Lead Author e-mail: *kpkraj@twarda.pan.pl*

Title: *The Middle Triassic petroleum source rocks in Svalbard, NW Barents Sea shelf*

Krzysztof P. Krajewski[1,2]

[1]***Institute of Geological Sciences, Polish Academy of Sciences, Research Centre in Warsaw Twarda 51/55, 00-818 Warszawa, Poland***

[2]*Instituto Antártico Argentino, Balcarce 290, Buenos Aires, Argentina*

The Middle Triassic Botneheia Formation of Svalbard comprises an organic carbon(OC)-rich, fine-grained clastic succession (up to 140 m thick) that makes the best petroleum source rock horizon in the NW Barents Sea shelf. The succession records a transgressive-regressive interplay between the prodelta depositional system sourced in the southern Barents Sea shelf (black shale facies of the lower and middle parts of the Muen Member) and the open shelf phosphogenic system related to upwelling and nutrient supply from the Panthalassic Ocean (phosphogenic black shale facies of the upper part of the Muen Member and the Blanknuten Member). However, the detailed processes of the deposition and geological preservation of organic carbon in the succession are poorly understood.

The relationships between organic matter and two major authigenic mineral phases, apatite and pyrite, have been investigated along the eastern Svalbard outcrop belt (Edgeøya and Barentsøya) in an attempt to characterize the relative roles of redox conditions and oceanic productivity in the deposition of the OC-rich facies. The results of an integrated study using petrographic methods, Rock-Eval pyrolysis, and P-Fe-S geochemistry allow to propose a model that links the migration and expansion of oxygen minimum zone related to upwelling and high biological productivity with phases of the Middle Triassic transgressive-regressive cycle. Major depositional regimes in this cycle are defined in terms of processes leading to preservation of organic matter and petroleum potential of the resultant sedimentary facies.

The accumulation of terrestrial and autochthonous marine organic matter in the black shale facies occurred under dominating oxic conditions and increasing-upward productivity related to early transgressive phase and retrogradation of the prodelta system. The phosphogenic black shale facies deposited in an oxygen minimum zone (OMZ) of the open shelf environment during the late transgressive to regressive phases under conditions of high biological productivity, suppressed sedimentation rates, and changing bottom redox. The phosphatic black shales occurring in the lower and upper parts of the phosphogenic succession reveal depositional conditions indicative of the shallower part of OMZ, including high input of autochthonous organic matter into sediment, oxic-to-dysoxic (episodically suboxic and/or anoxic) conditions, intensive phosphogenesis, and recurrent reworking of the seabed. The massive phosphatic mudstone occurring in the middle of the

phosphogenic succession reflects the development of euxinia in the deeper part of OMZ during high-stand of the sea. High input of autochthonous organic matter in this environment was coupled with mineral starvation and intermittent phosphogenesis. In mature sections in eastern Svalbard, the petroleum potential of the Botneheia Formation rises from moderate to good in the black shale facies, and from good to very good in the phosphogenic black shale facies, attaining maximum in the massive phosphatic mudstone.