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Microfacies and Sedimentary Environment of Potentially Hydrocarbon-Bearing Ordovician and Silurian Deposits of Selected Boreholes in the Baltic Syneclise (NE Poland)

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Abstract : Over the last few years extensive research on the Lower Palaeozic of the Baltic region has been carried out, associated with growing interest in the unconventional hydrocarbon resources of the area. The present study contributes to this investigation by providing relevant microfacies analysis of Ordovician and Silurian carbonate and clastic deposits of the Polish part of the Baltic Syneclise, using data from the Kętrzyn IG-1, Henrykowo 1 and Babiak 1 boreholes. The analytical data, encompassing sedimentological, palaeontological, and petrographic indicators enables the interpretation of the sedimentary environments and their control factors. The main microfacies types distinguished within the studied interval are: bioclastic wackestone, bioclastic packstone, carbonate-rich mudstone, marlstone, nodular limestone and bituminous claystone. The Ordovician is represented by redeposited carbonate rocks formed in a relatively high-energy environment (middle shelf setting). The Upper Ordovician-Lower Silurian rocks of the studied basin represent sedimentary succession formed during a distinctive marine transgression. Considering the sedimentological and petrological data from the Silurian, a low-energy sedimentary environment (offshore setting) with intermittent high-energy events (tempestites) can be inferred for the sedimentary basin of NE Poland. Slow sedimentation of carbonate ooze and fine-grained siliciclastic rocks, formed under oxygen-deficient conditions of the seabed, favoured organic matter preservation. The presence of the storm beds suggests an episodic nature of seabed oxygenation. A significant part of the analysed depositional successions shows characteristics indicative of deposition from gravity flows, but lacks evidence of its turbidity origins. There is, however, evidence for storms acting as a mechanism of flow activation. The discussed Ordovician-Silurian transition of depositional environments in the Baltic area fits well to the global environmental changes encompassing the Upper Ordovician and the Lower Silurian.

Keywords : Baltic Syneclise, microfacies analysis, Ordovician, Silurian, unconventional hydrocarbons
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