

Special Issue:

Multidisciplinary Event Approaches to the Devonian Stratigraphic Record

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## PREFACE

A number of Devonian global events have been identified, of these the drastic environmental changes at the Frasnian-Famennian (F-F) boundary have long attracted interest due to their presumed link with one of the severest Phanerozoic mass extinctions. Several other Devonian biospheric perturbations remain rather erratically known, and high-resolution multidisciplinary study of a widened Devonian time window is apparently required.

In this special issue, eight articles of the authors from Russia, Germany, Belgium, Czech Republic, Great Britain, Lithuania and Poland, partly address the above request. It includes not only results of 'classical' stratigraphical analysis of the F-F mass extinction in the still undervalued Uralian domain, but also new data on other remarkable events in Devonian sedimentary successions. In addition, explored are not only primary sedimentary, geochemical, geophysical and palaeontological proxies in the context of interpretation of the depositional and biotic history, but also later diagenetic processes, revealed by palaeomagnetic parameters recorded in the Devonian rocks.

The first three articles focus on various aspects of the eventful evolution of Late Devonian marine systems, recorded at the southeastern periphery of the Laurussian Continent over the crucial Southern Uralian domain. From palaeogeographical viewpoint, Mizens characterises extensively the deep-water basins (with flysch and/or argillaceous-siliceous deposition), their origin and evolution, and principal sedimentary environments. Main sources of clastic material are outlined, with a general conclusion that the eustatic sea level fluctuations were recorded in these oceanic settings as well (in particular Eifelian and F-F transgressive-regressive cycles). Abramova and Artyushkova document continuous conodont successions within the F-F boundary beds developed as different facies, considerably contributing to a refinement of the major extinction level. The mass-extinction stage boundary runs within the lithologically overall uniform successions, and can be therefore identified only by an abrupt faunal change, such as highlighted icriodid conodont blooms in the earliest Famennian. Owing to advanced biocorrelation, Veimarn *et al.* were able to discuss global-scale phenomena clearly manifested in the Uralian successions. In particular, a major sea level fall, onset of specific ultra-potassic volcanism and flysch deposition, along with exhumation of metamorphic complex, occurred in the critical F-F timespan. Consequently, the authors hypothesise about a catastrophic environmental impact of an erupting mantle superplume, encompassing vast areas of several continents.

Remaining contributions concern other events and expose a wide spectrum of methodological approaches. Korn considers a prominent faunal turnover of late Famennian ammonoids in two conjugate black shale horizons of the Rhenish Slate Mountains, in terms of genera distribution, phylogenetic relationships, and morphospace occupation. The results confirm that the worldwide anoxic "annulata Event" does not correspond to a biotic crisis, although it exemplifies an oceanographic turning point marked by a blooming of specialised fauna. A synthetic sedimentological overview of the middle Frasnian carbonate platform and renowned carbonate mounds of Ardennes is presented by Da Silva and Boulvain. The extensive facies variation is arranged in second-order shallowing-upward cycles, with the larger scale sequential framework corresponding to the eustatic pattern; therefore, for example, the development of lagoonal environments over the emerging platform was simultaneous with an atoll-stage of the carbonate mounds. From the lower Frasnian rhythmic basin succession at Kostomłoty, Holy Cross Mts, a signature of the transgressive-hypoxic Timan Event is described by Racki *et al.* The distinctive pyritic goniatite level is analysed in integrated palaeoecological and mineralogical-geochemical terms. This article contains first results of an interdisciplinary project on the lower to middle Frasnian events, supported by the Committee for Scientific Research in Poland. The task was inspired by promising effects of the previous Belgian-Polish carbon-isotopic study that demonstrated a major perturbation in the earth-ocean system during this Frasnian phase of intermittently rising sea level.

The following two articles concern geophysical properties of Upper Devonian carbonates, but assessed in different genetic contexts. Using high-resolution gamma-ray and magnetic susceptibility logs, Geršl and Hladil significantly refine stratigraphic correlation. This is especially important as providing an insight into the facies architecture of conodont-barren stromatoporoid-coral facies. The geophysical record of dispersed weathering products appears a sensitive tracer for eustasy and palaeoclimate, and therefore offers a clue to the above mentioned lower to middle Frasnian events, recognised in the South Polish–Moravian shelf. On the other hand, Upper Devonian dolomites from Baltic states, investigated palaeomagnetically by Katinas and Nawrocki, reveal remagnetization event caused by progressive replacement of ferric sulphides by magnetite and hematite. Migration of the oxidizing fluids, probably induced by the Mesozoic faults reactivation, was an alleged trigger for the total remagnetization. Thus, diagenetic (and even weathering) signatures can be extremely complex and their interpretation may be

helpful in multiple ways, as highlighted in geochemical studies of organic-rich shales recently reported in the special issue of *Chemical Geology* (206, 2004).

In summary, we hope that this issue of the *Geological Quarterly* illustrates a significant diversity of event approaches and new interdisciplinary perspectives involved in better understanding of Devonian sedimentary record, with special emphasis on regional case studies of Laurussian successions in Central and Eastern Europe. It is hoped that some of the research motives will be continued in the following issues of the journal.

During the final stages of editorial work on this volume we received sad message that Dr. Alevtina N. Abramova from the Institute of Geology of the Russian Academy of Sciences in Ufa died of cancer on May, 29th. She was an outstanding Devonian biostratigrapher, widely known for Her research related i.a. to ostracod and conodont stratigraphy of the Southern Urals and eastern Russian (East European) Plate. One of the main achievements of Dr. Abramova is the precise establishment of the Frasnian-Famennian boundary in a number of important Uralian sections, including those described in this volume.

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