

**Programme & Abstracts**  
**for the China–Russia Joint Workshop on**  
**“Plant Colonization of Land 2026”**

**“植物登陆 2026”中俄联合研讨会**

**会议日程及摘要集**

**北京大学地球与空间科学学院**  
**中俄基础科学研究院地球科学中心**  
**2026 年 9 月**

# 会议日程 Meeting Agenda – 9 月 24 日 September 24

## 10:00 a.m. – 19:00 p.m. | 注册 Registration

报到地点：北京大学中关村新园 1 号楼大厅

Registration Venue: Lobby, Building 1, Zhongguanyuan Global Village, Peking University

## 18:00–19:00 p.m. | 晚餐 Dinner

晚餐地点：北京大学中关村新园 1 号楼 2 层时光西餐厅自助餐

Dinner Venue: Buffet, Time Western Restaurant, 2F, Building 1, Zhongguanyuan Global Village, Peking University

# 会议日程 Meeting Agenda – 9 月 25 日 September 25

会议地点：北京大学中关村新园 1 号楼 11 层集贤厅

Meeting Venue: Jixian Hall, 11F, Building 1, Zhongguanyuan Global Village, Peking University

\*Invited speakers: 20 mins total (15 min presentation + 5 min discussion);

\*\*Student presenters: 15 mins total (12 min presentation + 3 min discussion)

## 08:30–12:05 a.m.

| Time                                              | Presenter            | Title                                                                |
|---------------------------------------------------|----------------------|----------------------------------------------------------------------|
| 08:30–08:40                                       | Bing Shen            | Opening Address (10 mins)                                            |
| <b>08:40–10:00   Session Chair: Jinzhuang Xue</b> |                      |                                                                      |
| 08:40–09:00                                       | Deming Wang*         | Devonian seed plants and their habitat                               |
| 09:00–09:20                                       | Olga Orlova*         | Disperse megaspores of the Devonian and their possible parent plants |
| 09:20–09:40                                       | Sergei Snigirevskii* | Devonian floras of Russia in the context of Sino-Russian cooperation |
| 09:40–10:00                                       | Igor Kosenko*        | Late Mesozoic terrestrial ecosystems of Transbaikalia                |
| 10:00–10:20                                       | —                    | Break (20 mins)                                                      |

## 10:20–12:10 | Session Chair: Olga Orlova

|             |                    |                                                                                                                                             |
|-------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 10:20–10:40 | Yuchen Zhang*      | Upper Ordovician–lower Silurian succession and faunas in northwestern Tarim, Xinjiang                                                       |
| 10:40–11:00 | Anna Liubarova*    | Devonian Woody Plants of Russia: Research Overview and New Findings from the East European Platform                                         |
| 11:00–11:20 | Elena Zaitseva*    | Tournaisian-Visean boundary (Lower Carboniferous) on East-European Platform (Russia)                                                        |
| 11:20–11:40 | Dmitrii Mamontov*  | Visean spore wall ultrastructure from Laurussia provides novel evidence for the origin and early evolution of leptosporangiate ferns        |
| 11:40–11:55 | Hui Wang**         | Silurian-Devonian vegetation zonation: Integrating fossil records and climate modeling                                                      |
| 11:55–12:10 | Mikhail Liamshin** | Middle Devonian xiphosurid from the Voronezh Region (European Russia) as part of Devonian diversification of aquatic chelicerate arthropods |
| 12:10–14:00 | —                  | Lunch and Midday Break                                                                                                                      |

## 12:00–13:00 p.m. | 午餐 Lunch

午餐地点：北京大学中关村新园 1 号楼 2 层时光西餐厅自助餐

Lunch Venue: Buffet, Time Western Restaurant, 2F, Building 1, Zhongguanyuan Global Village, Peking University

# 会议日程 Meeting Agenda -9 月 25 日 September 25

会议地点：北京大学中关村新园 1 号楼 11 层集贤厅

Meeting Venue: Jixian Hall, 11th Floor, Building 1, Zhongguanyuan Global Village, Peking University

\*Invited speakers: 20 mins total (15 min presentation + 5 min discussion);

\*\*Student presenters: 15 mins total (12 min presentation + 3 min discussion)

## 14:00–17:30 p.m.

| Time                                                    | Presenter                    | Title                                                                                                                           |
|---------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>14:00–14:50   Session Chair: Sergei Snigirevskii</b> |                              |                                                                                                                                 |
| 14:00–14:20                                             | Dr. Anastasiia Vaitekhovich* | Research directions in coal and organic petrology at the Faculty of Geology, Lomonosov Moscow State University                  |
| 14:20–14:40                                             | Wei Wei*                     | Hydrography of the Devonian North American Seaway: Relationship of redox conditions to salinity and watermass restriction       |
| 14:40–14:55                                             | Jiaxi Zhao**                 | The rise of forests first suppressed and later enhanced silicate weathering during the transition to the Late Paleozoic Ice Age |
| 14:55–15:10                                             | Ziyu Ling**                  | Plant expansion triggered enhanced continental weathering and carbon cycle fluctuations during the Early Mississippian          |
| 15:10–15:25                                             | Yulia Britova**              | New voltzian cones from Upper Triassic deposits of the Chelyabinsk basin                                                        |
| 15:25–15:40                                             | Igor Dronov**                | New data on the Lower-Middle Devonian floras of the Northern Khakassia, Russia                                                  |
| 15:40–15:50                                             | —                            | Break (10 mins)                                                                                                                 |

## Roundtable Discussion 15:35–17:30 | Session Chair: Bing Shen

|             |               |                                                                                                                                                                                                                    |
|-------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15:50-16:10 | Ksenia Sitar* | Advanced short-term training and short-term non-degree program for professional geologists within the framework of the joint Russian-Chinese Center for Geosciences: Possibilities for creation and implementation |
| 16:10–16:20 | Deming Wang*  | Potential Cooperation with Russian Partners                                                                                                                                                                        |
| 16:20–16:35 | Honghe Xu*    | Potential Cooperation with Russian Partners                                                                                                                                                                        |
| 16:35-17:30 | All Attendees | Open Discussion                                                                                                                                                                                                    |
| 17:30-17:40 | Jinzhuang Xue | Closing & Field Trip Briefing                                                                                                                                                                                      |

## 18:00–19:00 p.m. | 晚餐 Dinner

晚餐地点：北京大学中关村新园 1 号楼 2 层时光西餐厅自助餐

Dinner Venue: Buffet, Time Western Restaurant, 2F, Building 1, Zhongguanyuan Global Village, Peking University

## **Devonian seed plants and their habitat**

Deming Wang <sup>1\*</sup>, Peng Xu <sup>1</sup>, Yi Zhou <sup>2</sup>, Min Qin <sup>3</sup>, Yuehan Pan <sup>1</sup>, Yujia Liu <sup>1</sup>

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The earliest known seed plants occurred in the Upper Devonian (Famennian). For a century, they were documented only from the Laurussian continent. In recent decades, they have been found in South China block and Australian portion of Gondwana. Famennian seed plants are generally consistent in the absence of an integument micropyle in ovule (female organ), presence of a simple pollen organ (male organ), terminal positioning of fertile organs on leafless branches, ribbed protostele in vasculature of stem, and a presumed hydrasperman reproductive system. Seed plants can be well adapted to dry habitats, but the ecological adaptations of Famennian ones, due to usually isolated preservation of fertile organs, have long been debated.

Famennian seed plants demonstrate significant diversity in the characteristics and functioning of the ovules including integument lobes and cupules (if present) which surround the ovules, and in hydrasperman reproduction or not. Famennian seed plants were widespread in Laurussia and South China, but the plants respectively occurring on these two landmasses are completely dissimilar at the genus level, and markedly different regarding ovule size, presence or absence of ovulate cupules, and development of integument structures associated with wind dispersal and photosynthetic nutrition. Such wide distribution, significant diversity and marked differences indicate a Devonian explosion of seed plants at lower latitudes. The floral differences, implying the evolutionary divergence or independent origins, result from major geographic isolation and different climatic zones. Numerous but isolated Famennian ovules were preserved in the extensive Xinhang forest of South China. Their taphonomy and ovular traits suggest that the earliest known seed plants principally dominated (dry) inland habitats and were transported to wet lowlands or coastal habitats where in situ lycopsids, fernlike plants and sphenopsids thrived.

**Keywords:** Devonian; seed plants; diversity; evolutionary divergence; ecology

## Disperse megaspores of the Devonian and their possible parent plants

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Well-preserved disperse megaspores are often found in Devonian terrigenous deposits. Relatively few Devonian heterosporous plants with their in-situ megaspores in the sporangia are known compared to the number of known disperse megaspores. Consequently, paleobotanists seek to gather additional information from disperse material to broaden our understanding of the diversity of heterosporous plants of the Devonian. What characteristics can help us to identify the parent plants of the Devonian disperse megaspores? First, specific morphological features can provide clues. For instance, disperse megaspores with complex anchor-like appendages are characteristic of lycopsids. Such disperse megaspores of specifically those of the genera *Hystricosporites*, *Nikitinsporites*, and *Ancyrospora* appear in the Givetian (megaspore assemblages Middle Devonian, the Kursk region) from that we have previously studied. Second, the ultrastructure of the disperse megaspore sporoderm can reveal the potential parent plant. Our study of ultrathin sporoderm sections from the disperse megaspore *Biharisporites arcticus* var. *productus* revealed that the outer sporoderm layer consists of three-dimensional "branchlets," a feature characteristic of lycopsid spores. The parent plant of disperse megaspores can also be identified by comparing them with identical spores extracted from the sporangia of previously described heterosporous plants. For example, megaspores morphologically similar to the disperse megaspores of *Verrucisporites submamillarius* (McGregor) Chi et Hills were found in the sporangia of the heterosporous arborescent lycopsid *Protolpidodendropsis pulchra* Høeg. Large disperse megaspores of the genus *Lagenicula* can be compared to in-situ megaspores of similar morphological structure. Such megaspores have previously been extracted from the sporangia of several heterosporous Late Devonian lycopsid strobili, such as *Sublepidodendron grabau* and *Kowieria alveoformis*, as well as from the bisporangiate strobilus of the genus *Flemingites* and others. Disperse megaspores of the genus *Contagisporites* are frequently observed in Middle and Late Devonian deposits; in-situ megaspores of this type have repeatedly been identified in the sporangia of archaeopteridalean plants (genera *Archaeopteris* and *Svalbardia*). There are other examples as well. However, even when comparing them with in-situ material, it is not always possible to determine the identity of the parent plant.

Morphologically similar disperse megaspores can occur in different groups of parent plants; for instance, disperse megaspores of the *Calamospora* type are known from the sporangia of certain lycopsids (barinophytes), progymnosperms (neggerathialeans), and sphenopsids (calamostachyaleans).

**Keywords:** disperse megaspores, Devonian, possible parent plants, lycopsids, archaeopterids

## **Devonian Floras of Russia in the Context of Sino-Russian Cooperation**

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3. Department of palaeontology, Moscow State University, Moscow, Russia

Devonian floras of Russia have long been known, yet they have been studied quite unevenly.

The first researchers of Devonian floras in Russia were Ivan Schmalhausen (late 19th century), followed in the first half of the 20th century by Mikhail Zalessky and Afrikan Kryshtofovich. The circle of researchers expanded significantly during the second half of the 20th century, driven by the rapidly developing geological mapping of the USSR and the need for the stratigraphic subdivision of sedimentary formations of continental origin. Among the specialists of that time, Georgy Radchenko, Nina Petrosyan, and Natalia Snigirevskaya (Leningrad), Alefina Yurina and Mirra Senkevich (Moscow), and Venedikt Chachlov, Anatoly Ananiev, Spartak Stepanov, and Tatyana Zakharova (Tomsk), among others, were widely known. While works from the first half of the 20th century were often published in translation into foreign languages, research from the second half of the same century appeared primarily in Russian. Consequently, the publications of most of these specialists are virtually unknown abroad.

Since the late 20th century, Devonian floras have been actively studied by us as well as by our junior colleagues (D. Mamontov, A. Lyubarova, and others). Devonian floras of Russia also attract the attention of other specialists, such as O.P. Tel'nova, A.V. and N.V. Bazhenov's, T.V. and A.O. Alekseev's, and others.

Let us examine the best-known fossil plant localities across the vast territory of Russia.

One of the first sites to be discovered was located in the southern part of the Donets Basin. Plant remains, predominantly of Late Devonian age, were preserved in tuffaceous siltstones and replaced by siliceous material, allowing for the study of their anatomical preservation. It was from this locality that remains of wood belonging to the genus *Callixylon* Zalessky were

first described. Numerous shoots of the lycopods *Helenia karakubensis* (Schmalhausen) Snigirevskaya were also found there.

The Timanian sections are characterized by the richest Late Devonian floras, exhibiting maximum taxonomic diversity. This indicates the active development of terrestrial vegetation as early as the beginning of the Late Devonian. The preservation of the plant remains allows for the study of spores contained *in situ* and, at times, details of their anatomical structure. It is in the Timan region that two fossil Devonian forests have been discovered in Russia: an Early Frasnian forest on the Tsilma River (Middle Timan) and a Late Famennian *Archaeopteris* forest on the Volonga River (Northern Timan).

In recent years, our research in the European part of Russia has identified a significant number of *Callixylon* wood remains – heavily replaced by calcium carbonate and featuring preserved perennial lateral branches – which has enabled the proposal of a new reconstruction of *Archaeopteris*. Furthermore, last year, a large fragment of an organism with a woody habit was discovered in the upper Middle Devonian strata near St. Petersburg; it exhibits an anatomical structure similar to that of *Prototaxites* Dawson.

The Devonian floras of the Urals – particularly those spanning the Devonian-Carboniferous boundary – are of exceptional interest. The sections we encountered can be correlated with the deposits of the European Etroeungt Zone. These sections exhibit a fascinating, mixed taxonomic composition, featuring highly advanced elements alongside archaic forms. There is also a large number of endemics. This mosaic-like composition of plant communities is most likely explained by the development of this unique flora on islands situated within a shallow marine basin. Most remarkable were the discoveries of large sheathing leaves – some still attached to stems, others chaotically buried at the very base of a lens of pyroclastic material. Thus, the remains of what is currently the oldest known instance of leaf fall on Earth were identified.

The classic Early (or Middle?) Devonian Shira locality in northern Khakassia is virtually unknown abroad. It exhibits the greatest taxonomic diversity of fossil plants, with representatives of all major taxonomic groups that existed during the Early Devonian. However, despite the abundance of publications in Russian, these floras remain poorly studied. A revision of all taxa previously described from this site is required.

Cooperation in the following areas appears most promising:

1. Research on Devonian fossil forests in China and Russia.
2. Study of the floras of Khakassia and China – particularly Northern China.
3. Investigation of continental deposits spanning the Devonian-Carboniferous transition that contain preserved plant remains.

**Key words:** Donets basin; *Callixylon*; Timanian ridge; Devonian fossil forests; Etroeungt flora; Shira Locality.

## Late Mesozoic terrestrial ecosystems of Transbaikalia

Igor Kosenko <sup>1\*</sup>, Eugenia Bugdaeva <sup>2</sup>, Ekaterina Pestschevitskaya <sup>1</sup>, Vsevolod Efremenko <sup>1</sup>,  
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Jurassic and Lower Cretaceous non-marine deposits are widely distributed in Transbaikalia. In Eastern Transbaikalia they are divided into the following regional stages: Shadoron (J<sub>2-3</sub>), Unda-Daya (J<sub>3</sub>-K<sub>1</sub>?), Ust-Karsk (K<sub>1</sub>vln-htv), Turga (K<sub>1</sub>htv-apt) and Kuti (K<sub>1</sub>apt-alb).

The Shadoron Regional Stage is represented primarily by the volcanic Shadoron Group. The subsequent Unda-Daya Regional Stage comprises the volcanic-sedimentary Unda-Daya Group, which is characterized by a diverse fossil assemblage including plants, ostracods, branchiopods, insects, spores, and pollen. Several sections, such as Daya and Kulinda, represent unique localities of this terrestrial biota. The Glushkovo Formation, outcropping at the Daya section, yields numerous well-preserved insects, tadpole shrimps, anostracans, and conchostracans. The Kulinda locality, represented by the Ukurei Formation, is widely known for the discovery of the first feathered ornithischian dinosaur, *Kulindadromeus zabaicalicus*. The age of the Unda-Daya Group is generally considered to be Late Jurassic; however, its uppermost part may extend into the Early Cretaceous. The Ust-Karsk Regional Stage, originally proposed by S.M. Sinitsa as a transitional unit between the Unda-Daya and Turga regional stages, yields fossils characteristic of both stages. Its most typical fossils are mayfly larvae (*Proameletus*), tadpole shrimps (*Prolepidurus*), and conchostracans (*Nestoria* and *Defretinia*). The genus *Nestoria* is a typical fossil of the Early Stage of the Jehol Biota (JBS I), which is distributed across the Dabeigou and Huajiying formations of Northern Hebei. Thus, it is possible to correlate the Ust-Karsk Regional Stage with the Dabeigou and Huajiying formations of NE China. New U-Pb dating obtained from two tuff layers in the upper part of the Ust-Karsk Formation (the stratotype of the Ust-Karsk Regional Stage) revealed ages of  $132.58 \pm 0.8$  and  $132.47 \pm 0.75$  Ma, corresponding to the Valanginian/Hauterivian boundary. Therefore, these dates confirm the proposed correlation.

Finally, dinosaur footprints were discovered during a joint expedition by IPGG SB RAS and NIGPAS in the summer of 2024.

The Turga Regional Stage, which encompasses the Turga and its coeval formations, is characterized by a rich fossil assemblage containing key elements of the middle and late stages of the Jehol Biota (the *Eosestheria*–*Ephemeropsis*–*Lycoptera* assemblage). Notably, some sections of the Turga Regional Stage, including the stratotypic Turga section and the Belaya Gora section, yield angiosperm pollen. New U-Pb dating obtained from bentonite beds in the Turga section revealed an age of  $124.23 \pm 0.53$  Ma, corresponding to the Early Barremian. Therefore, the middle part of the Turga Regional Stage is correlated with the Yixian Formation of NE China, while its upper part is correlated with the Jiufotang Formation. The Aptian–Albian Kuti Regional Stage includes the coal-bearing Kuti Formation and other coeval units, corresponding to the coal-bearing Fuxin Formation of NE China.

Collaborative research conducted over the past six years by scientists from the IPGG SB RAS and the Nanjing Institute of Geology and Palaeontology has significantly refined our understanding of the depositional environments and age of Upper Mesozoic strata in Transbaikalia. Furthermore, this work has identified the factors responsible for the exceptional preservation of fossils at certain sites.

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**Keywords:** Late Jurassic; Early Cretaceous; Transbaikalia; Jehol Biota; U-Pb dating; terrestrial ecosystems.

## Upper Ordovician–lower Silurian succession and faunas in northwestern Tarim, Xinjiang

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The northwestern margin of the Tarim Basin, NW China, preserves a relatively complete Upper Ordovician–lower Silurian succession that is key to understanding the Tarim Paleoplate and its correlation with adjacent Central Asian blocks. Based on systematic field investigation of 24 well-exposed sections in the Ying'an, Yimugantawu, Kalpintag, Tataaiertag, and Wushi areas, integrated with lithostratigraphic, biostratigraphic, and paleontological data, this study revises the regional stratigraphic framework, identifies two major unconformities, and documents diverse fossil faunas, especially brachiopods.

Stratigraphically, the Upper Ordovician succession in the Kalpin region is revised into four units. The Ying'an Formation is redefined as three members—Kazile, Yangjikan, and Kumatila—spanning the early Katian (Ka-1). It is overlain by the purplish-red siliciclastic Arisu Formation (late Katian, Ka-4) and the greenish Terekawat Formation, which is subdivided into Siltstone and Sandstone members (late Katian, Ka-4). The thin but laterally extensive Xikeer Bed, yielding the *Cathaysiorthis* Fauna, represents latest Hirnantian to earliest Rhuddanian O–S transitional deposits. In the Wushi area, the Yakrik and Yabage formations are recognized as lower and middle–upper Katian correlatives, respectively.

Two major unconformities are identified. The Katian and pre-Katian hiatus, lasting 1.4–20 Myr, records regional uplift and differential erosion related to the Kalpin Uplift; it also marks a depositional shift from a carbonate platform to a siliciclastic shelf. The Hirnantian hiatus (~1.6 Myr), between the Terekawat Formation and the Xikeer Bed, coincides with global glacio-eustatic sea-level fall and subsequent rise, comparable to coeval records on the Yangtze Platform and elsewhere.

The strata yield abundant fossils, including brachiopods, bryozoans, chitinozoans, conodonts, corals, cryptospores, gastropods, graptolites, stromatoporoids, trace fossils, and trilobites. Brachiopods are especially significant. The early Katian *Altaethyrella* Fauna from the top of the Ying'an Formation contains 12 genera and 12 species, dominated by the smallest known *Altaethyrella* species (~40%). It represents the earliest known *Altaethyrella* in China and exhibits a lilliput effect in reef-related settings. The *Cathaysiorthis* Fauna from the Xikeer Bed is the first of its kind in Tarim and the third known globally, after South China and Australia. *Cathaysiorthis yushanensis* and *Leptaena rugosa* dominate (>90%), forming the *Cathaysiorthis-Leptaena* Association, a post-LOME survival fauna and a key component of the Edgewood-Cathay Fauna. In the Wushi Yabage Formation, brachiopods such as *Altaethyrella seletensis*, *Bokotorthis tarimensis*, *Schachriomonia wushiensis*, and *Weberorthis brevis* further reveal Katian connections. The Xikeer cryptospore assemblage, dominated by dyads, provides rare evidence of terrestrial ecosystems near the O–S boundary and supports paleogeographic proximity to Gondwanan margins.

These brachiopod faunas show close biogeographic affinities between Tarim and South China, Kazakhstan terranes, and Altai-Sayan region of Russia. The shared genera and species provide a robust paleontological link across the Proto-Tethys and offer a valuable reference for stratigraphic correlation, paleogeographic reconstruction, and tectonic evolution of the Altai Mountains. Therefore, this study has important significance for Sino-Russian cooperative research in the Altai region, particularly for understanding Late Ordovician–early Silurian marine connections and orogenic processes.

**Keywords:** Late Ordovician–early Silurian; northwestern Tarim; lithostratigraphy; regional unconformity; brachiopod fauna; Tarim–Altai paleobiogeographic correlation

## **Devonian Woody Plants of Russia: Research Overview and New Findings from the East European Platform**

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The Devonian period was a turning point in the history of terrestrial life: it witnessed the appearance of the first true trees and forests, the origin of secondary growth, and the formation of the earliest forest ecosystems and soils. Among Devonian woody plants, the archaeopteridaleans (Archaeopteridophyta) occupy a special place. Their trunks, described under the genus *Callixylon*, together with the fronds of *Archaeopteris*, are now recognized as parts of a single plant (Beck, 1960). This group existed for a geologically short time – only the Late Devonian, about 26 million years, but it became the dominant woody vegetation of that epoch, and its remains are widely distributed from China and the Urals to Western Europe, Africa, and North America. The very first finds and descriptions of archaeopteridalean wood come from the East European Platform (EEP), which can rightly be considered one of the “birthplaces” of this iconic Devonian taxon.

The history of studying Devonian woody plants of the EEP is long but uneven. First fragmentary descriptions date back to the late 19th and early 20th centuries, when wood remains were often identified without detailed anatomical study. A special place among these pioneering works belongs to I.F. Schmalhausen. In 1894, he described from the southern Donets Basin a series of important Late Devonian taxa: *Archaeopteris archetypus* Schmalh., *A. fissilis* Schmalh., *Dimeripteris gracilis* Schmalh., *D. fasciculata* Schmalh., *Sphenopteris lebedevii* Schmalh., and *Lepidodendron karakubense* Schmalh. (Schmalhausen, 1894). Although these finds were represented mainly by impressions, they laid the foundation for the subsequent study of wood from this region. The first detailed anatomical description of Devonian wood from the Donets Basin and the first attempts at its systematic interpretation are connected with the works of M.D. Zalessky. In 1909 (published in 1910), he described fossil wood with bundles of primary xylem around the pith from the Upper Devonian of the right bank of the Mokraya Volnovakha River,

assigning it to the genus *Dadoxylon* as a new species, *D. trifilievii* (Zalessky, 1909). In 1911, he transferred this species to the genus *Callixylon*, designating *Callixylon trifilievii* Zal. as the type species (Zalessky, 1911). Later, N.S. Snigirevskaya prepared unique collections of archaeopteridalean roots and stems from the Donets Basin and Northern Timan, but most of this material remained undescribed for decades. As a result, until recently, palaeoxylotomical data on Devonian woody plants of the EEP were rare, fragmentary, and based on single, isolated finds. A number of taxa described from the EEP, such as *Dadoxylon* (*Callixylon*) *timanicum* Zal., *Caracuboxylon bakhasuense* Zal. et Tchirkova, *Cladoxylon tanaiticum* Snigirevsky, and many others remain poorly studied and are almost unknown to the international community.

Our study aims to fill this gap. It is based on extensive collections from the Donets Basin, Northern and Middle Timan, Kanin Peninsula, and the Voronezh, Kursk, and Belgorod regions, collected by the authors and by N.S. Snigirevskaya in 1979 – 2023. More than 1000 plant remains and about 250 thin sections, including SEM preparations, were studied. The material is exceptionally diverse: coalified, pyritized, silicified, and calcitized woods of varying preservation, fragments of rhizoids and root systems, and impressions of vegetative and reproductive organs.

The main directions of our research are: (1) detailed anatomy and taxonomy of archaeopteridalean wood (*Callixylon*), including species diagnostics and variability; (2) revision of poorly known taxa (3) reconstruction of the root systems and growth habit of archaeopteridaleans; and (4) palaeoecological and palaeopedological interpretation of the first Devonian forests of the EEP. Within these directions, we have proposed two new reconstructions of *Archaeopteris* trees, based on a unique find from the Upper Devonian of the Syas' River (Leningrad Region) and on BIN RAS collections from the Donets Basin (Snigirevsky et al., 2025). At least two in situ Devonian forests were discovered and studied in the Timanian Ridge – the Frasnian “Tsilma River forest” and the Famennian “Vолонга River forest,” where in situ roots of *Callixylon zalesskyi* Arnold and *C. trifilievii* were found (Lyubarova, Snigirevsky, 2020).

Thus, the Devonian woody plants of the East European Platform, which for a long time remained poorly known, are now becoming a key source for understanding the origin and early evolution of trees and the formation of the first forest ecosystems. Our ongoing studies

continue the traditions of Russian palaeoxylotomical research and open new perspectives for international cooperation.

Keywords: Devonian; woody plants; Archaeopteridophyta; Callixylon; East European Platform; palaeoxylotomy; fossil forests

## **Tournaisian-Viséan boundary (Lower Carboniferous) on East-European Platform**

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The Tournaisian-Viséan boundary has long been studied by the International Subcommission on Carboniferous Stratigraphy as a global datum. In the Belgian Stratotype, it was previously located at the base of the Moliniacian, which is correlated with the foraminiferal zone *Eoparastaffella* (CF4 $\alpha$ ), at the top of the *Scaliognathus anchoralis* conodont zone, or at the base of the *Mestognathus praebeckmani*-*beckmani* zone. It was subsequently determined that the Ivorian–Moliniacian boundary actually lies below the Tournaisian–Viséan boundary defined by the appearance of *Eoparastaffella*. The identified subzone CF4 $\alpha_1$  (the lower part of the Moliniacian), which lacks *Eoparastaffella* and is characterized by the appearance of *Mestognathus praebeckmani* conodonts, was assigned to the Tournaisian. In the International Geochronological Chart (IGC), the boundary of the Viséan stage is defined by the appearance of the foraminifers *Eoparastaffella simplex* in the evolutionary lineage *Eoparastaffella rotunda* – *E. simplex*. The Global Stratotype Section and Point (GSSP) was established in the Penchong section, Guangxi, South China (at the base of layer 83). This decision was ratified by the International Stratigraphic Commission in 2008. In the Viséan Stratotype, it was adopted at the top of the CF4 $\alpha_1$  subzone. Corresponding changes have been made to the General Stratigraphic Chart (GSC) of Russia.

The position of this boundary on the East European Platform (EEP) was long a subject of debate. In stratigraphic schemes for the Lower Carboniferous of the EEP, it was aligned with the IGC, resulting in the assignment of the Kosva Regional Substage to the Tournaisian. Resolving this issue is complicated by major reorganizations at the Tournaisian-Viséan boundary, which caused sedimentary hiatuses of varying amplitude and significant lateral facies variation. In the western regions of the EEP such as the Moscow Syncline—a sedimentary hiatus is observed at this level. In the eastern regions—the Volga-Ural Anticline—the facies spectrum ranges from continental terrigenous lacustrine-paludal, nearshore-marine, and deltaic settings to deep-shelf environments.

Within the boundary interval of the East European Platform (EEP), the *Dainella staffelloides*–*Eoforschia moelleri* foraminiferal zone (in the uppermost Tournaisian) and the *Eoparastaffella simplex* zone (at the base of the Viséan) have been identified; this is broadly consistent with the foraminiferal successions observed in Western Europe and South China. Further research is required to clarify the distribution of the *Eoparastaffella rotunda* zone, the assemblage of which has been traced in only a few sections in the southwest (the Karakul–Smushkov zone) and, possibly, in the southeast of the EEP.

The structure of terrigenous and carbonate-terrigenous sections, including the duration of hiatuses, is substantiated by miospore assemblages. In continuous sections of the boundary deposits, two miospore zones have been identified: *Tuberculispora exigua*–*Triquitrites batillatus* (EB) and *Monilospora variomarginata*–*Euryzonotrites macrodiscus* (VM) in the upper Tournaisian (Kosva Regional Substage); and three zones: *Gorgonispora multiplicabilis*–*Murospora aurita* (MA), *Monilospora culta*–*Lycospora pusilla* (CP), and *Gorgonispora appendices*–*Cincturasporites canaliculatus* (AC) at the base of the Viséan (Radaevka Regional Substage). Of particular interest are the carbonate-clayey depression sections of the Kama-Kinel trough system, which are characterized by foraminiferal and miospore assemblages.

**Keywords:** Lower Carboniferous, Tournaisian, Viséan, Stratotype, foraminifers, miospores

# **Visean spore wall ultrastructure from Laurussia provides novel evidence for the origin and evolution of leptosporangiate ferns**

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The Early Carboniferous (Mississippian) represents a highly complex and enigmatic time interval for understanding the evolution of true ferns (leptosporangiates) as key colonizers of terrestrial ecosystems. The origin of leptosporangiates still remains unclear, but their fossil diversity is well known. The macrofossil record of pteridophytes shows that leptosporangiates emerged and first diversified during the Mississippian–Pennsylvanian. This first radiation resulted in at least six extinct lineages (families)—Anachoropteridaceae, Botryopteridaceae, Kaplanopteridaceae, Psalixochlaenaceae, Sermayaceae, and Tedeaceae—as well as several incertae sedis genera (*Discosoropteris*, *Kidstoniopteris*, *Radiitheca*, *Sturia*, *Boweria*, and *Tenchovia*), all of which became extinct before the end of the Permian. The oldest fossil assemblages of true ferns indicate that the earliest leptosporangiates evolved within a diverse ancestral group of eusporangiate ferns, including zygopterids, cladoxylopsids, and stauropterids, during the middle Tournaisian–Visean. Although the palaeobotanical record of Visean leptosporangiates is scarce, their abundant palynological record preserves a strong phylogenetic signal based on spore wall ultrastructure. Recently, we have shown that the miospore ultrastructure of *Maiaspora* from the late Visean of Central Russia and the UK represents the oldest fossilizable apomorphy of the total-group Gleicheniales. It shows a three-layered exospore at the interradian areas of the proximal wall, while the non-apertural parts of the wall consist of two exospore layers. The middle layer is composed of foliated or undulate lamellae spreading from the base of the aperture slit to the subequatorial margins of the kytome areas. The lamellae do not overlap the aperture slit and terminate at two-thirds to three-quarters of the slit height. In the present study, we examined for the first time the ultrastructure of auriculate miospores of *Triquitrites comptus* from Central Russia. The ultrastructure of *Triquitrites* spores shows a more primitive state of sporoderm ultrastructural organization compared to the more derived condition in *Maiaspora*. It also shows a three-layered exospore at the interradian areas of the proximal wall. However, the middle layer spreads from the base of the aperture slit to the equatorial and distal-equatorial margins of the sporoderm. The lamellae do not overlap the aperture slit but extend very close to the apex of the aperture. Such an ultrastructural pattern

has no analogue among extant leptosporangiate ferns and is considered transitional between the Osmundales and Gleicheniales types of ultrastructure. Significantly, in situ analogues of *Triquitrites* miospores were previously described from the leptosporangiate ferns *Szea sinensis* and *S. yunnanensis* from the Permian of China. Differences in ultrastructure between *Triquitrites* and *Maia spora* provide key evidence for an evolutionary transition from basal to more derived groups of leptosporangiate ferns, serving as a signal of their rapid diversification during the Viséan.

**Keywords:** Viséan, miospores, ultrastructure, *Triquitrites*, leptosporangiates, Gleicheniales

# **Silurian-Devonian vegetation zonation: Integrating fossil records and climate modeling**

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We compiled the Silurian-Devonian vascular plant macrofossil data and integrated them with paleoclimate simulations from the CESM model. By spatially aligning paleobotanical records and simulated climate variables, a unified paleo-vegetation-climate dataset was constructed. Köppen climate classification criteria were applied to derive key precipitation and temperature thresholds, allowing a preliminary reconstruction of Silurian-Devonian vegetation zonation. The results show that in the Silurian early vascular plants (e.g., Rhyniopsida and Zosterophylloids) were mainly distributed in tropical zones, with grassland as the dominant vegetation type. During the Early Devonian, Lycopsida expanded significantly into tropical and subtropical regions, and grassland remained predominant. By the Middle Devonian, Rhyniopsida and Zosterophylloids declined, whereas Lycopsida, Cladoxyloids, and Progymnospermopsida diversified and spread. Vegetation types became more varied, including forests, shrublands, and grasslands. In the Late Devonian, the rise of Spermatopsida marked a key evolutionary event. Lycopsida and Progymnospermopsida forests became established in tropical and subtropical regions, with forests and shrublands dominating the landscape. The quantitative reconstruction of climatic adaptations in Silurian-Devonian vascular plants, combined with paleoclimate modeling, offers new insights into the development of early terrestrial ecosystem and its environmental drivers.

**Keywords:** Silurian-Devonian, vascular plants, paleoclimate, climate zonation, vegetation type

## **Middle Devonian xiphosurid from Voronezh Region (European Russia) as part of Devonian diversification of aquatic chelicerate arthropods**

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The origin and diversification of land-based vegetation has most certainly had an influence on the environment and, by proxy, on its inhabitants. The authors of this presentation want to answer these few questions: when why and how did the marine arthropods transition to freshwater basins and later to land dwelling, the influence of vegetation on that process. Marine Xiphosurids have evolved approximately during Ordovician, though they were quite sparse until middle Devonian. Increase in diversity and quantity of Xiphosurid is closely related to Devonian, when they have managed to successfully invade brackish and freshwater basins, during Carboniferous the rapid increase in diversity continues. Despite all that, information on those fascinating creatures is quite limited, only 15 species is known. Authors have looked at a new specimen of ancient horseshoe crab *Kasibelinurus* sp., found in clays of the Vorobievka Regional Substage (early Givetian) in the vicinity of Town of Pavlovsk, Voronezh Region (European Russia). The specimen is small (less than 2 cm), probably juvenile, but have traits, that were studied using microtomography, resembling those of Devonian xiphosurids from North America (*Patesia*) and Australia (*Kasibelinurus*).

The layer containing the specimen also is abundant in brachiopods-lingulids, ostracods, conodonts (*Polygnathus*, *Icriodus*), and with numerous findings of various fish remains (heterostracans and armored fishes). It is quite obvious, that the basin was brackish though it still had the connection with marine basin. The carapace of the specimen has been fully preserved and there is no indication that it has been transported or otherwise relocated. Paleoeological reconstruction of the conditions present at the time of active sedimentation and burial of the specimen, drawing parallels to the Kerschthum Konservat-Lagerstätte (Luxembourg, Eifelian), allowing us to better understand the environment in which the ancient horseshoe crab dwelled. Horseshoe crab started to invade freshwater basins simultaneously with conchostrachans, but a little earlier than ostracods and bivalves. Presumably, it is related to the rapid diversification and colonization of land by plants,

which intern created an environment that was suitable for colonization by arthropods like horseshoe crabs and other animals.

The specimen has proven to be of great interest for future research and further understanding of the natural world, and, to be more precise horseshoe crabs and their relationship with their environment through time. Though, undeniably, further research in the field is necessary.

**Keywords:** Animal invasion in low salinity and freshwater basins; Givetian; xiphosurids; connection to food accessibility

## **Research directions in coal and organic petrology at the Faculty of Geology, Lomonosov Moscow State University**

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Research in coal and organic petrology at the Department of Geology and Geochemistry of Fossil Fuels, Faculty of Geology, Lomonosov Moscow State University, covers a wide range of organic-rich rocks from different regions of Russia. Coal-petrographic studies include deposits and coal basins extending from the Moscow Coal Basin to the coal-bearing regions of Kamchatka and Sakhalin in the Far East. The studied materials include brown coals, bituminous and coking coals, anthracites, and highly metamorphosed carbonaceous materials, including graphite. Coal is composed of three major maceral groups: vitrinite, inertinite, and liptinite, whose proportions and composition vary with coal type and rank. Another important direction is the study of oil shales. Petrographic investigations focus on the composition, distribution, and transformation of organic matter dispersed within the mineral matrix. Microscopic examination, including reflected-light, transmitted-light, and ultraviolet fluorescence microscopy, is used to characterize the petrographic features of organic matter and its individual components.

Organic-petrological studies of petroleum source rocks cover organic-rich successions from the Volga-Ural, Timan-Pechora (northeastern European Russia), West Siberian, North Caucasus, and East Siberian basins. Unlike coals, in which organic matter is concentrated, source rocks contain predominantly dispersed organic matter within the mineral matrix. The liptinite group represents the major maceral group in the studied source rocks. The investigated successions include the Bazhenov Formation of Western Siberia, Domanik deposits, the Khadum Formation of the North Caucasus, and the Kuonamskaya Formation of the Siberian Platform.

**Keywords:** organic-petrological studies, oil shales, coal-petrographic studies

## **Hydrography of the Devonian North American Seaway: Relationship of redox conditions to salinity and watermass restriction**

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The Devonian North American Midcontinent Seaway (NAMS) was an extensive epeiric sea for which marine salinity conditions were long assumed, despite pronounced restriction of the watermass in its interior regions. Recent studies using elemental salinity proxies have inferred mainly brackish conditions within the Appalachian and Illinois basins, but the larger-scale pattern of salinity variation within this continent-spanning seaway and its relationship to contemporaneous redox variation have not been explored to date. Here, we report data for 19 black shale drillcores from the North American Midcontinental Sea, allowing reconstruction of patterns of restriction-salinity-redox (RSR) covariation on the Oklahoma and West Texas shelves and in the Williston, Illinois Basin, and Appalachian Basin. During the latest Devonian-earliest Carboniferous, the Williston Basin had strongly restricted deep waters characterized by hypersaline and euxinic conditions. The Oklahoma and West Texas shelves were less restricted and exchanged their deep waters with the open ocean more freely, leading to normal-marine salinity and variable redox conditions. In the Appalachian Basin, lateral watermass gradients were present, with low-brackish and oxic

conditions in proximal regions to the northeast and high-brackish and euxinic conditions in distal regions to the southwest. These data allowed us to reconstruct spatio-temporal patterns of covariation between salinity and redox within the Devonian-Carboniferous NAMS, providing fundamental insights into paleoenvironmental controls: 1) paleogeographic factors impacting watermass restriction are commonly the dominant control on salinity conditions; 2) salinity variation is commonly the dominant control on redox variation in ancient depositional systems; and 3) the link between salinity and redox variation depends on the watermass restriction of the study basin. We advocate using a combination of watermass restriction, salinity and redox proxies in all future paleoenvironmental studies.

**Keywords:** boron; B/Ga; strontium; Sr/Ba; environmental gradient; marginal-marine

## **The rise of forests first suppressed and later enhanced silicate weathering during the transition to the Late Paleozoic Ice Age**

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The spread of deep-rooted forests during the Devonian is widely proposed to have intensified silicate weathering and promoted late Paleozoic cooling. Yet widespread afforestation preceded the main phase of the Late Paleozoic Ice Age by approximately 30 million years, challenging the assumption that vegetation acted as a fixed weathering amplifier. Here, we combined paired vegetated and vegetation-free Earth system simulations with a global silicate weathering model across 17 time slices from 410 to 250 Ma. Exact Shapley decomposition attributed vegetation-induced weathering anomalies to temperature, hydrology, and soil stabilization. During Late Devonian afforestation, soil stabilization dominated: vegetation reduced erosion and fresh-mineral supply across extensive mid-latitude regions, lowering global silicate weathering. As time evolves, the weathering anomaly due to vegetation changed from  $-0.34 \times 10^{12} \text{ mol yr}^{-1}$  at 380 Ma to  $+0.14 \times 10^{12} \text{ mol yr}^{-1}$  at 330 Ma. This reversal accompanied the assembly of Pangaea, when vegetation-enhanced hydrology increasingly outweighed geomorphic suppression over lower-latitude land. Vegetation-induced warming additionally promoted weathering at high latitudes. Paleogeography therefore modulated the balance among geomorphic, hydrological, and thermal effects, making vegetation a state-dependent regulator rather than a fixed weathering amplifier. This mechanism may have contributed to the delay between Devonian afforestation and the main phase of the Late Paleozoic Ice Age.

**Keywords:** Silicate weathering; Land plant evolution; Late Paleozoic Ice Age; Earth system modeling

## **Plant expansion triggered enhanced continental weathering and carbon cycle fluctuations during the Early Mississippian**

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During the Mississippian, Earth's climate experienced a major shift from a greenhouse to an icehouse state, accompanied by significant climate-environmental changes. This period provides a deep-time perspective on glacier-environment-climate coevolution and future climate change. Current research on this period has primarily focused on marine carbonate records, and the complex climate-environmental changes in non-marine strata remain unclear. Therefore, to deeply understand the driving mechanisms of climate-environmental changes during this period, we analyzed mudstones from the Tournaisian to early Visean stages in the marine-terrestrial transitional strata of the Duyun Section in Guizhou, South China. Using organic carbon isotope composition ( $\delta^{13}\text{C}_{\text{org}}$ ), total organic carbon content (TOC), continental weathering proxies (CIA, CIX, and WIP), polycyclic aromatic hydrocarbons (PAHs), and elemental geochemical ratios (P/Al, Rb/Sr, Sr/Cu), to reconstruct trends in continental chemical weathering, carbon cycling, and climate-environmental evolution in the early Mississippian marine-terrestrial transitional environment. The results show that  $\delta^{13}\text{C}_{\text{org}}$  and CIA values exhibit synchronous periodic variations, with two positive excursion stages (early-middle Tournaisian and early Visean) and two negative excursion stages (late Tournaisian and middle Visean). These fluctuations in carbon cycling and continental weathering trends are closely related to climate-environmental evolution cycles: the positive offset phases of  $\delta^{13}\text{C}_{\text{org}}$  and CIA values correspond to relatively humid climatic

conditions, the development of swamp environments, increased primary productivity, and enhanced carbon burial; whereas phases of negative offset in  $\delta^{13}\text{C}_{\text{org}}$  and CIA values correspond to relatively arid climatic conditions, reduced primary productivity, diminished carbon burial, and the prevalence of wildfires. Comparative analysis reveals that global carbon cycle and continental weathering disturbances during the mid-Tournaisian and early Viséan periods coincided with events of seed plant diversification. The expansion of seed plants into uplands triggered intensified continental chemical weathering, increased productivity, enhanced carbon burial, and a decrease in atmospheric  $\text{pCO}_2$  concentrations, leading to a positive shift in  $\delta^{13}\text{C}_{\text{org}}$ . And then, abundance of vegetation and rising atmospheric  $\text{pO}_2$  concentrations triggered frequent wildfires that destroyed terrestrial vegetation; this may have been the direct cause of the weakened continental chemical weathering and the negative shift in  $\delta^{13}\text{C}_{\text{org}}$  during this period. Our research indicates that terrestrial vegetation expansion drove the climate and environment change during the early Mississippian.

**Keywords:** carbon isotope, chemical weathering, PAHs, marine-terrestrial environmental, South China.

## New voltzian cones from the Upper Triassic deposits of the Chelyabinsk basin

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The genus *Voltzia* Brongniart is an important component of the Triassic floras of Western Europe. The structure of female cones is known for 12 species from 8 localities in Western Europe and one species from the eastern part of the USA. The genus *Voltzia* occurs less frequently in the Triassic deposits of Russia and is represented by several species described predominantly from the leafy shoots. Seed scales of the genus *Cycadocarpidium* Nathorst and cone-like seed-bearing organs of uncertain taxonomic affinity, assigned by the authors to the genus *Antholites* of the Voltziaceae family were described early from the Triassic deposits of the Chelyabinsk Basin.

An impression of the Triassic female cone from the Vernadsky State Geological Museum collection originating from a presumed locality of Kopeysk town (Chelyabinsk Region) was examined. Analysis of the computed tomography results for the cone specimen revealed five-lobed seed scales with bracts extending from the axis.

Its feature allows the specimen to identify as *Voltzia* sp. Another specimen of a female cone from a nearby locality (Kopeysk, Chelyabinsk Region) comes from the collection of the Department of Paleontology at the Faculty of Geology, Lomonosov Moscow State University. It was also examined using tomography and, following a detailed description of its morphological characteristics, was assigned to the same morphotype. These findings extend the known Triassic geographic distribution of the genus *Voltzia* within Russia, while the aforementioned impressions of cone-like seed-bearing organs, previously described as the genus of *Antholites*, warrant careful re-examination using tomography and potentially be refer to the same morphotype of the cone.

**Keywords:** Voltziaceae; Triassic; conifers; seed cone, *Voltzia*; Chelyabinsk basin

## **New data on the Lower-Middle Devonian floras of the Northern Khakassia, Russia**

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The localities of Lower–Middle Devonian fossil plants in the Shira District of the Republic of Khakassia are unique: they include essentially all high-ranking taxonomic groups of plants that inhabited the Earth at that time, moreover their preservation is often very good, and they are numerous.

The localities are placed within the Chulym-Yenisei depression of the Minusinsk intermontane trough and the northwestern slopes of the Batenevsky uplift; fossil plants are found in interlayers and lenses of sandstones and siltstones within the sedimentary-volcanogenic terrestrial deposits of the Byskar Series. The history of their investigation spans nearly a century and remains controversial. The earliest data on Devonian floras of Khakassia were reported by A. N. Kryshstofovich ((1927) 1928). Subsequently, A. R. Ananiev and his students S. A. Stepanov and T. V. Zakharova (Tomsk State University), as well as A. S. Peresvetov (Moscow Geological Prospecting Institute), H. F. Tschirkova (Institute of Geology and Development of Fossil Fuels, Moscow), G. P. Radczenko, V. G. Lepekhina, and N. M. Petrosyan (All-Russian Geological Research Institute, Leningrad), carried out detailed studies of the Devonian floras in the area under consideration. However, the non-compliance of many taxa does not meet the modern requirements of the ICBN, the often-low quality of the published materials, the ambiguous interpretation of palaeobotanical data, and the lack of international cooperation have forced us to undertake a restudy of these floras.

Between 2024 and 2026, we collected a rich and representative collection of fossil plants from six localities in the southern part of the Chulym-Yenisei depression of the Minusinsk intermontane trough and on the northwestern slopes of the Batenevsky uplift, and carried out taphonomic observations. A preliminary identification of the taxa (in the terms used by

Soviet palaeobotanists) yielded the following list, locality by locality: *Cooksonia* sp., *Drepanophycus spinosus*, *Glyptophyton granulare*, *Jenisseiphyton rudnevae*, *Protobarinophyton obrutschewii*, *Psilodendron sibiricum*, *Psilophyton princeps*, *Taeniocrada* cf. *gracile*, *T. decheniana* f. *pectinata*, *T. timanica*, *Zosterophyllum myretonianum* (the «Transportnoye» Locality); *Cooksonia* sp. *Distichophytum mucronatum*, *Drepanophycus spinaeformis*, *D. spinosus*, *Gosslingia breconensis*, ?*Hicklingia erecta*, *Jenisseiphyton rudnevae*, *Juliphyton glazkini*, aff. *Niayssia altaica*, aff. *N. plumata*, *Psilodendron sibiricum*, *Pectinophyton norvegicum*, *Zosterophyllum* cf. *rhenanum* (the «Levoberezhnoe-Sokhochulskoye» (the «Severo-Sokhochulskoye») Locality); *Glyptophyton granulare*, *Drepanophycus* sp., *D. spinaeformis*, *Jenisseiphyton rudnevae*, *Saxonia kaluginii* (The «Neck» Locality); *Jenisseiphyton rudnevae* (the «Pravoberezhnoe-Sokhochulskoye» («Rudnevskeye»); *Matharakia inopinata*, *Minusia antiqua*, *Psilophyton* sp. (the «Central- 1» Locality); *Blasaria sibirica*, *Drepanophycus* sp., *Matharakia inopinata*, *Minusia antiqua*, *Protobarinophyton obrutschewii* (or *Pectinophyton bipectinatum*), *Psilophyton princeps*, *Psilophyton* sp., *Zosterophyllum rhenanum* (the «Central- 2» Locality).

The plant remains in the collection consist of relatively large fragments, often much more representative than the material originally used to establish these taxa (for example, *Glyptophyton granulare*), they are typically well preserved and, finally, encompass virtually all plant groups that existed during the Early-Middle Devonian – all of this gives us reason to hope that the material we have collected will allow us to take a new look at these remarkable floras.

We would very much welcome Russian–Chinese cooperation, because the floras we study are similar to the well-studied floras of Western Dzungaria in northwestern China not only geographically but also in their position on palaeogeographic maps; however, they have never been properly compared, simply because they were studied separately. Besides the Lower and Middle Devonian floras of the Northern Khakassia exhibit certain similarities with coeval floras of South China, including the presence of genera such as *Zosterophyllum*, *Distichophytum*, *Gosslingia* and *Drepanophycus* and many others.

**Keywords:** Lower–Middle Devonian; the Chulym-Yenisei depression; the Minusinsk intermontane trough; the Byskar Series; A. R. Ananiev; *Jenisseiphyton*; *Drepanophycus*; *Psilophyton*; *Zosterophyllum*