

Abstract of Ph.D. Thesis

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Microfacies analysis of Devonian Carbonate and Evaporate Rocks in deep wells from Northeastern Bulgaria

Devonian rocks in Northeastern Bulgaria are known only from deep wells drilled for oil and gas prospecting. The present study is focused on Middle to Upper Devonian carbonate and evaporate sediments, presented in seven subsurface sections: R-1 Chereshovo, R-2 Preslavtsi, C-24 Nikola Kozlevo, OP-2 Mihalich, R-120 Ograzhden, R-119 Kardam and R-1 Vaklino. Twenty-five microfacies types (MFT 1-25) are distinguished and grouped in three microfacies associations (A, B and C).

Microfacies association A includes Eifelian open-marine sediments deposited below (MFT 1-4) or above (MFT 5 and 6) normal weather wave base. They are interpreted as inner- and mid-ramp carbonates developed in a shallowing-upward sequence. Microfacies association B represents Eifelian to Frasnian cyclic sediments formed in subtidal (MFT 7-11), intertidal (MFT 12-16) and supratidal (MFT 17-19) zones of a peritidal environment. Most probably the ancient tidal flat was developed in the shallowest back-ramp parts of carbonate ramp. Subtidal zone is characterized by deposition of low- to moderate-energy carbonates containing monotonous, but often abundant fossil associations. Intertidal sediments are presented predominantly of laminated and fenestral microbial bindstones, interpreted as former microbial mats. Homogeneous mudstones/dolomudstones and intraformation breccias, originated by desiccation processes were formed in supratidal zone. In some parts of the tidal flat arid climatic conditions were favored precipitation of supratidal (sabkha) evaporates (MFT 19) with characteristic syndepositional and early alteration structures (nodular and mosaic "chicken-wire" anhydrites as well as enterolithic folds). Microfacies association C (MFT 20-25) includes Famennian microfacies deposited in low- and high-energy shallow marine settings with open water circulation.

Most of the established microfacies are comparable with Wilson's Standard Microfacies Types and/or with other microfacies, described from Middle to Upper Devonian successions of Central and Western Europe, as well as from the Romanian parts of the Moesian platform.

Early diagenetic alteration of the studied carbonate rocks is a result of microbial micritization, marine phreatic cementation, mechanical compaction and dolomitization. Obtained petrographic, XRD, CL and isotopic (O^{18} and C^{13}) data testify an early diagenetic origin of the peritidal dolomites, that are interpreted as formed by evaporitic (sabkha) model.