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Title of doctoral thesis: **The modelling of geomechanical parameters of Silurian and Ordovician rocks in selected areas of the Baltic Basin and their use in petroleum prospecting.**

### **Summary**

Recognition of Lower Palaeozoic formations in the central and eastern parts of the Polish onshore Baltic Basin has been improved in recent years by exploration for unconventional hydrocarbons. The results of the exploration work provide data necessary for the process of three-dimensional static modelling. One important parameter for assessing shale rock is brittleness, but there is no universally standardized and accepted definition or method for its estimation. Naturally occurring fractures in rocks, can be identified by a number of methods, with different resolutions and scales. These issues can be successfully characterized using computer modelling, and are the subject of this dissertation.

The study presents a detailed analysis of selected Silurian and Ordovician formations in two regions of the Opalino-Lubocino-3D seismic survey. The study comprised calculations of the distribution of elastic parameters in selected boreholes, followed by calculations of average brittleness values on their basis. Calculations of the brittleness index were based on lithological geophysical interpretations of selected boreholes. The obtained results made it possible to characterize the formations, and also provided input data for subsequent parametric modelling work. The modelling was preceded in the semi-detailed structural model, within which fragility modelling was carried out with the use of seismic data from the Opalino-Lubocino 3D seismic survey and seismic attributes calculated on its fragment with the use of the genetic inversion algorithm. Moreover, a detailed model was made in the vicinity of the Lubocino-2H horizontal well, in the area of which hybrid modelling of natural fracture network was made based on interpretation coming from the high-resolution electrical scanner (XRMI) in the Lubocino-1 well.

The performed models provided information on the spatial distribution of modelled parameters, and their analysis enabled detailed characterization of selected formations. On the basis of prepared scenarios, an assessment of the fracturing process in the Lubocino-2H well, both in the zone subjected to fracturing and in its surroundings, was carried out.