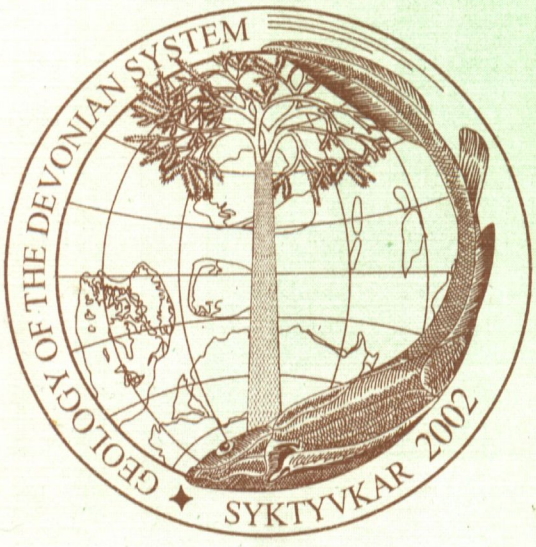
РОССИЙСКАЯ АКАДЕМИЯ НАУК

# ГЕОЛОГИЯ ДЕВОНСКОЙ СИСТЕМЫ




# GEOLOGY OF THE DEVONIAN SYSTEM

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# ГЕОЛОГИЯ ДЕВОНСКОЙ СИСТЕМЫ

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Представлены материалы Международного симпозиума «Геология девонской системы», посвященного рассмотрению накопленных за последнее десятилетие новых данных о геологии одной из интереснейших и важнейших в ресурсном отношении систем фанерозоя. Среди проблем, отраженных в материалах симпозиума — эволюция седиментационных бассейнов и биоты девона, стратиграфия и корреляция разрезов, фации и геохимия осадочных толщ, их тектоника и геодинамика.

Сборник представляет интерес для широкого круга специалистов, занимающихся изучением различных аспектов геологии девонской системы и палеозоя в целом.

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GEOLOGY OF THE DEVONIAN SYSTEM: Syktyvkar, Geoprint, 2002. 340 p.

The materials of the International symposium «Geology of the Devonian system» are submitted. They represent the recent data on the geology of one of the most interesting and rich in natural resources systems of the Fanerozoic. The present volume focuses on the problems of the evolution of sedimentary basins, Devonian biota, stratigraphy and correlation, facies and geochemistry of sedimentary sequences, tectonics and geodynamics.

The publication is of interest to a wide range of geologists dealing with the Devonian.

этапа (надеждинское событие) распознается по появлению в мелководно-шельфовых Южно-Тамбаевском, Еллей-Игайском, Малоичском разрезах регрессивных кораллово-строматопоровых биогермов. С основания зоны *inversus* в Калиновом, Герасимовском разрезах депрессионного типа появляются «черносланцевые» породы мирной свиты с фауной остракод, тентакулитов, радиолярий (далейское событие?).

Раннеэйфельское абиотическое событие (трансгрессия в начале чарымовского цикла осадконакопления) проявилось в выпадении из разреза отложений зон *partitus* и *costatus*. Позднеэйфельское абиотическое событие зафиксировано в Калиновом разрезе появлением черных битуминозных известняков чузикской свиты.

Уровень зоны *varcus* (живетское событие) четко документируется в разрезах ЗСП по наличию органогенных построек небольшой мощности с участием массивных и крупных субцилиндрических форм строматопорат («амфипоровых» известняков), смене таксономического состава и низкому видовому разнообразию конодонтов, бедности фауны остракод и тентакулитов и, напротив, обилию и видовому разнообразию фораминифер надотряда *Parathuramminoida*.

Отчетливо распознается в разрезах ЗСП нижнефранский интервал, отражающий значительный подъем уровня моря и проявившийся литологически в распространении глинисто-кремнистых битуминозных доманикоидных пород. С основания пограничных отложений живета — франа появились конодонты *Mesataxis falsiovalis, Ancyrodella binodosa*, тентакулиты *Homoctenus acutus* («тентакулитовые» слои), многочисленные радиолярии, практически исчезали строматопораты, кораллы, редки фораминиферы и остракоды. Региональный событийный уровень зоны *gigas* устанавливается по конодонтам, редким находкам вымирающих строматопорат, кораллов, тентакулитов. Абиотическое глобальное событие на границе франа — фамена (Kellwasser) документируется в Нижнетабаганских, Северо-Калиновых, Арчинских разрезах по «черносланцевыми» фациями.

Фаменский событийный уровень на территории ЗСП литологически представлен сферово-узорчатыми тонкозернистыми известняками верхнелугинецкой подсвиты с редкими фораминиферами и сферовыми водорослями. Эти известняки замещаются по латерали глинисто-кремнисто-карбонатными породами чагинской свиты с конодонтами, радиоляриями и остракодами семейства *Entomozoidae*. С основания зоны *trachytera* в биоте бассейна начинают доминировать представители качественно нового этапа эволюции фораминифер — надотряда *Endothyroida*.



## DEVONIAN EVENT-STRATIGRAPHY LEVELS ON THE WEST-SIBERIAN PLATE

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The Devonian system in the territory of the West-Siberian plate (WSP) is represented by a terrigene-carbonate deposit complex, intrusive formations and products of volcanic activity. Through the Devonian, marine conditions and the climate close to subtropical have prevailed over the greater part of the plate and promoted the development of diverse biota. The Nyurolskiy structure-facies area (SFA) has received the most study with respect to the Devonian stratigraphy. It is located in the southeast of WSP (the Ob-Vasyugan interfluve). The facies distribution within the Mezhovskiy intermediate massif has been governed by the block structure of the basement formed in the end of Early Paleozoic. This has resulted in forming two zones of deposition: carbonate platforms and depression zones separating these former. Two great unequal stages are sharply defined in the history of the Devonian sedimentation, which are represented by the carbonate series. These series are separated from each other, as well as from the subjacent Silurian deposits and superjacent Carboniferous ones by diverse stratigraphical breaks. Hence, these series may be classified as sequences. The Ichkalinskaya series integrates the Lower Devonian thin-layered, fine-grained carbonate-terrigene deposits, while the Charymovskaya series combines the Middle Devonian carbonate reef deposits and the upper Devonian clotty limestone. The analysis of the biotic and abiotic factors of the sedimentation has revealed a certain succession of the Devonian events of various levels (global and regional) in the WSP territory.

The global abiotic events are related to changes of the World Ocean level. Within the Devonian WSP sections they are identified, first of all, by the occurrence of «black-shale» rocks in different stratigraphical

levels (the Mirnaya, Chusikskaya, Chaginskaya suites). The oxygen status disturbance of the within the ooze cavities of the Kalinoviye, Gerasimovskiye, Nizhne-Tabaganskiye sections is determined by the appearance of dark-grey bituminous limestones alternating with black argillites (domanikites: rocks impregnated with the organic matter). In the Devonian, there were various settings of sedimentation in the Nyurolskiy SFA: benthic forms were dwelling in elevations, and planktic ones were dominating within cavities. Such kind of combined conditions resulted in the unique possibility of tracing the parallel changes in the benthic and planktic biota. The levels of the global biological events connected with the biota evolution have been established: the appearance of new morphological attributes in taxa, radiation, mass extinction etc.). On the base of the results received, it became possible to develop a detailed stratigraphical scale for the WSP Devonian (Resolutions ..., 1999).

The sedimentary alterations resulted from the regional tectonic shifts during the Ichkalinsky and Charymovsky stages. The regional biotic events manifested themselves in the changes of the biodiversity of organisms communities and in the biofacies alteration. The beginning of the Ichkalinskiy sedimentary stage (the early Lochkovian Kyshtovian event) in a shallow shelf is recognized by the emergence of small coral and stromatoporoid biostromes within the Maloichskiye, Perkatskiye, Kilsinskiye sections, as well as by the distinct change of the ostracode and conodont taxonomic diversity in comparison with the Silurian.

The Pragian abiotic event in the beginning of the Armichevskian time (the elevation of the sea level) has resulted in the abrupt reduction in the coral and stromatoporoid biota, but it has promoted the broad dispersion of ostracodes which are characterized by their prominent species diversity. Against this background, the conodont rare occurrence and low species variety emphasizes not only the regional character of event but also the global one. The event is lithologically recognized by the emergence of lenses with «lithoclasts» of the slide genesis within the thin-layered carbonate-terrigene rocks; these lenses being among structural characteristics of the Armichevskaya suite (Solonovskiye, South-Tabaganskiye, West-Ostaninskiye and other sections).

In the beginning of the Solonovskoye time (the Early Emsian Solonovskoye event), the transient sea-bottom elevation has been responsible for the new biofacies change and the development of minor stellopore biostromes within the North-Ostaninskiye, Elley-Igaiskiye, Maloichskiye sections. The ostracode communities of this level have become extremely representative. The conodont taxonomic renewal and diversity, as well as the first appreciable participation of primitive foraminifera in the biota composition should be mentioned. The Upper Emsian level of the Ichkalinskiy stage (the Nadezhdinskoye event) is recognized by the emergence of the regressive coral-stromatoporoid bioherms in the shallow shelf South-Tambayevskiy, Elley-Igayskiy, Maloichskiy sections. The «blackshales» of the Mirnaya suite with ostracodes, tentaculites, radiolaries (the Daleyan event?) have appeared from the bottom of the *inversus* Zone in Kalinoviy, Gerassimovskiy depression type of sections.

The Early Eifelian abiotic event (the transgression in the beginning of the Charymovsky sedimentary cycle) has manifested itself as an omission of the *partitus* and *costatus* Zones from the section. The Late Eifelian abiotic event has been exhibited by the occurrence of the Chuzikskaya black bituminous limestones within the Kalinovye sections.

The level of the *varcus* Zone (the Givetian event) is clearly traced within the WSP sections by the occurrence of minor organogenic constructions involving massive and large subcylindrical stromatoporoid forms («amphiporous» limestones), by the conodont taxa change and their low species diversity, by the ostracode and tentaculite fauna depauperation accompanied by the abundance and taxonomic diversity of the foraminiferal superorder *Parathuramminoida.*

The Lower Frasnian level of the WSP sections is clearly identified. It is representative of the sea level rise and manifests itself lithologically in the distribution of clay-siliceous, bituminous domanicoid rocks. Conodonts *Mesataxis falsiovalis, Ancyrodella binodosa,* tentaculites *Homoctenus acutus* («tentaculite» beds), numerous radiolarians appear from the bottom of the Givetian/Frasnian boundary deposits. Stromatoporoids and corals have practically become extinct, foraminifera and ostracodes are rare. The regional event level of the *gigas* Zone is established by conodonts, rare finds of stromatoporoids becoming extinct, corals, tentaculites. The global abiotic event within the Frasnian/Famennian boundary (Kellwasser) is documented by «blackshale» facies within the Lower-Tabaganskiye, North-Kalinoviye, Archinskiye sections.

The Famennian event level of the WSP territory is lithologically represented by the sphere-ornamented fine-grained limestones of the Verkhneluginezkaya subsuite with rare foraminifera and spherical algae; the limestones are alternated along the lateral by the clay-siliceous-carbonate rocks of the Chaginskaya suite enclosing conodonts, radiolarians and ostracodes of the *Entomozoidae* family. From the bottom of the *trachytera* Zone, the foraminifera of the superorder *Endothyroida* become prevalent in the biota of the basin, as representatives of qualitatively new evolutional stage.