

Syn-Extensional Development of the Upper Permian (Zechstein) Evaporites From the Central Polish Basin - New Insight from Seismic and Well Data

Piotr Krzywiec¹, Tadeusz Peryt², Hubert Kiersnowski²

¹Institute of Geological Sciences, Polish Academy of Sciences; ²Polish Geological Institute

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Abstract

It has been long known that pre-, syn-, and post-tectonic stratal packages can be used to decipher the consecutive stages of the development of extensional zones. Syntectonic growth strata are characterized by gross divergent geometries towards the fault active during sedimentation. Similar thickness geometries and trends might be expected for evaporitic successions deposited during active extension. In the case of salt, however, detection and analysis of growth packages is extremely difficult, if possible at all. This is because of the difficulty to discern initial depositional thickness variations and those caused by syn-depositional or post-depositional halokinetic flow. Therefore, observed thickness variations of evaporites are not unequivocal indicators of syn-depositional extension. Also basin inversion tends to severely obliterate primary extension-related stratal relationships, rendering the analysis of the extensional phase of basin development less straightforward, especially in the case of sedimentary basins with thick evaporites (including ductile salt). The Polish Basin formed at the eastern periphery of the large epicontinental Permian-Mesozoic Central European Basin System. It was filled with several kilometers of siliciclastics, carbonates, and thick Zechstein (Upper Permian) evaporites. Late Cretaceous-Paleogene inversion of the Polish Basin was associated with uplift the Mid-Polish Trough that, as a result, was transformed into a large regional anticlinal structure referred to as the Mid-Polish Swell. A qualitative model of the Permo-Mesozoic geologic evolution of the central part of

the Polish Basin (Bydgoszcz - Szubin area), constructed using regional seismic profile and detailed stratigraphic data from two deep research wells suggests a significant role of localized extension and subsidence during Permian sedimentation, including formation of syn-extensional Zechstein evaporites that were deposited within the half-graben controlled by a deeply rooted normal fault. Basin inversion was associated with substantial uplift of the hangingwall block, formation of the Szubin salt pillow, folding of the Mesozoic supra-salt overburden and formation of the Mid-Polish Swell. Obtained results shed new light on evaporitic deposition during active extension, and could be used to better understand evolution of other extensional basins with evaporites such as the North Sea Basin.