaceous as well as in the Paleocene, movements of the Laramie phase led to the re-uplift of the analysed part of the Carpathian Foreland. During this tectonic episode, the reactivation of an older fault system occurred, mainly in the NW-SE directions. The Upper Cretaceous formations deposited in the flexural depression underwent a partial inversion and intensive erosion process, lasting until the beginning of the Neogene, which contributed to the reduction of thicknesses or the removal of some of the Upper Cretaceous formations, especially in the areas, adjacent to the major dislocations. The material for analysis consisted of 3D seismic data and geological information from the wells. In the scope of the project, we approached linking 3D seismic image and well data to reconstruct, as detailed as possible, the palaeoenvironment of the studied segment of the Late Cretaceous basin based on the chronostratigraphic method. The analysis shows various palaeomorphological elements that can bring insight into the sedimentation environments (Fig. 2). The significant influence of tectonic processes on the depositional history of

the sedimentary basin was also evidenced. The tectonostratigraphic interpretation divided the Late Cretaceous sediments into two different tectonic phases (Łaba-Biel *et al.*, 2023). Analysis of a thick Miocene interval that overlies directly on the Mesozoic formations enabled to reason about the influence of the Alpine orogenesis on the study area that was manifested by the reactivation of major regional faults in the central part of the Carpathian Foreland. This phase is directly related to the stage of progressive closure of the Tethys Ocean due to the collision of tectonic plates.

References

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