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Seismic processing and imaging of the new 2D marine reflection seismic data in the Polish sector of the Baltic Sea

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Geological structure and tectonics of the Phanerozoic sedimentary cover within the transition zone between the Precambrian and Paleozoic platform in the Polish sector of the Baltic Sea was imaged using new 2D high-resolution multi-channel seismic reflection data. The new seismic data were acquired in 2016 during the course of RV Maria S. Merian expedition MSM52 within the framework of the BALTEC project. Eight profiles (with the total length of ca. 850km) covered the tectonics blocks located within the Polish Exclusive Economic Zone, stretching from the East European Craton (EEC) to the Paleozoic platform across the Teisseyre-Torquist Zone (TTZ).

Our in-house seismic processing workflow focused on removing multiples contaminating this shallow-water data, both water bottom and interbed related. Various demultiple techniques such as SRME, TAU-P domain deconvolution, high resolution parabolic Radon demultiple and SWDM (Shallow water demultiple) have been tested. Combination of all those techniques at different stages of the processing with some modifications based on a particular seismic profile proved to be the most effective. Consequently, multiples obscuring seismic sections were efficiently reduced. Data were processed up to Kirchhoff pre-stack time migration.

The longest seismic profile (line BGR16-212, ca. 240 km long) crosses almost perpendicularly majority of Precambrian and Paleozoic fault systems bordering the tectonic blocks of the EEC basement, so fault systems could be easily interpreted. EEC Precambrian basement is characterized by a regional flexure towards the TTZ. Cambrian-Ordovician exhibits similar geometry and is characterized by a relatively constant thickness related to deposition on the Tornquist Ocean passive margin. Thick Silurian succession is characterized by a regional divergent pattern caused by deposition within the Caledonian foredeep basin. Structural pattern within the W part of the study area is much more complex as this area underwent Late Paleozoic extension/transension, Variscan inversion, Permo-Mesozoic subsidence and Late Cretaceous inversion.

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