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KEYNOTES

MICROBIAL- TO METAZOAN-DOMINATED REEF TRANSITION IN THE EARLY PALEOZOIC

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The transition from microbial- to metazoan-dominated reef ecosystems began in the Cambrian. The early Cambrian saw the development of archaeocyath-microbial reefs, followed by lithistid sponge-microbial reefs in the middle to late Cambrian. The Early Ordovician then marked the emergence of the first, but localized, metazoan-dominated reefs, with the discovery of stromatoporoid and bryozoan reefs in South China, while the rest of the Earth was dominated by lithistid-*Calathium*-microbial reefs. The late Darriwilian (Middle Ordovician) saw a sudden and widespread appearance of metazoan-dominated reefs across multiple paleogeographic regions, characterized by the advent of stromatoporoids, corals, and bryozoans. However, recent discoveries of Early Ordovician stromatoporoid reefs suggest that metazoan reef ecosystems may have developed earlier and more gradually than previously thought. This pattern of reef evolution was likely driven by a combination of biological evolution and environmental changes, particularly increased marine oxygenation. Cambrian 'greenhouse' conditions, characterized by elevated temperatures and reduced oxygen solubility, favored microbial and lithistid sponge reef builders that could tolerate low-oxygen environments. The gradual cooling and increased oxygenation in the Early to Middle Ordovician likely facilitated the diversification of metazoan reef builders, leading to the widespread establishment of stromatoporoid-coral-bryozoan reefs in the late Darriwilian.

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A BALTOSCANDIAN VIEW OF THE GOBE RADIATIONS DELAYED BY A LOCAL SHORT-TERM EXTINCTION DURING THE DARRIWILIAN SHIFT INTO THE ORDOVICIAN ICEHOUSE

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Over decades scientists studied the intense diversifications of life after the Cambrian innovations. Different steps of this Great Ordovician Biodiversification Event (GOBE) were documented within various clades with taxa invading a multitude of new palaeoenvironments and niches. A distinct global biodiversity burst is observed in Darriwilian times. With that knowledge, the main goal became to find causes for the ecosystem changes leading to these major radiations in different faunal groups. There are many potential factors that through complex interplay could have influenced the biodiversifications – this time interval is associated with the highest dispersal of continental plates, the largest tropical shelf areas, and the most intense volcanic activity during the Palaeozoic, including some of the largest ashfalls in Earth's history, a remarkably high extra-terrestrial dust input related to the breakup of the L-chondrite parent body (LCPB), as well as increased faunal interactions and competition in increasingly complex ecosystems. Today, geoscientists mostly agree that cooling of the global climate was one important, if not "the" major, trigger for the GOBE. We conducted a complete bed-by-bed appraisal of conodont species richness in the Hällekis quarry at Kinnekulle, southern Sweden, and integrated biotic data with high resolution δ^{18} O and δ^{13} C data, to detect changes in local environments. The records display a rising conodont richness curve up through the *Lenodus antivariabilis* conodont zone (CZ), before a peak in the lowermost *Lenodus variabilis* CZ is followed by a plateau, prior to a two-phased richness drop in the upper half of this CZ. Our δ^{18} O record supports results of a microfacies-derived sea level curve and shows that the studied interval presumably was mainly deposited during relatively cold climates. The richness plateau and extinction pulse occurred during colder climate when sea level was lowest. Because the richness data is range interpolated, effects of facies change due to fluctuating sea levels should be minimal, thus suggesting that the extinction represents a true biotic signal. The Hällekis succession tells also the fascinating story of the large LCPB disruption, seemingly causing an enhanced flux of micro-meteorites to Earth 467 Ma. This asteroid breakup represents one of the major extraterrestrial events in our solar system and scientifically best-documented asteroid collisions. It was suggested that it caused climate cooling and had a fundamental influence on biodiversity by intensifying the GOBE. However, this is under debate since the inferred LCPB level occurs within an overall cooling phase corroborated by our detailed data.

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ORGANIC-WALLED PHYTOPLANKTON AND SPORES: HELPING TO FILL KNOWLEDGE GAPS IN THE ORDOVICIAN LIFE EVOLUTION

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The Ordovician period encompasses two major evolutionary events of life on Earth: the "Great Ordovician Biodiversification Event" and the "Late Ordovician Mass Extinction". Organic-walled phytoplankton, as marine primary producers, and the spores, as representatives of the early land plants, can contribute to the understanding of the causes and consequences of these events, as well as being valuable biostratigraphic tools to comprehend their chronology and scale. In the Ordovician of South America, organic-walled phytoplankton (OWP) records are limited but primarily found in western Argentina, with some discoveries in Colombia and Brazil. Notably, the presence of the *messaoudensis-trifidum* acritarch assemblage, which spans the Tremadocian–Floian boundary around the Gondwana margin and Baltica, provides a useful biostratigraphic tool for correlation of late Tremadocian time slices. The OWP exhibits its greatest diversity during the Floian and Middle Ordovician in Argentina and Colombia, with affinities with the Perigondwanan acritarch Province. In Colombia, the OWP proved crucial in distinguishing the global series and stages of the Ordovician. Towards the Late Ordovician, the OWP declines in diversity and tends to cosmopolitanism. It is predominantly represented by Katian–Hirnantian assemblages from both Colombia and Argentina. In the Middle Ordovician, the appearance of terrestrial plants produced major changes in the carbon cycle, irreversibly modifying the conditions of the Earth's surface and, therefore, affecting marine productivity, ergo the OWP. Dapingian cryptospores found in northwestern Argentina represent the earliest evidence of land plants globally. In Argentina, the Ordovician record includes cryptospores from the Darriwilian, Sandbian, and Katian stages and much more diverse Hirnantian assemblages associated with some of the world's oldest trilete spores. Hirnantian cryptospores are also present in Brazil, Paraguay, and Colombia. The early cryptospore and trilete spore records support the Gondwanan origin of land plants. In Sweden (part of the paleocontinent Baltica), the late Darriwilian, Sandbian and early Katian provided rich and diverse OWP assemblages. Remarkably, taxa with Silurian affinities, previously known from glacial-postglacial Hirnantian strata, appear in the late Darriwilian–early Sandbian, additionally accompanied by spores revealing the early presence of land plants in Baltica. In levels related to volcanic ash beds, particularly near and within the Kinekulle-K bentonite, the marine primary productivity shows its highest peak while the diversity reaches its minimum value. The intense volcanism could have promoted the phytoplankton innovations and the early establishment of land plants in Baltica, setting up a new benchmark in the knowledge of these groups' origin, evolution, and radiation.

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LINKING EARTH-SYSTEM CHANGE WITH SPECIATION AND DISPERSAL PROCESSES DURING THE GREAT ORDOVICIAN BIODIVERSIFICATION EVENT (GOBE) AND RICHMONDIAN INVASION

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The Ordovician Period was a time of intense biotic change including dramatic radiation of marine life and development of new ecosystem structures, during the Great Ordovician Biodiversification Event (GOBE), dramatic dispersal events such as the Richmondian Invasion in the Katian, and ultimately culminating in the Late Ordovician Mass Extinction (LOME). These biotic changes co-occurred and were facilitated by a diverse array of environmental changes including cooling global temperatures, tectonic shifts, increasing oxygenation, increased nutrient supply from continental weathering and volcanism, changes in global ocean circulation, and cycles of sea rise and fall. Better constraining the linkages between the earth and life system is essential for fully understanding how the drivers of diversity change and ecosystem establishment in earth history. Detailed stratigraphic and species occurrence data are essential for resolving biodiversity patterns. Regional records offer outstanding promise for detailed understanding due to the co-location of the fossil and stratigraphic data. This linkage is often lost in global databases, but is essential for discerning evolutionary patterns, as speciation and adaptation occur within specific areas, not as a simultaneous global process. Regional analyses of Mid Ordovician brachiopods within the Oklahoma Basin of Laurentia demonstrate the timing of diversification, body size increase, and speciation in this area is synchronous with other regions such as Baltica and peri-Gondwana and environmental factor analysis indicate that global changes (such as temperature) exerted greater control on diversification patterns than local lithology changes. lobal synchronicity of regional signals support a discrete Mid Ordovician GOBE within the temporally expanded Ordovician Radiation. A signature feature of the GOBE was the dispersal of clades among paleocontinents. Notably, vicariance and dispersal speciation alternate during this interval following the Biotic Immigration Event (BIME) model. This links speciation directly to sea-level, climatic, and tectonics events. This process culminated in widespread dispersal in the Katian Stage, the best studied example of which is the Richmondian Invasion, which included a several waves of biotic invasion from multiple source regions into the Cincinnati and Nashville Basins from other regions of Laurentia and nearby paleocontinents. General patterns of the Richmondian Invasion include the significant restructuring of paleocommunities, and differential survival of generalist taxa relative to specialist taxa, and niche evolution. New analyses are expanding niche stability, diversity, and invasion pathway analyses and provide the opportunity to identify similarities and differences in invasion impacts during ~contemporaneous events in the discrete, but related, Cincinnati and Nashville basins.

WORKSHOPS

FROM INDIVIDUALS TO ECOSYSTEMS: ANIMAL-SUBSTRATE INTERACTIONS IN THE EARLY PALEOZOIC

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Ichnology, the study of animal-substrate interactions as revealed by trace fossils (tracks, trails, burrows, and borings), represents an alternative source of information to assess secular changes in biodiversity and to unravel ecologic breakthroughs in the history of life. Ichnologic studies allow encompassing a broad range of scales of analysis from autoecology of individual bioturbators to the synecology of discrete infaunal communities to trends in animal-substrate interactions along the depositional profile and major changes at ecosystem scale. Combining individual case studies with compilation of global databases creates valuable synergies that provide insights into evolutionary paleoecology from both qualitative and quantitative approaches. In this workshop, we will address a series of questions such as: can ichnodiversity and ichnodisparity trajectories illuminate the debate about the links between the Cambrian Explosion and the Ordovician Radiation? What can trace fossil tell us about early Paleozoic communities and ecosystems? Which is the pattern of evolutionary innovations? Did evolutionary innovations take place in all environments at the same time? Which is the potential of ichnologic datasets to provide insights into early Paleozoic biotic crises? We will discuss the evidence supporting a dramatic increase in ichnodiversity and ichnodisparity in softground communities by the early Cambrian (Series 1 and 2). In contrast to this evolutionary explosion in bioturbation structures, only a few Cambrian bioerosion structures are known. After the middle to late Cambrian diversity plateau, ichnodiversity in softground communities shows a continuous increase during the Ordovician in both shallow- and deep-marine environments. This Ordovician increase in bioturbation diversity was not paralleled by an equally significant increase in ichnodisparity as it was during the Cambrian explosion. However, hard substrate communities experienced an increase in ichnodiversity and ichnodisparity through the Ordovician. Innovations in macrobioerosion clearly lagged animal-substrate interactions in unconsolidated sediment. The diachronic nature of the Agronomic revolution will be discussed to show how evolutionary innovations took place originally in offshore settings expanding later into marginal-marine and deep-marine environments.

MORPHOLOGICAL DATABASES AS POWERFUL TOOLS FOR EXPLORING DIVERSIFICATION DYNAMICS IN THE FOSSIL RECORD

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Modern approaches provide valuable metrics to quantify and understand macroevolutionary and macroecological patterns and processes. Many studies have shown that patterns of morphospace occupation through time is a powerful tool for exploring diversification trends in the fossil record. In particular, the relation between taxonomic diversity and disparity has been extensively examined as it provides unique data that captures ecological and evolutionary processes and patterns across time. However, there is still a need to deepen our understanding of how disparity accommodates in the ecological landscape during these events. In this workshop we discuss the need to move beyond classical occurrence-based databases towards dynamic and open morphological databases. We show the potential power that the analysis of morphological diversity can bring to the study of the ecological processes that influence biodiversity structure by tracking disparity not only through time, but also across spatial scales. Participants are invited to consider the benefits of broader access to comprehensive, collaborative trait databases: how would such access impact our research? Could it open up new research questions or reveal broader evolutionary patterns? Might it even help solve long-standing questions in our field? Focusing on trilobites as a model group, we introduce TriloMorph, an open, online morphometric repository of extinct marine organisms that promotes and brings together data generated from the collaborative efforts of contributors in a dynamic manner, approaching an open science framework. We discuss the primary challenges of establishing such databases, particularly achieving data and metadata standardization. Finally, we highlight the substantial benefits of open and collaborative databases, including a) shared efforts and expertise, b) sustained continuity, and c) increased impact. Broad data access optimizes time and resources, promotes collaboration, and enhances research efficiency and transparency, thus fostering a stronger, global scientific network.

EARLY PALEOZOIC EVOLUTION OF MARINE FAUNAS, FOSSIL PRESERVATION, AND NEW TRENDS IN HIGH RESOLUTION STRATIGRAPHY

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Here we use graptolites as a case study to provide biostratigraphic and paleobiogeographic insights, assess the temporal constraints for a number of paleobiological studies around the world, and explore future applications of this research. As result of an extensive international co-operation with colleagues from Europe, China, South America and North America, based on new collections and the reexamination of significant collections housed in various official institutions, we also offer a summary of the Treatise of Hemichordata revision project and its applications for not only graptolite investigation. Our work includes examples of improved taxonomy for biostratigraphic interpretations concerning *Rhabdinopora*, *Dictyonema*, and other mesh-work benthic to planktic graptolite colonies, didymograptids, and biserial graptolites; and their identifications based on the precise definition of proximal end developments and colony shapes, but also we stress the type of preservation. Additionally, we summarized the biostratigraphic framework previously proposed for the early Paleozoic rocks widely exposed in the Central Andean Basin of South America, particularly in Ordovician fossiliferous successions that reach several thousand meters in thickness across southern Bolivia and northwestern Argentina. The biostratigraphic framework of the region was largely based on graptolites, conodonts, trilobites, brachiopods and palynomorphs found in clastic sediments from the Early–Middle Ordovician platform developed at the Cordillera Oriental and Sierras Subandinas, as well as in the volcanic arc and associated volcano-sedimentary basin at the Puna. We here propose several strategies to address unresolved questions regarding the graptolite biostratigraphic scheme for the Central Andean Basin, as regional correlations with other fossil groups and global correlations; as well as to the paleobiogeographic affinities of Early–Middle Ordovician graptolites from the Cordillera Oriental and Puna, which largely shown remarkable connections with graptolite faunas from Scandinavia and Great Britain. Moreover, graptolite reflectance has recently emerged as a valuable tool for determining thermal gradients in Ordovician rocks from Northwestern Argentina. To ensure the accuracy of these results, they are being compared with other organic and inorganic proxies. The constrained optimization (CONOP) was also used as an innovative tool to test with the biostratigraphic graptolite zonation previously proposed for northwestern Argentina based upon traditional methods, as well as to analyzed CONOP-derived species richness curves and compared them with regional and global patterns. After many years of graptolite research in Argentina, the taxonomic data is now being integrated into globally databases, making it available to all the public interested in this production.

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GENERAL SESSIONS

MORPHOMETRIC ANALYSIS AND TAXONOMIC DETERMINATION OF THE GENUS *HOEKASPIS* IN THE SELLA FORMATION BASE, MENDEZ PROVINCE AND CERCADO, DEPARTMENT OF TARIJA, BOLIVIA

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Over the years paleontology has been considered a tool for the relative dating and reconstruction of events on Earth, but in some cases, incomplete remains make it difficult to obtain more conclusive data; therefore, today, to fill these gaps, the use of technological tools such as specialized software has been implemented to complement these studies. Furthermore, taking into account the scarce studies in Bolivia specialized in paleontology and biological morphometry, this study focuses on the Sella Formation, characterized by its high fossiliferous content, which is an ideal case for morphometric analysis. So, at the eastern end of the Cordillera de Los Andes, between the provinces of Méndez and Cercado in the department of Tarija, there are Floian–Dapingian sediments of a regressive environment defined as the Sella Formation, recognized by its high fossiliferous content, which was used to carry out a taxonomic study based on 156 samples (with predominant presence pygidia of the species *Hoekaspis megacantha*, *Ogygitella australis*, *Ampyx pallens*, and *Lonchodomas* sp.) collected at the base of the formation, to analyze the morphometric variation of these fossils, a geometric morphometric analysis was conducted using recognized software. The analysis followed a series of procedures, including the use of TPS programs (developed by F. James at Stony Brook University, New York), which allowed for the digitization of landmark points to capture the shape of each collected sample. The shapes were defined according to the classification of Bookstein (1991). Further analysis methods included Procrustes superposition, principal component analysis (PCA), and canonical variate analysis (CVA). These analyses identified three predominant populations and recorded dimensional variations within each population, linked to ontogenetic variation criteria.

SMALL PHYLLOCYSTIDS (ECHINODERMATA) FROM THE MIDDLE ORDOVICIAN OF BALTICA: JUVENILES OR NEW SPECIES?

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After the description of first two species of the genus *Phyllocystis* from the Middle Ordovician of the Leningrad Region (North-West Russia) in 2024, new abundant material of smaller marginal plates and stylocones was extracted from the same clayey marl layer as one of those species, *Phyllocystis cellularis*, which raising a question whether these plates belonged to juvenile individuals of this species, or to another species. More detailed description of these skeletal elements and clarification of this issue is the objective of the present research. In total, there are 167 stylocones (1–1.7 mm in length), 168 M'2 plates (1.6–4.9 mm), 137 M2 (1.5–3.5 mm), 92 (presumably) M'3 (1.5–4 mm), and 7 M5 (1.6–2.3 mm). Positions of the similar-shaped plates in the theca was determined by analogy with specimens of other phyllocystids; it is not possible to determine the position of several hundred other fragments due to their poor preservation or too different shape. All collected skeletal elements are stored in the Borissiak Paleontological Institute of the Russian Academy of Sciences, collection 4125. In addition to the absence of characteristic cellular sculpture, the classification of small specimens as another species is supported by the differences in the shape of their plates and stylocones from *Ph. cellularis*. Second marginal plates are less curved and have a relatively wider depression on the inner surface; at the proximal end there are large articular facets, bent in the middle. Appendage on M5 placed closer to the distal end. Stylocones have longer distal part and a sharper transition from the distal to the proximal. However, these differences can also be explained by changes with age. Classification as juveniles is supported by: 1) co-occurrence, 2) abundance in comparison with large plates (in most animals, only a few individuals survive to adulthood), and 3) significant individual variability. The absence of transitional size stages in fossil material can be explained by the climate seasonality in shallow-water habitat: the death and burying in sediments occurred during the storm season; small-sized parts belonged to individuals of the first year of life, and by the next storm season, the surviving individuals were already reached adult size. It is also worth noting that among the small stylocones one specimen has unique proportions and sculpture. That one indeed should belong to another, less numerous species.

ORDOVICIAN CHITINOZOANS FROM ARGENTINA: STATE OF THE ART AND FUTURE TRENDS

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Chitinozoans are a group of marine organic-walled microfossils commonly found from the Ordovician to Devonian. Although their biological affinity is still unknown, these microfossils were a crucial component of the Ordovician paleoplankton, and due to their rapid diversification and abundance, they have been extensively studied for biostratigraphical purposes. 28% of the known genera appeared in the Early Ordovician, 24% during the Middle Ordovician, and 11% during the Late Ordovician, estimating 63% of the 56 known genera emerging during this period. These characteristics and their minimal dependence on facies have allowed the development of high-resolution Ordovician regional biozonations for Laurentia, Baltica, Avalonia, and northern Gondwana. However, the Ordovician chitinozoan records from Western Gondwana are scarcer and more fragmented. Outside Argentina, there are only a few publications from Colombia, Brazil, and Bolivia. Most of these records lack the detailed systematic study necessary for an accurate biostratigraphic analysis. Although Ordovician chitinozoan research in Argentina began in the late 1970s, detailed studies were not conducted until the 1990s. This contribution aims to review the Ordovician chitinozoans from Argentina and outline potential future research directions. This fossil group record includes the Famatina System, Precordillera and the geological provinces of Puna, Cordillera Oriental, and Sierras Subandinas in the Central Andean Basin of northwestern Argentina. The Early Ordovician assemblages were described in Famatina, Puna, and Cordillera Oriental. Additionally, Middle Ordovician chitinozoan were found in the Sierras Subandinas, while the Late Ordovician has been recorded in the Puna, Cordillera Oriental, Sierras Subandinas, and Precordillera. These studies have been extremely useful for biostratigraphic, paleogeographic and paleoenvironmental analysis. Some results show similar assemblages in northwestern Argentina, and northern and peri-Gondwana, including cosmopolitan species from Baltica, Avalonia, and South China. Furthermore, in the Precordillera, this chitinozoans have proved to be useful in contributing to the paleogeographic evolution of this terrane. Although informal chitinozoan zonations have already been proposed in Argentina, the next step forward would be to establish a formal biozonation to enhance and standardize the western Gondwana biostratigraphical framework. This would increase the significance and use of chitinozoans as a biostratigraphic tool in Argentina. To achieve this detailed scheme, more high-resolution studies are needed to fill the gaps in the records. Finally, a multidisciplinary approach is crucial to calibrate the biostratigraphic schemes based on chitinozoans. This is especially important when working with widely recognized biostratigraphic zonations, such as those of graptolites and conodonts, to establish accurate and reliable international correlations.

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BIOFACIES ANALYSIS OF CONODONTS (LOWER–MIDDLE ORDOVICIAN) IN THE WESTERN FLANK OF CORDILLERA ORIENTAL, NORTHWESTERN ARGENTINA

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Previous works on the conodont fauna of different areas of the western flank of the Eastern Cordillera (La Ciénaga in Purmamarca, Espinazo del Diablo, and Los Colorados in Humahuaca) have allowed us to record and expand the conodont biostratigraphic chart of the Lower and Middle Ordovician of these regions. However, no analysis of the conodont population in relation to the set of environmental factors (*i.e.*, their biofacies) has been presented so far. This contribution details for the first time the biofacies present in these areas of Northwestern Argentina and their interaction with the surrounding environment for the upper Lower Ordovician and lower Middle Ordovician. It is possible to recognize different conodont biofacies by characterizing them according to the most abundant genus within each sample population (relative abundance). The methodology used was the counting of different genus per sample with the consequent determination of their percentage values per kilo of sample, which allowed a direct comparison of the relative frequencies of occurrence of each genus. Furthermore, once the dominant biofacies is recognized, it is possible to relate it to the surrounding environment. The counting of the conodonts obtained from the samples of these three regions of the Western flank of Cordillera Oriental yielded two dominant biofacies corresponding to *Drepanoistodus pitjanti* and *Erraticodon patu*. The first is defined for the Sepulturas Member in the Cieneguillas Formation (La Ciénaga) and the Acoite Formation in the Espinazo del Diablo and Los Colorados (Lower Ordovician). This biofacies would be characterizing environments of strong somerization and coastal progradation, located in a shallow platform typical of these areas. The *E. patu* biofacies has been interpreted along the Alto del Cóndor Formation in the Los Colorados region (Middle Ordovician), where there is a marked change in the environment. The Lower Member represents a drop in the sea level that produced a greater influence of the fluvial tributaries causing an adverse environment for the development of the conodont species while the Upper Member, first exhibits a shallow muddy platform that gradually passes to a shallower environment of greater energy with abundance of macrofauna and a restitution of the diversity of the conodont fauna. In both environments the dominant species is present, evidencing a rapid adaptability to changes. In addition, the genus *Erraticodon* is characterized by its preferences for the high energy environments.

NEW SPONGES FROM THE ORDOVICIAN REEF MOUNDS OF THE ARGENTINE PRECORDILLERA: ATYPICAL COMPONENTS OF ANTHASPIDELLID-DOMINATED REEFS

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The discovery of new sponges within reef mounds from the Lower Ordovician limestones of the Precordillera of western Argentina significantly increase the diversity of the group associated with these reef structures. Three new unexpected poriferan components which are unusual in reef ecosystems in the Paleozoic include: a new genus of heteractinid calcarean, a reticulosan hexactinelid and a sphaeroclone demosponge. The main components of the Argentinean reefs areabundant demosponges with entire sponge bodies or amorphous spiculitic boundstones forming scaffolding structures associated with calcimicrobe crusts. The three-dimensional triangulated skeleton of the orchoclad ("lithistid") demosponges appear to have been the primary adaptation allowing them to occupy to shallow-water environments since their first appearance in the late Cambrian. The finding of these new groups of sponges as small accessory organisms, probably living in internal reef habitats, suggest that the number and diversity of such sponges may be underestimated. The heteractinids shows a general trend towards thicker body walls, and more strongly fused construction, correlated with occupation of more turbulent environments such as reefs. However, they are scarce and not very diverse during the Paleozoic, making it unclear why such sponges, if present, were not more successful and common. The sphaeroclone demosponge predates their diversification that occurred later in the Late Ordovician and Silurian. The scarcity of hexactinellids in Paleozoic platform and reefs contrast with the abundance and diversity of this group in coeval deep-water environments, where simple delicate single-layered sponge bodies predominate. Conversely, hexactinellids show a remarkable abundance and diversity in Mesozoic platform and reef environments. Among Hexactinellida the earliest representatives of the Lychniscosa occur in the Triassic and hexactinosans are known from the Devonian. The complex three-dimensional skeleton of clearly fused spicules of the Hexactinosa and Lychniscosa may possibly have been a preadaptation that allowed hexactinellids to colonize shallow carbonate platforms and reefs during the Mesozoic.

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OLDEST ANTIPATHARIANS (BLACK CORALS) FROM THE ORDOVICIAN OF ARGENTINA

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Present-day antipatharians, commonly known as black corals, are exclusively colonial marine suspension feeders, represented by over 235 species. These antipatharians are anthozoans, hexacorallians with skeletons (corallum) composed of a laminar chitin complex. The majority of antipatharian species inhabit tropical and subtropical regions, ranging from deeper waters to abyssal depths, though they can also be found in subtidal and polar environments. Despite the abundance and ecological importance of black corals in modern deep-water marine ecosystems, their presence in the fossil record is largely unknown. Previous studies have documented abundant remains interpreted as black corals in the Lower Ordovician (Floian) Fenxiang Formation in southern China, although these fossils lack clear modern analogs. Additionally, there has been a brief mention of the genus *Leiopathes* in the Miocene of Italy. The discovery of small spiny rods in Tremadocian and Floian (Lower Ordovician) strata of the Santa Victoria Group of Northwestern Argentina, as well as in the Las Chacritas Formation (Darriwilian) of the Argentine Precordillera, is considered to represent probable fragments of antipatharian black corals. These fragments, preserved in apatite, consist of spiny rods that likely represent terminal stems of the coral colonies, as well as basal parts or main branches, with crowded or isolated stems. Some fragments include probable encrusting basal plates, covered by irregularly arranged stems or spines. Most of these fragments are found in the siliciclastic platform environments (lower offshore) of the Santa Victoria Group, while fewer rods or branches with isolated stems occur in the deep subtidal platform carbonates of the Las Chacritas Formation. The most significant feature is the occurrence of numerous spiny rods with small, solid spines, remarkably uniform in form and size, and regularly arranged in longitudinal rows. The internal structure of the rods is composed of concentric layers, with the spines emerging from the mid-wall. These characteristics are typical of extant antipatharians, and in this context, the spiny rods found in the Ordovician of Argentina can be compared with living black corals, and tentatively considered part of the antipatharian basal crown group.

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ORDOVICIAN CEPHALOPOD EVOLUTION IN THE CENTRAL ANDEAN BASIN

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Although long known from the Ordovician of the Central Andean Basin (CAB) in Northwestern Argentina (NWA), cephalopods are relatively rare and hitherto, poorly understood. Recent and ongoing investigations are gradually increasing our knowledge of the diversity and palaeobiogeographical affinities of these faunas as more material is discovered. This is a preliminary report on the changing diversity and affinities of cephalopod faunas from the Ordovician of the Central Andean Basin. Currently, the oldest cephalopods belong to small and abundant *Ellesmeroceras*, accompanied by a few specimens of probable *Basslerоceras* in the Tremadocian (Tr_1) of NWA. Cephalopod occurrences of this age are restricted to the paleotropical belt and consist predominantly of ellesmeroceratids. During the middle Tremadocian (Tr_2), there was a marked increase in cephalopod diversity. One conspicuous element is the cyrtocerinid *Saloceras*, whose affinities are peri-Gondwanan, especially with Avalonia. Unpublished material from the middle Tremadocian includes rioceratids and isolated endosiphuncles probably of proterocameroceratids and/or dissidoceratids. Endoceratids were reported from the upper Tremadocian (Tr_3) of Parcha. During the Floian, the cyrtocerinids become very important, with the origin of new taxa, and are accompanied by the proterocameroceratid *Protocyptendoceras fuenzalidae*, which together belong to the Peri-Gondwana Realm. Other taxa that need revision were also reported, as *Robsonoceras*, *Purmamarcoceras*, and *Clarkoceras*. In addition, unpublished protocycloceratids, endoceratids and rioceratids increase the cephalopod diversity of the Floian of NWA. No cephalopods are currently known from the Dapingian of the CAB in Argentina, but large endoceratids are present in the Darriwilian Capillas Formation of Jujuy Province. In the same strata, cyclostomiceratids, baltoceratids and protocycloceratids have been reported and also need revision. Further north, in Bolivia, during the Floian, cyrtocerinids endemic to the CAB occur together with rioceratids endemic to peri-Gondwana at that time. In Perú, cyrtocerinids, orthoceratids, and possible endoceratids are present in probable Middle Ordovician sediments. Although erratic, and based on incomplete data, there appears to be a progressive increment of diversity since the middle Tremadocian, with a peak during the Floian (Fl_{2-3}), and another in the Darriwilian. The apparent origination of several cyrtocerinid taxa in the CAB suggests a degree of endemicity, but other taxa appear to comprise elements of a peri-Gondwanan fauna, parts of which may have links with Avalonia and also with Baltica. Future work on recently collected material is expected to expand the number of cephalopod taxa known from the CAB, and further clarify their paleobiogeographic affinities and patterns of diversity.

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CUYANIA AND CENTRAL SOUTHERN LAURENTIA-ISOTOPIC DATA (U/PB, O, HF) RECORD CRYOGENIAN–EARLY CAMBRIAN RIFTING THROUGH MID-ORDOVICIAN DRIFTING AND TERRANE TRANSFER

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Upper Cambrian (u€) through Lower and Middle Ordovician (L, MO) sedimentary strata of the Marathon/Solitario Basin (western Texas) preserve evidence of three pre-Pangean tectonic episodes on the central southern Laurentian margin. Anchored in rigorous biostratigraphic research, integrated zircon U/Pb geochronological (LA-ICP-MS, SHRIMP), whole-rock geochemical (XRF and ICP-MS), and isotopic data (SHRIMP) provide new constraints on 1) Cryogenian–early Cambrian rifting of Rodinia, 2) progressive foundering of Iapetus, and 3) separation of the Cuyania terrane from Laurentia and its accretion to Gondwana, with resulting volcanism. *Rodinia rifting*. New detrital zircon data from the Solitario expand on our geochronological/geochemical results from Cryogenian (706 Ma) volcanic boulders of intraplate rift geochemical character within L–MO marine conglomerates in Marathon Basin: Cryogenian zircons in Dagger Flat Formation (u€), Marathon Formation (L–MO). Early Cambrian rift-phase grains (580–520 Ma) are also present: upper Marathon Formation (detritals and tuff clast), Ft. Peña Formation. Both phases are common in L-M€ meta-siliciclastics, cored in the nearby Devils River Uplift: 780–700 and 580–520 Ma. Correlative Cuyania occurrences include Laurentian A-type granites (776 Ma) and carbonatite (570 Ma) in Sa. de Maz, and Sa. Pie de Palo metasedimentary constituents (697–532 Ma). *Drifting*. With departure of Cuyania, the expansion of Iapetus (u€-MO) stimulated headward erosion of drainages, reflected in systematic NNW-ward shift in zircon provenance from west Texas Grenville (1281–889 Ma) and southern Granite-Rhyolite provinces (1500–1300 Ma) to Yavapai-Mazatzal (1800–1600 Ma) and Cheyenne Belt (2880–2510 Ma) sources. *Collision* of the Cuyania continental fragment with western Gondwana in Early and Middle Ordovician time (486 ± 7 Ma to 463 ± 4 Ma) fueled voluminous volcanism in the Famatina complex (Argentina), most intense from ~472 to 468 Ma. Volcanic zircons appropriate to that source have been recovered from Ft. Peña bentonitic shales, dated, and analyzed isotopically (O, Hf, Lu). Famatina zircons in MO strata of Marathon/Solitario Basin are consonant with proximity of south-central Laurentia, Cuyania and the Famatina arc at 470 Ma, as determined paleomagnetically. Compared with well-characterized Famatina volcanics in Cuyania, Ft. Peña zircons are of identical age (U/Pb; graptolite, conodont biozones) and compatible crystal morphology. Magmas hosting those zircons received significant upper-crustal input; considerable time had elapsed since separation from a depleted mantle source. The Hf data compare well overall, but when evaluated with the O data, the only complete match is with NE Patagonia. Thus, at present the isotopic results permit interpretation of a Famatina source for 470 Ma volcanic zircons in the Ft. Peña Formation.

PHOSPHATE-RICH LINGULIFORM BRACHIOPOD SHELLBEDS FROM THE LOWER TREMADOCIAN OF NORTHWESTERN ARGENTINA

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Phosphorites composed by linguliform brachiopod shells represent a globally distributed but poorly known phosphorus source. Phosphatic shell-beds from Northwestern Argentina (Lower Tremadocian Santa Rosita and Floresta formations corresponding to the Central Andean Basin) were studied from a sedimentological, taphonomical, and paleoenvironmental perspective to understand the mechanisms leading to their formation. Petrographic analysis was conducted on 2 thick-bedded composite shell-beds and 10 simple shell-beds and shelly sandstones from 3 localities (Quebrada del Arenal, Abra de Santa Laura, and Alto de la Sierra sections from Jujuy and Salta), while facies analysis was performed on the 160 m thick succession exposed in the Quebrada del Arenal section. This study was combined with taphonomic observations and experimental modelling of the transport behavior of Recent *Lingula anatina* shells, here considered analog to Paleozoic species. Fragmentation processes in *Lingula anatina* are strongly controlled by the degree of decomposition of the organo-phosphatic shells: upon agitation, moderately degraded specimens experience fragmentation while severely degraded specimens present exfoliation yielding thin, flaky bioclasts. Experimental modelling shows that shell fragments are characterized by low settling velocities and high critical shear velocities, meaning that they present significant resistance to erosion but they are easily transported once set into motion, thanks to their platy shape. Paleoenvironmental analysis revealed that linguliform brachiopod remains accumulate in storm-dominated shallow marine settings above the storm wave base, characterized by dynamic bypass of siliciclastic sediments towards more distal settings. Bioclast accumulation is favored by their contrast with respect to the hydrodynamic behavior of finer-grained siliciclastic sediments, while their resistance to erosion favors shell-bed preservation in such energetic environments. Shell-beds dominated by linguliform brachiopod remains are mostly composed of moderately degraded shell fragments with scarce exfoliated bioclasts, which suggests sustained bioclast input during shell-bed formation rather than prolonged reworking of residual shells; subordinate trilobite and articulate brachiopod remains may also be found. The irregular distribution of trace and body fossils as well as microbially-induced sedimentary structures in the shell-bed bearing successions points to episodic sedimentation and physico-chemical stress associated with fluctuations in environmental parameters such as turbidity, salinity, oxygenation. We conclude that the main factors favoring the deposition of the studied linguliform brachiopod shell-beds are: 1) occurrence of linguliform brachiopod-dominated faunas, possibly associated with stressful physico-chemical conditions, and 2) concentration of linguliform brachiopod shell fragments by recurrent erosive storm processes, with bypass of siliciclastic sediments towards more distal environments favored by their contrasting behavior with respect to bioclastic sediments.

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MORPHOLOGICAL DIVERSITY AND PHYLOGENY OF RAPHIOPHORIDAE (TRILOBITA) DURING THE GREAT ORDOVICIAN BIODIVERSIFICATION EVENT, FOCUSED ON SPECIES FROM THE PRECORDILLERA OF WESTERN ARGENTINA

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Species comprising Raphiophoridae, in-turn composed of the subfamilies Raphiophorinae and Endymioniinae, are an example of a novel morphology in trilobites that appeared during the Great Ordovician Biodiversification Event (GOBE). Raphiophorids arose during the Tremadocian (Early Ordovician) and achieved their peak diversity during the Darriwilian (latest Middle Ordovician). Their morphologies are characterized by the usual absence of eyes, and diverse glabellar structures, which range from simple tubercles, lobation adjacent to the glabella, variably shaped spines, and bulbs. Although the group has been investigated for decades, the taxonomic assignment of species in Raphiophoridae, the validity of its constituent subclades, and the evolution of its particular morphology are enigmatic. To explicate these requires an analysis of their phylogeny and further interpretation of character evolution within the larger paleoecological restructuring of the GOBE. This investigation will not only aim to clarify the internal relationships of the subclades within the family, but also its position relative to the proposed sister clades, Trinucleidae and Dionididae. A cladistic analysis is underway, including its constituent 42 genera to evaluate this. The raphiophorid collections from the Precordillera of Argentina provide a particular opportunity to study this group due to their relative diversity and excellent preservation. Carbonates from the Middle Ordovician San Juan, Gualcamayo, Las Aguaditas, and Las Chacritas formations have yielded silicified sclerites of both juvenile and adult specimens, as well as adult calcified specimens. The silicified specimens permit detailed descriptions of the ontogeny of some of these taxa. Preliminary taxonomic results have identified one species of Endymioniinae and eight of Raphiophorinae, three of which are confidently new. One of these new species, probably representing a new genus, bears a novel spine morphology for raphiophorins that is recurved posteriorly. Another possesses a short spine in its adult specimens that is not typical of the subfamily. Contextualizing the morphological diversity with the obtained phylogeny, through the revision of character evolution in raphiophorid phylogenetic history, and the inclusion of ontogenetic data, will elucidate how the appearance of certain traits in raphiophorids influenced their diversification during the GOBE.

CHANGES IN RATES OF THE DEPOSITIONAL SEDIMENTARY RECORD DURING THE MIDDLE AND UPPER ORDOVICIAN IN THE PRECORDILLERA, ARGENTINA

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During the Cambrian–Lower and Middle Ordovician the sedimentation in the Precordillera Basin was mainly carbonate; however, during the lower Darriwilian (Middle Ordovician) the depositional history of this basin changed becoming fine clastics the principal deposit, it was sometime transitional and other was abrupt. An erosional unconformity expressed by the lack of the lower *Pygodus serra* Zone (*Eoplacognathus foliaceous* and *E. reclinatus*) was recognized in several exposures in the Precordillera. This time interval likely represents the maximum lowstand in the basin. This is followed by shallow coarse deposits assigned to the early *E. robustus* Subzone indicating a transgressive system that results continuous in time to the Upper Ordovician, controlled by local differential tectonic subsidence. Despite the *Pygodus anserinus* conodont Zone correspond from the upper Middle Ordovician to lower Upper Ordovician, mostly the Upper Ordovician is represented. An increase in the thickness of the Upper Ordovician deposits was observed (~ 150 m), in the La Cantera Formation (Villicum Range), Sierra de la Invernada Formation, Los Azules Formation (Cerro La Chilca), and Las Aguaditas Formation (Las Aguaditas creek and probably Las Chacritas River section). These units are composed of distinct types of sediments such as green shale and sandstone, black shale, mudstone and eventually carbonate breccia. Different interpretations for these phenomena have been proposed, assigning eustatic or tectonic processes. The importance of increase in the deposition sedimentary rate is highlighted during a brief time interval represented by the Upper Subzone of *P. anserinus* Zone (~ 0.4 Ma) with different responses in those sections of the Eastern and Central Precordillera. We considered that this change in the sedimentary record was triggered by the climate change that started during the lower Darriwilian, from arid to humid in the region, pushing the increase of clastic sediments available in the continent by an inland uplift associated to a differential subsidence of the basin that accelerated during the *Pygodus anserinus* Zone.

IMPACTS OF THE RICHMONDIAN INVASION IN THE NASHVILLE DOME: ANALYSIS OF STABILITY USING ECOLOGICAL NICHE MODELING

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The Richmondian Invasion was the immigration of a diverse suite of marine taxa into southeastern Laurentia during the Late Ordovician (Katian), which is preserved in the strata of the Cincinnati Basin and Nashville Dome of Eastern North America. The evolutionary and ecological impact of the invasion has been well studied in the Cincinnati region; however, faunal change in the Nashville Dome is more poorly constrained. In this study, we hypothesized that before the invasion, there will be high niche stability among the taxa, but that this stability will decline during the invasion interval, and that there will be evidence of overall niche evolution after the invasion. Late Ordovician strata of the Nashville Dome comprise highly fossiliferous limestone and shale units. Fossils are distributed across a large geographic area, which provides a robust framework on which to apply Paleo-Ecological Niche Modeling to quantify the amount of change in species' niches between the intervals before, during, and after the invasion. In-situ data were collected to gather both occurrence data for different fossil taxa and environmental proxy data for niche modeling. Niche models were developed using MAXENT, an R-based modeling package. Models were produced for taxa with at least seven geographic occurrence points among twenty locations spanning the western edge of the Nashville Dome. Articulated brachiopods, bryozoans, gastropods, and a few other benthic clades were included in the modeled taxa. Different sedimentary proxies for environmental parameters, such as carbonate bedding style and thickness, and limestone/shale percentage were used. It is possible to characterize changes in niche dimensions across the invasion event in the Nashville Dome by examining temporal changes in environmental parameters coupled with the distributional data for taxa. Quantifying niche stability and comparing the similarities between different stages of the invasion further constrains niche evolution within geographic space and improves the current understanding of how Biotic Immigration Events alter ecology in geologic time. Models demonstrate that biotic shifts can be observed across time slices, taxa change their niche breath as a response. Patterns of niche stability have been observed between pre- to post-invasion conditions across clades, with some taxa being more affected than others. Comparing these results with similar analyses previously conducted for taxa of Cincinnati region permits analysis of how species responses to the Richmondian Invasion varied among basins. Comparisons have shown that taxa responded with niche stability as well, but in different ways and frequencies from Nashville taxa.

TAXONOMIC AND BIOSTRATIGRAPHIC REVISION OF GRAPTOLITES FROM THE TOKOCHI FORMATION, LAMPAYA REGION, BOLIVIA

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The Tokochi Formation is primarily characterized by black shales rich in organic matter showing a transition to a gray-pink color in the upper part of the unit from which graptolites and inarticulate brachiopods were previously recorded. This study presents a taxonomic review of the graptolites stored at the paleontological laboratory of the Instituto de Investigaciones Geológicas, Universidad Mayor de San Andrés in La Paz, Bolivia. The studied material was collected by Toro and Salguero in 1996 from a single stratigraphic level of the Lampaya region, along the road between the YPFB pumping station and the city of Cochabamba, which is overlying a level with *Dicranograptus* sp. These authors assigned it to *Climacograptus pigmaeus*, *C. putillus*, *Climacograptus* sp., *Diplograptus* sp., and Retiolitidae indet. The aim of this work is to enhance the value of this collection by updating the taxonomic identifications and discussing the biostratigraphic implications of the significant taxa, as part of a Scientific Transference Project (STAN, CONICET). Robust biserial graptolites exhibiting undulate median septum and sinuous interthecal septa were assigned to *Metabolograptus parvulus*. These specimens are characterized by a relatively short upward extension of the first thecal pair, a distal change in the thecal shape losing the geniculum, and more outwardly inclined ventral thecal sides. Moreover, a relatively slender specimen was identified as *Normalograptus minor* based on the remarkable parallel-sided tubarium and the shape of the thecae. In contrast, a number of tubaria, previously described as Retiolitidae indet., are preserve as scalariform views and remain unidentifiable. This revision documents the presence of the aforementioned species in Bolivia for the first time, constraining to the *Metabolograptus persculptus* Biozone (late Hirnantian) the bearer levels, rather than the *Dicellograptus complanatus* Biozone (late Katian) previously mentioned for the upper part of the Tokochi Formation. Additionally, a regional correlation could be established with Late Ordovician deposits from the La Chilca and Don Braulio formations of the Argentine Precordillera, and probably with the lower levels of the Salar del Rincón Formation, Puna region at Northwestern Argentina. Furthermore, the studied levels can be globally correlated with deposits from Wales, Scandinavia, Spain, Canada, and the Yangtze region of China, where the studied species have been also recorded in late Hirnantian deposits. Finally, this work expands the geographic distribution of the studied taxa and enhance the Bolivian graptolite record database, but more exploration is needed to improve local correlations with equivalent sedimentary successions from the Ordovician of Bolivia.

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THE RICHMONDIAN INVASION: ECOLOGICAL AND TAXONOMIC IMPACTS IN CINCINNATI AND NASHVILLE BASINS

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Biotic immigration events profoundly impact biodiversity, fundamentally altering the composition and structure of ecosystems. One of the best-studied fossil invasions is the Late Ordovician (Katian) Richmondian Invasion. Over 60 genera, primarily brachiopods, bryozoans, mollusks, and corals, invaded the Eastern Laurentian basin during this event. Spanning approximately 3 million years, this invasion marked a significant transition in marine communities and is documented in the geological strata around Cincinnati, Ohio, and Nashville, Tennessee, United States of America. This event is a prime example of a coordinated invasion, wherein multiple immigrant taxa invade a new geographic region simultaneously. Such invasions result in significant and lasting changes in the structure and function of the affected communities, impacting biomass distribution, species composition, and other community dynamics like species richness, evenness, and dominance through niche partitioning and contraction. Although the consequences of the Richmondian Invasion are well-documented in the Cincinnati basin, the same invasion in Nashville has been less studied. This study aims to understand the similarities and differences between faunal response to the Richmondian Invasion in these two basins, focusing on ecological and taxonomic aspects. Stratigraphically constrained species occurrence data for the Katian stage in each basin were collected from literature, database (PaleoDB and iDigBio), and fieldwork. Diversity dynamics of the two basins and how the interactions between native and invasive species affect each other were examined using PyRate. PyRate estimates speciation, extinction, and preservation rates from fossil occurrence data using a Bayesian framework. The Multivariate Birth-Death Model in PyRate was employed to estimate the diversity dependency of one group on the evolution (speciation and extinction) of the other competing group [*i.e.*, whether the diversity of one clade or group (ex. specialist vs. generalist or invasive vs. incumbent taxa)] suppresses or promotes the origination and/or extinction of other clades or groups. Environmental parameters such as sea level and tectonic activity were also analyzed to understand the impact of abiotic factors on this invasion event. Data show that both regions experienced significant diversity changes, with native species undergoing decreased speciation and increased extinction, while the invaders diversified. Details of diversity changes also differ between basins. These diversity dynamics largely reflect the differing ecological tolerances of native species and invaders. Specialist natives were most affected by generalist invaders. Environmental factors influenced the invasion, particularly the timing of the invasion in the two basins, which determined community assemblage and abundance based on sea level and facies.

AN UPPER ORDOVICIAN BRACHIOPOD ASSEMBLAGE FROM THE DEEP WATER YERBA LOCA FORMATION, ARGENTINE PRECORDILLERA

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A low diverse Upper Ordovician brachiopod fauna is reported for the first time from the Yerba Loca Formation exposed in the Western Precordillera of the San Juan Province. The sampled section at the Quebrada El Toro in the Sierra del Tigre consists of sandstones, black shales, siltstones, and few conglomerate and calcarenite beds. Several basic sills and pillows are present through the section. The Yerba Loca Formation has been interpreted as deep-water turbiditic deposits. Brachiopods reported herein are associated with graptolites of the *Diplacanthograptus caudatus* Zone that indicates globally the base of the Katian Stage (Upper Ordovician). Fossil content is scarce, mostly composed of graptolites, conodonts, brachiopods, arthropods, and traces. The benthic fauna likely inhabited quiet, deep-water and dysaerobic slope environments with low levels of nutrients. The low diverse brachiopod assemblage is represented by slightly deformed, partially articulated small linguliforms and a few strophomenoids preserved as external molds. Linguliforms include two taxa in which only the postmetamorphic ornamentation of growth lines is preserved. The most abundant shell is elongated oval in outline and can be referred with doubts to the genus *Palaeoglossa*, whereas some dorsal valves having a widened oval outline may belong to an undetermined Acrotretidae. Rhynchonelliform brachiopods are represented mainly by thin shells having a fine, uniformly parvicostellate ornament intersected posteriorly by irregularly spaced rugae, resembling rafinesquinids. A single incomplete small shell ornamented by evenly distributed concentric growth lines is suggestive of foliomenides, but the lack of information on internal structures does not enable generic identification. While the finding of this fauna is promising, a more exhaustive search for brachiopods is needed in order to confirm the occurrence of the widespread deep-water *Foliomena* Fauna in South America.

THE EARLIEST STYLOPHORANS (ECHINODERMATA) FROM SOUTH AMERICA: NEW CORNUTES FROM THE EARLY TREMADOCIAN (LOWER ORDOVICIAN) OF JUJUY PROVINCE, ARGENTINA

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Stylophorans are a class of Palaeozoic echinoderms (Miaolingian–Bashkirian) characterized by the possession of a single feeding appendage (aulacophore) and a flattened, asymmetrical body (theca). Along with eocrinoids, glyptocystitid rhombiferans, and solutans, stylophorans were a major component of the low diversity cosmopolitan echinoderm assemblages spanning the Furongian–mid Tremadocian interval, before the diversification of crinoids. In northwestern Argentina (eastern Cordillera of Jujuy Province, Angosto del Moreno locality), the Pupusa Formation (Upper Member of the Guayoc Chico Group) reflects deposition in an offshore environment ending in a shoreface environment. The Pupusa Formation yielded a remarkably well-preserved assemblage of early Tremadocian (Tr1) echinoderms comprising eocrinoids and cornute stylophorans, found at the base of storm-induced sandstone beds in offshore settings. The cornute can be assigned to the scotiaecystid genus *Thoralicystis*, which is also present in the Lower Ordovician of the Montagne Noire (France) and the Anti-Atlas (Morocco). Several mitrate stylophorans have already been described in the Lower and Middle Devonian of South America (Argentina, Bolivia, and Brazil). Therefore, the new Ordovician cornute reported here from the Pupusa Formation (Jujuy Province, Argentina) represent the earliest record of the class Stylophora in South America.

LATE CAMBRIAN THROUGH TREMADOCIAN CONODONT AND CARBON ISOTOPE DATA FROM THE CENTRAL PRECORDILLERA

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Conodont faunas from the La Silla Formation in its type section at Cerro La Silla were investigated in the late nineties and compared with material from sections across Laurentia in the USGS collections at Reston, Virginia. Beside the report of some characteristic warm water taxa in 1997 and of faunas from the top 9.6 m of the La Silla Formation in 2020, there is no documentation of the conodont succession composed of exclusively tropical taxa typical for shallow water environments on the North American Midcontinent. For re-evaluation of the $\delta^{13}C$ record published in the early nineties, unpublished data shown here were used as background information. Several carbon isotopic events (CIEs), partly accepted as global events, were described from the La Silla Formation including COTICE, TSICE, and LSICE, plus the informal negative peak 'Skullrockian Low'. Some of these events became intercontinental correlation tools, some are compared to shifts in the Great Basin but not yet recorded on other palaeocontinents. There are no pandemic index species of *Cordylodus* but taxa such as *H. hirsutus* and *C. elongatus*, characterizing subzones in restricted shallow settings (*e.g.*, Great Basin, Texas) allow correlation to global sea-level events, and support the Laurentian origin of Cuyania often discussed in the past. Four regional assemblage zones (AZ) are distinguished: *Teridontus nakamurai*, *Onetodus gracilis, Oneotodus simplex–Variabiloconus bassleri,* and the *Colaptoconus quadraplicatus–Striatodontus prolificus* AZ, ranging into the basal San Juan Formation. Sparse Laurentian index species enable intercontinental correlations, and together with the $\delta^{13}C$ record provide a useful stratigraphic framework. The sequence boundary at the La Flecha-La Silla formational boundary represents the Red Tops Lowstand; the basal 25 m in the La Silla Formation up to the occurrence of *H. hirsutus* are condensed and coeval to the *Eoconodontus notchpeakensis* Zone. This lowermost part of the La Silla Fm spans the famous HEllnmaria-Red Tops Boundary Event (HERB) and includes the Lange Range Eustatic Event (LLRE) which presumably corresponds to a noticeable stromatolitic interval. The multiple $\delta^{13}C$ shifts known from the Notch Peak Formation in the Central Great Basin can be recognized, including the *Cordylodus proavus* shift (CPS) named in North China. A prominent CIE in the part of the succession equivalent to the upper *Macerodus dianae* Zone will be named (MSICE–Mid Stairsian Isotopic Carbon Event); another less known CIE, the BAsal Stairsian Positive Interval (BASPI), may be present in the interval correlated with the Low Diversity Interval.

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FAUNAL TURNOVER DRIVEN BIOGEOGRAPHIC SHIFTS DURING THE ORDOVICIAN-SILURIAN TRANSITION

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The first of the five major Phanerozoic extinctions unfolded near the Ordovician/Silurian boundary, leading approximately to an 85% decline of marine species. The impact of the extinction varied across higher taxa, with complete loss in some groups, partial declines in many, and others navigating through the end-Ordovician extinctions relatively unscathed. However, the translation of these changes into first-order biogeographic patterns remains elusive. Using network analysis and a large compilation of fossil occurrences, we delineate bioregions of marine invertebrates across the Ordovician/Silurian boundary. Simultaneously, by integrating the spatial and temporal dynamics of diverse biological assemblages, including global diversity, beta diversity, and alpha diversity, we scrutinize how faunal turnover and nestedness influence paleontological spatial patterns. Our findings indicate that the decline in beta diversity during the Hirnantian and Rhuddanian stages was primarily driven by a significant drop in faunal turnover. Environmental stress during the main pulses of the extinction even led to an increase in nestedness, similar to modern cases where fish communities affected by agricultural pollution show higher nestedness. These results unveil crucial environmental drivers, providing insights into the co-evolutionary mechanisms of life processes and the environment during mass extinctions.

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DBI: A NEW DISTANCE COEFFICIENT FOR QUANTITATIVE VARIABLES WITHOUT COMPROMISING INTERNAL VARIATION

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Quantifying the similarity or difference between pairs of objects is the core of multiple analyses frequently used in paleontological and biological sciences. When an object includes multiple observations, data are commonly adjusted to existing coefficients by estimating a point measure of central tendency, however, this practice results in the loss of information about the internal variation of the objects. While various methods model the distribution of observations within elements and quantify the overlap of these distributions, they often require information not always available in the paleontological record. Here we introduce 'Distance Between Intervals' (DBI) to solve this question. This paired distance coefficient retains the range of internal variation by operating with intervals defined by a minimum and maximum value (*e.g.*, minimum and maximum observed). The coefficient also accommodates cases where an object includes a single observation, adapting to the information available in the fossil record. The resulting distances are continuous, ranging from 0 to infinity, increasing as the overlap between intervals decreases from fully overlapped to non-overlapped. The necessary files for using DBI in the R programming environment are freely accessible online and straightforward to implement. This function returns a distance matrix that can be integrated with matrices obtained from other coefficients. Additionally, the function provides the option to perform a classical standardization for quantitative variables, facilitating integration with other coefficients. Unlike the indices that work with empirical distributions of observations, DBI yields consistent results across various possible scenarios of interval overlap (*i.e.*, total, partial, or no overlap). It also offers greater granularity than similar binary methods used in previous paleoecological studies. Combining multiple evaluated characters in this way enhances DBI's ability to capture different overlap scenarios compared to binary methods. DBI outperforms other methods, adapting to the characteristics of data available in the fossil record, without compromising information about the internal variation of the elements. It is accessible and easy to use with basic knowledge of statistical tools.

UPPER ORDOVICIAN GRAPTOLITE ASSEMBLAGES FROM THE WESTERN PRECORDILLERA, SAN JUAN, ARGENTINA: FAUNAL EXCHANGE AND PALEOENVIRONMENTAL IMPLICATIONS

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Graptolites represent one of the most important fossil groups for biostratigraphic studies of the early Paleozoic. In the deeper Ordovician sea of the Western Precordillera (western Argentina), the presence of this planktonic colonies became crucial to increase the knowledge of this poorly-studied area. Most of the Ordovician outcrops in the Western Precordillera belong to the Yerba Loca Formation (Darriwilian–early Katian), unit composed of black shales, sandstones, conglomerates, and intrusive/extrusive basalts. The Late Ordovician graptolite faunas have allowed to record the Sandbian *Nemagraptus gracilis* and *Climacograptus bicornis*, and the Katian *Diplacanthograptus caudatus* zones. In this interval a marked lithological change is observed, initiated with mostly fine granulometries in the *N. gracilis* Zone, followed by a conglomerate-dominated succession in the lower *C. bicornis* Zone. The granulometry gradually decreases until carbonaceous black shales in the top strata of the *C. bicornis* Zone, continuing with shales and sporadic fine sandstones in the base of the *D. caudatus* Zone, and finishing with an increase in sandstone levels towards the upper part of this biozone. The *C. bicornis* Zone is dominated by species of the genus *Orthograptus* in the lower part, *C. bicornis* in the middle segment, and *C. tridentatus* in the upper levels. Meanwhile, the *D. caudatus* Zone showed a dominance of the nominal taxon and species of the genus *Dicranograptus*. Taken into account the next considerations based on graptolite paleoecological models: 1) *Orthograptus* is abundant in lower depths than those occupied by *Climacograptus*; 2) *C. tridentatus* indicates higher depths than *C. bicornis*; and 3) *D. caudatus* suggests colder waters than those related to *C. bicornis* and *C. tridentatus*; some paleoenvironmental considerations about the studied area can be proposed. First, the transition between the *N. gracilis* Zone to the *C. bicornis* Zone might be related to a sea level fall, which produced the mentioned increase in granulometry. This was previously observed in contemporaneous successions in the Sierra de La Invernada Formation (Central Precordillera). Later, the faunal exchange observed during the *C. bicornis* Zone, together with a granulometric decrease, might indicate a continuous sea level rise with a maximum in the uppermost Sandbian. Finally, the Sandbian-Katian passage might be linked with the start of a new sea level fall. Contemporaneous eustatic variations were recognized in other global sections (from Laurentia, Baltica, Avalonia, and China), and interpreted as early evidences of the Hirnantian glaciation. Future paleoecological and chemostratigraphic studies might give light on this proposal.

TAXONOMIC REVISION OF REMOPLEURIDID TRILOBITES FROM NORTHWESTERN ARGENTINA: A CLASSIFICATION IN PROGRESS

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The position of the Remopleurididae, *sensu* Jell and Adrain in their 2003 paper, within Trilobita has been a matter of discussion for some time. The relationships and classification within the superfamily are also troublesome at many taxonomic levels. Multiple familial and subfamilial groups have been erected and removed from classification, genera and species have been diagnosed and synonymized and species have been reassigned multiple times, making it complex to track the full extent of the superfamily. In this process, multiple emended diagnoses have been attempted. It becomes clear that a substantial and comprehensive review of the superfamily is needed; however, the amount of groups within Remopleuridoidea compels for a careful and extensive intervention. Early remopleuridids represent an emblematic group of trilobites in Argentina, given its abundance and wide distribution throughout South America, and its usefulness for regional and global biostratigraphic correlation. Therefore, a critical analysis of the diagnostic features of this group may shed light on the definition and relationships of the Argentine members of the Remopleurididae family. The focus of this contribution is to show an early approach to the study of the paraphyletic group referred to as "richardsonellids". These are selected as a starting point for a future review of the Remopleurididae because 1) they comprise a large number of genera within the superfamily, 2) they are the most discussed and well documented group in the literature, and 3) they are present in Argentina as well as all paleocontinents during the Cambrian–Ordovician. Considering that at least 11 species have been formally described in Argentina for the Furongian–Tremadocian interval, a review of the material available from northwestern Argentina is a necessary first step to locate key characters that allow for a taxonomical sorting of the group. Species level identification is to be attempted with material from several localities in the northwestern Cordillera Oriental of Argentina.

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DAPINGIAN–DARRIWILIAN BOUNDARY IN THE ARGENTINE PRECORDILLERA: NEW U-PB ID-TIMS DATE CONSTRAINED BY CONODONT BIOSTRATIGRAPHY

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The age of the boundary between of Dapingian and Darriwilian stages has recently been a topic of discussion. In the 2012 Geological Timescale, it was placed at 467.3±1.1 Ma, whereas in the 2020 Geological Timescale, it was positioned at 469.4±0.9 Ma. The Lower–Middle Ordovician carbonate succession of the Central Precordillera is represented by the San Juan Formation. This unit preserves an extensive record of explosive volcanism in the late Floian through middle Darriwilian. Conodonts enable biostratigraphic constraints of the bentonite beds. The upper part of the San Juan Formation in the Río Francia section (Central Precordillera) is composed of bioclastic wackestone-packstone interbedded with bentonite beds. Recently, a detailed analysis of conodont biostratigraphy in this section was conducted, recording early–middle Darriwilian zones based on first occurrences of index species of the genus *Lenodus*. Here we provide a high precision U-Pb zircon date from biostratigraphically well constrained bentonite from this section. The *Lenodus antivariabilis* conodont Zone was registered from ~18 to 14.5 m below the top of this unit, documenting the lowest strata of the Darriwilian Stage in the Precordillera. The bentonite bed RF-4 was sampled 1.7 m below the first occurrence of the key species *L. antivariabilis*. Unfortunately, this stratigraphic interval was barren of conodonts. However, zircon grains extracted from the bentonite provided a consistent age of 467.99±0.45 Ma. This represents the hitherto most precise absolute dating of the Dapingian–Darriwilian boundary interval. Based on our new U-Pb date for the bentonite bed, biostratigraphically constrained by the first appearance of key early Darriwilian conodonts, we note that the absolute age for the Dapingian–Darriwilian boundary overlaps within error with that of the 2012 Geological Timescale. Together with U-Pb data from younger strata in Sweden, our results indicate that the *L. antivariabilis-L. variabilis* interval spans approximately 1.5 Ma.

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OLENIDAE PALEOBIOGEOGRAPHY: A COMPREHENSIVE PRELIMINARY APPROACH

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The paleogeographic distribution of olenids varied from the middle Cambrian (Guzhangian) to the Ordovician, reaching a cosmopolitan distribution at their peak during the Cambro–Ordovician boundary. Species records, incorporating stratigraphic and geographic data, were used to create curves showing occupied areas over time. Cluster analyses (agglomerative hierarchical clustering) and nonmetric multidimensional scaling (NMDS) were conducted for two time slices at the Cambro–Ordovician boundary (Stage 10 and Tremadocian). Tectonostratigraphic units without shared genera were excluded from the NMDS analyses. Additionally, using a calibrated preliminary phylogenetic hypothesis for olenids, BioGeoBEARS was employed to compare six biogeographic models (DEC, DIVALIKE, BAYAREALIKE, and their variants with jump dispersal, DEC + j, DIVALIKE + j, BAYAREALIKE + j). During their peak, olenid faunas were documented worldwide. However, nearly half of the recorded genera for these periods were documented from a single area (19 out of 40 are singletons in the Furongian, and 14 out of 30 in the Lower Ordovician), with only eight genera (four in each period) exhibiting worldwide distribution. Cluster analyses did not yield consistent results, being sensitive to changes in data treatment (*e.g.*, the choice of similarity index). Both cluster analyses and NMDS showed no correlation with paleogeographic reconstructions for the Cambro–Ordovician boundary, indicating an absence of distinct faunal realms for olenids. Preliminary BioGeoBEARS analyses suggested that jump dispersal events played a crucial role in olenid evolution. Both DIVALIKE and DEC models showed similar fit to the data and estimated a similar history, suggesting a Baltic or South American origin, though this remains inconclusive. Overall, these results align with previous studies. Olenids displayed high dispersal capacity through jump-dispersal and significant environmental tolerance, enabling colonization of remote areas unaffected by thermal barriers. The Steptoean Positive Carbon Isotope Excursion (SPICE) event likely triggered their initial radiation, by creating anoxic conditions and causing an extinction that generated niche vacancies. Then, the sea level rise at the Cambro–Ordovician boundary contributed to their peak, allowing olenids to establish lineages in different parts of the world. Their subsequent decline during the Floian may be attributed to changes in global ocean circulation, which likely caused environmental fragmentation and restricted their habitats.

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UNDERSTANDING ORDOVICIAN COLONIZATION PATTERNS USING TRACE FOSSILS: A CASE STUDY FROM BAGNOLES DE L'ORNE, NORMANDIE (FRANCE)

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The Lower Ordovician Armorican Sandstone Formation of northwestern France is renowned for its trace-fossil content. Outcrops are typically found in coastal cliffs and inland quarries and large bed surfaces may be exposed in places, which is the case at Bagnoles de l'Orne (Normandy). Large bed surfaces with trace fossils allow us to understand the paleoecology of seafloors as "snapshots" that can be studied with a modern perspective. The study area is located on the southern edge of the Mortain-Domfront Variscan syncline, where the Armorican Sandstone Formation overlies the Precambrian Brioverian series. This area is included into the Normandie-Maine UNESCO Geopark and will be classified as a regional nature reserve by the Normandy region. The aim of this contribution is to describe and interpret trace-fossil associations in the area adding value to the Geopark heritage. Three bed surfaces (between 20 and 300 m^2) located at the Pierre Plates Avenue and Béatrice walkway, and strata exposed in front of the *Roc au Chien* cliff (8-10 m) were analyzed. The first surface at Pierre Plates shows large-scale undulations that could correspond to sand dune or hummocky cross-stratification bedforms. On one side of the surface, *Cruziana*, *Daedalus* and *Rusophycus* are common and *Diplocraterion* is rare. On the other side of the surface, high bioturbation intensity by *Diplocraterion* and subordinate *Skolithos* is present. The other two bed surfaces (Pierre Plates and Béatrice) show abundant *Cruziana* and *Rusophycus* that almost completely reworked the substrate. Finally, the outcrops at *Roc au Chien* show intense bioturbation by *Skolithos* and subordinate *Rosselia*. This study demonstrates that high bioturbation intensity and good trace-fossil diversity were emplaced in sandy nearshores of the Lower Ordovician, which certainly resulted from the major ecological restructuration that was taking place in relation to the Ordovician radiation of animals. Furthermore, to reinforce the region's heritage by opening it up to new research and allowing for public promotion and awareness.

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PALEONTOLOGICAL HERITAGE: ORDOVICIAN COLLECTIONS PRESERVED IN THE LABORATORY OF PALEONTOLOGY AT INSTITUTE OF GEOLOGICAL AND ENVIRONMENTAL RESEARCH, UNIVERSIDAD MAYOR DE SAN ANDRES, LA PAZ, BOLIVIA

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Many years of geological research work and paleontological sampling on the Ordovician outcrops from Bolivia allowed a relatively understanding of the stratigraphy and biostratigraphy of the referred strata. Most collected samples are kept in the repository of Paleontological Laboratory of the Institute of Geological and Environmental Research at Universidad Mayor de San Andres in La Paz, Bolivia. Collections can be broadly grouped in Lower, Middle and Upper Ordovician faunas, that were mostly collected by the researcher Margarita Toro (†), providing information about the living forms that inhabited the Bolivian territory during this time Period. Some of these collections are being showed in National Bolivian Congress. The objective of this contribution is to present a summary of conditions and diversity of samples that lie in the paleontology repository, setting knowledge in remains, traces, localities and information that are not totally studied. As a part of the relevant samples of the collections that the repository embrace, we shall mention Tremadocian fauna like *Geragnostus (Microagnostus) hoeki, Koldinioida sinouosa, Angelina punctolineata, Rhadinopleura incaica, Parabolina (Neoparabolina) frequens argentina, Macrocystella* sp. and others; Floian–Darriwilian fauna like *Hoekaspis megacantha, Ogygitella australis, Huemacaspis* sp., *Dignomia munsterii*, a regressive sequence identify by Nereites to *Cruziana-Skolithos* ichnofacies, associate to *Homalonotus bistrami* and the Rugosa group. Graptolites collections corresponding to specimens from Tremadocian to Hirnantian age. The palaeontologic heritage from the Ordovician of Bolivia is diverse, poorly studied by means of conservation, and a fundamental part of the global knowledge to be kept safe. It is also a need for its study and protection by those responsible social actors from different institutions (laboratories, museums, students, researchers, etc.).

UPPER ORDOVICIAN (KATIAN) TRILOBITES FROM THE UPPER KTAOUA AND LOWER SECOND BANI FORMATIONS OF THE ANTI-ATLAS (MOROCCO)

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The Upper Ktaoua Formation tops the Ktaoua Group and contains abundant trilobites classically assigned to the "pre-Hirnantian Ashgill", now upper Katian (Ka3–4: Kralodvorian), based on chitinozoans from the Bou Ingarf section. Here, the boundary between *Armoricochitina nigerica* and *Ancyrochitina merga* biozones coincides with a condensed macrofossil-rich horizon with a subordinate Fe-oolitic ironstone, in the middle part of the formation. The shales 20–30 m below record *Phacopidina quadrata, Mucronaspis zagoraensis, Eudolatites inflatus, Dalmanitina* sp., *Octillaenus* cf. *O. marocanus*, *Selenopeltis* sp., *Onnia ultima*, and *Calymenella* sp. The condensed and oolitic horizon contains *P. quadrata, M. zagoraensis, E. inflatus, Baniaspis*? sp., and *Onnia ultima*. In contrast with previous works, which correlate the entire formation with the Kralodvorian stage, the trilobite record, along with the brachiopod *Aegiromena descendens*, indicate late Berounian (Ka2). This finds a Bohemian parallel in the Podolí 'Horizon', at the base of the Králův Dvůr Formation in Czechia, which also records an upper Berounian assemblage. The Berounian-Kralodvorian boundary (Ka2–Ka3) is thus located at the top of these horizons in both regions. The upper 6–15 m of the Upper Ktaoua Formation are highly fossiliferous and contain abundant trilobite-nodules, concentrated towards the top and ending in a condensed horizon with pebbles and crusts of oolitic ironstone. This, the so-called 'Ouzregui bed' due to the abundance of the nominal trilobite, has been intensively exploited commercially along more than 50 km. In Akka Bou Ingarf, Taguesaft, and Oum-jrane sections we identified *Flexicalymene ouzregui, Brongniartella platynota marocana, Calymenella* sp., *Mucronaspis greti*, "*Dreyfussina*" *struvei, Kloucekia* sp., *Selenopeltis vultuosa, Octillaenus marocanus, Onnia ultima*, and *Actinopeltis insocialis*. Other authors identified *Baniaspis globosa, Eudolatites maiderensis, Kloucekia poueytoi, Mucronaspis termieri, Lichas marocanus, Dionide* sp., and *Amphitryon* sp. Some recent works consider the 'Ouzregui bed' a marker at the base of Lower Second Bani Formation, but the occurrence of the *ouzregui*-nodules shows a rather gradual increase towards the top of the Upper Ktaoua Formation. Also, the original boundary between the Ktaoua/Second Bani groups was placed by J. Destombes at the base of the so-called "*Dreyfussina struvei* horizon" (topmost "Ouzregui bed"). Late Katian (Kralodvorian) trilobites are still present in the first 12–15 m (lower Mb) of the Lower Second Bani Formation, which in Akka Bou Ingarf and west of Tagounite sections contains *Mucronaspis termieri*, *Kloucekia tutana*?, *Brongniartella platynota*, *Onnia ultima, Actinopeltis* aff. *A. insocialis,* and *Cekovia* aff. *C. loredensis*.

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ORDOVICIAN-SILURIAN ORGANIC-WALLED PHYTOPLANKTON OF THE PARANÁ BASIN, BRAZIL: PRELIMINARY RESULTS AND PALEOGEOGRAPHIC IMPLICATIONS

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Organic-walled phytoplankton assemblages were obtained from the Iapó and Vila Maria formations of the Rio Ivaí Group, which span the Ordovician-Silurian interval in the Paraná basin. Glacial deposits of the Iapó Formation, Hirnantian in age, are represented by conglomerates, diamictites, and shales with dropstones, covered by shales, siltstones, and sandstones of the Vila Maria Formation, tentatively attributed to the Ordovician-Silurian. The transition between both formations is marked by the occurrence of cryptospores, previously reported, associated with acritarchs, prasinophyte algae, scolecodonts, fungi, and organic fragments not studied in detail yet. Thus, the composition of the phytoplankton assemblages and their paleogeographic implications are the objectives of this work. Seven samples from the Três Barras Farm section (26 m), Bom Jardim de Goiás Municipality, Goiás State, were prepared according to the standard sequence of acid dissolution and preparation of palynological slides. The stratigraphic interval analyzed comprises 2.4 m to 7.2 m measured from contact with the basement. In the basal portion of the Iapó Formation (2.4 m), the palynomorphs are broken and corroded, and mainly represented by sphaeromorph acritarchs and algal morphotypes, with minor participation of *Musivum gradzinskii*, *Clypeolus* sp., and *Retialetes*? sp. Reworked taxa are also present. In the uppermost portion of the diamictites (6.3–6.95 m), the high abundance of *Veryhachium* spp. and *Dorsennidium* spp. is accompanied by species of *Multiplicisphaeridium*, *Micrhystridium*, *Eupoikilofusa*, *Gorgonisphaeridium*, *Villosacapsula*, and rare *Pterospermella* sp. In addition, more than 20 morphotypes are still in the identification process. The specimens are very folded and interestingly, teratological forms are also present, which may indicate high environmental stress associated with initial excursion of the global carbon cycle. Similar diversity characterizes the transition between both formations, however, in the basal portion of the Vila Maria Formation, representatives of the *Veryhachium trispinosum* group, *Veryhachium lairdii* group, and *Dorsennidium* are abundant. The specimen's preservation improves and the abundance of teratological forms decreases. The recovered assemblages have worldwide distributed species in common with coeval deposits from North Africa and Saudi Arabia.

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TRILOBITE AND BRACHIOPOD BIOSTRATIGRAPHY OF THE LOWER KTAOUA FORMATION (UPPER ORDOVICIAN) IN THE BANI OF ALNIF, MOROCCAN ANTI-ATLAS

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The "Bani of Alnif" is a supplementary mountain range developed locally between the laterally extensive sandy packages of the First and Second Bani groups (Middle and Upper Ordovician, respectively) represented throughout the Anti-Atlas. It only extends for about 35 km south of Alnif, in the western part of Jbel Tiskaouine, where the main relief is constituted by the intermediate and upper sandstone members (Tiberguentand Tafersiktht mbs, ca. 60 and 65 m in thick, respectively) of the Lower Ktaoua Formation. Its basal member (Bou Isidane Mb) outcrops at the western escarpment of the Bani of Alnif and is composed of about 140 m of highly fossiliferous micaceous shales with some nodule-rich beds. The trilobite *Colpocoryphe grandis* (Šnajdr) is commercially exploited from this member, being a species previously described in the lower and middle Berounian (Sa1–Ka1) of Bohemia, Ibero-Armorica, Sardinia, and Turkey. The classic works of J. Destombes and V. Havlíček provided several identifications of "Caradoc" trilobites and brachiopods from the Lower Ktaoua Fmat Jbel Bou Isidane and Jbel Ahchahach sections, 14–16 km south of Alnif, which are rather outdated, so these important outcrops remain poorly known in terms of modern chronostratigraphy. This work presents new biostratigraphic data from a section located northeast of Tanout-ou Abid village, 18 km south of Alnif. Towards the middle part of the Bou Isidane Mb, ca. 45 m of shales and fossiliferous nodules include levels extraordinarily rich in *C. grandis*, alongside which sporadic records of *Dalmanitina socialis*, *Eudolatites* sp., *Eccoptochile* cf. *E. clavigera*, *Placoparia* cf. *P. africana*, *Prionocheiluspulcher*, *Selenopeltis* sp., *Deanaspis goldfussi, Vysocania* sp., and "*Panderia*" cf. "*P.*" *beaumonti*. Among the rare brachiopods we have identified T*azzarinia drotae, Onniella* sp., *Drabovia* sp., *Hirnantia* sp., and *Rafinesquina* sp. In the Tiberguent Mb, thick coquinoid beds of the brachiopods *Drabovia pentagonomya* and *D. tenuiseptata*? were recognized. The trilobite assemblage of the Bou Isidane Mb shows greater affinity with those known from the Letná Formation of the lower Berounian (ca. global Sa1) of Bohemia, where nine out of the ten genera occur, some represented by the same species or species that are closely related or may be synonyms. Towards the top of the unit, brachiopods of Bohemian affinity suggest a slightly younger age, middle to upper Berounian (Sa2–Ka2).

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FIRST RECORD OF OSTRACODS FROM THE ORDOVICIAN VOLCANO SEDIMENTARY ROCKS OF THE FAMATINA RANGE, WESTERN ARGENTINA

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This study presents the first record of ostracods from the arc-related volcano-sedimentary rocks of the Famatina Range in western Argentina. While ostracods from the Precordillera and the Central Andean Basin have been extensively documented, their presence in the Famatina Basin was previously unknown. A detailed examination of samples bearing conodonts has resulted in the discovery of phosphatized ostracod specimens. Ostracods are very scarce, and only one species has been so far recorded. The studied material was collected from the high-gradient, mixed siliciclastic-volcaniclastic platform of the Famatina Group, specifically from levels of coquinas with a calcareous matrix from the upper part of the Suri Formation and the base of the Molles Formation. The units are dated as Floian (Fl2) to late Floian–early Dapingian based on graptolites and conodont assemblages. The only recorded species is here assigned to the genus *Nanopsis*, possibly *N. victoria* previously known from the Santa Victoria Formation, Central Andean Basin. This genus is characterized by a simple morphology with nodes and sulci confined to the dorsal half of the valves, and the absence of marginal structures. The valves are subelliptical and range from amplete to slightly postplete. They exhibit a bi or tri sulcation, with S1 poorly developed, S2 being the deepest and longest sulcus, and S3 being poorly defined if present. *Nanopsis* has been recorded from the Tremadocian (Tr2) to the Floian (Fl2), and is relatively widespread, at least in the Tremadocian, with records in the Central Andean Basin, Baltic region, Alborz Mountains of northern Iran, and possibly South China. During the Floian, it is known only from the Central Andean Basin and Australia. In general, ostracod diversity is very low in the Early Ordovician, with sparce records from both the Tremadocian and Floian. Until now, the Central Andean Basin has stood out as an important area for studying this early radiation due to its relatively high diversity (five genera and nine species), in contrast to the occurrence of only one species in other palaeocontinents. The new record from Famatina contributes to our understanding of the early stages of ostracod evolution. Finally, *Nanopsis* shows paleogeographical affinities with both the Central Andean Basin and Australia, a pattern also observed in trilobites and brachiopods.

CRANIDIAL AND PYGIDIAL DISPARITY PATTERNS OF LATE CAMBRIAN–EARLY ORDOVICIAN TRILOBITES: TWO SIDES OF THE STORY

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Morphological disparity as a complementary estimate for assessing macroevolutionary and macroecological dynamics has a long pedigree in paleobiology. In this sense, trilobites represent an iconic group of Palaeozoic marine arthropods with an exceptional fossil record and are considered a model group for investigating aspects of early animal evolution. Most investigations of trilobite disparity-through-time include some type of morphological quantification of the cephalon or cranidium; most probably because the cranidium represents a morphologically complex structure that captures important features that relate to the ecological strategies of the group. However, recent studies indicate a discrepancy in patterns of morphological disparity based on individual structures or substructures of organisms. For this reason, the present work aims to study individual patterns of disparity of different structures and analyze how they contribute to the knowledge of the history of a group. For this, we explore morphospace occupation through time of Ordovician and Devonian trilobite assemblages, considering two anatomically and functionally distinct structures, namely the cranidium and pygidium. Our results show discordant patterns of disparity for these structures, suggesting differential constraints. Cranidium disparity fluctuates a lot across temporal intervals, regardless of diversity. In contrast, the trend in pygidial disparity mirrors diversity, even at key moments of community restructuring such as the Tremadocian and the Floian where cranidial disparity clearly decouples from diversity. A comparison of both morphospaces using a Procurstes superimposition indicates that the main differences are caused by taxa with extreme morphologies for both structures. In general, pygidium morphology fails to give an accurate portrayal of ecological diversity. Rather, the morphological disparity of pygidia and taxonomic diversity behave similarly, suggesting that it is a suitable proxy for richness, at least for Furongian–Floian trilobites. The quantification of the morphological differences of cranidia, on the other hand, clearly identifies ecological roles or strategies in these trilobite communities, providing a promising approach to a more complete perspective on biodiversity and ecosystem functioning.

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MODELING THE PALEOECOLOGICAL TROPHIC NETWORK OF THE LOWER ORDOVICIAN FEZOUATA SHALE (MOROCCO) FOSSIL FAUNA

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The Fezouata Shale, a fossil Lagerstätte from the Lower Ordovician of Morocco, has a fauna composed of species typical of both the Cambrian Explosion and the Great Ordovician Biodiversification Event. This community is directly comparable to that of the Cambrian Chengjiang and Burgess Shales in that they were shallow, open water marine communities. Here, we reanalyzed species lists for the early Chengjiang fauna and later Burgess Shale assemblages. We then compiled a comprehensive species list for the Fezouata Shale and developed an empirical trophic network, including 15 of its comparable properties. These were compared to a modeling of the trophic structure of the three fossil faunas by the niche model, known for accurately representing modern trophic networks. An uncertainty analysis was also conducted to evaluate the presence of potential bias in the fossil data. The Fezouata trophic network was more speciose and larger (420 taxa and 18751 interactions, 178 trophic species, and 4228 interactions) than that of Burgess (142 taxa and 771 interactions, 48 trophic species, and 249 interactions) and Chengjiang Shales (85 taxa and 559 interactions, 33 trophic species, and 99 interactions). The Fezouata network had a lower mean trophic level than that of Chengjiang, due to a higher proportion of basal species following the Ordovician Plankton Revolution. The Fezouata network was similar to the Burgess one as no property meaningfully differed between them. Thirteen properties of all three fossil networks showed little meaningful difference, but for a gradual increase or decrease from the oldest to youngest trophic networks. This is significant because it supports the hypothesis that there was a gradual slow-burn change in trophic complexity from the Cambrian Explosion through to the Late Ordovician, suggesting the Cambrian Explosion and the Great Ordovician Biodiversification Event were part of one same long-lasting diversification event.

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LINKING THE GRAPTOLITE BIOSTRATIGRAPHIC FRAMEWORK WITH NEW FINDINGS OF ACRITARCHS FROM THE LA CIENAGA DE PURMAMARCA, CORDILLERA ORIENTAL, ARGENTINA

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Taxonomic analysis of Ordovician graptolites from the Acoite Formation at La Ciénaga de Purmamarca section, western Cordillera Oriental, Argentina, allows to accurate the stratigraphic range of significant taxa stored at the CICTERRA-CONICET-UNC. It supports a biostratigraphic framework, comprising three graptolite biozones (*Tetragraptus phyllograptoides, Paratetragraptus akzharensis, and Baltograptus* cf. *B. deflexus*) corresponding to the Early Ordovician (Floian) that lets to precise stratigraphical ranges of acritarchs. New acritarch records from this section enable us to refine the first appearances (FADs) in Argentina of useful peri-Gondwana markers by correlating them with graptolite biozones. In the lower part of the succession, we only recorded *Cymatograptus rigoletto*, a key species that points out that the *Tetragraptus phyllograptoides* Biozone is developing through the yielding levels of earliest Floian (Fl1) age. So far, levels corresponding to the *T. phyllograptoides* Biozone had produced very few acritarchs that did not help to constrain the age to the Time-Slice 2a. The acritarchs recorded here are more diverse, highlighting the FAD of *Arbusculidium filamentosum*, whose earliest known record in Argentina was associated with the *Baltograptus* cf. *B. deflexus* Biozone (Fl2). Although the worldwide FAD of *A. filamentosum* has been located at the base of the Time-Slice 2b (Fl1), in Avalonia its FAD corresponds to the *T. phyllograptoides* Biozone. Even if the first worldwide appearance of *Barakella* is approximately equivalent to the *P. akzharensis* Biozone, its previous first occurrence in Argentina was in levels corresponding to the *Baltograptus* cf. *B. deflexus* Biozone. However, there is a probable record of *Barakella* in South China, which would correspond to the *T. phyllograptoides* Biozone. Up to the middle portion of the succession, the FAD of *B. vacillans* indicates the lower boundary of the *P. akzharensis* Biozone, and a few meters above the significant species *Paratetragraptus approximatus* is also present. Both of these indexes suggest an early Floian (Fl1) age for the bearer levels. In the upper third of the section, the first records of *Baltograptus* cf. *B. turgidus* and *B. kunmingensis* are defining the lower boundary of the *Baltograptus* cf. *B. deflexus* Biozone (Fl2), indicating the early middle Floian age of the upper fossiliferous strata. This interval also produces acritarchs characteristic of the Floian of peri-Gondwana (*Coryphidum* cf. *C. ohemicum, Striatotheca transformata, Aureotesta clathrata*, and *Dactylofusa velifera*). The studied succession is regionally correlated with the lower part of well-known sections from the Cordillera Oriental, and included in the global scheme proposed for the Central Andean Basin.

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NEW DATA ON THE ORDOVICIAN–SILURIAN BOUNDARY IN THE TYPE SECTION OF THE SALAR DEL RINCON FORMATION, SOUTHWESTERN PUNA, ARGENTINA

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Taxonomic analyses of biserial graptolites and palynomorphs collected from the sandy interval of the Upper Member of the Salar del Rincón Formation allow us to reassess the position of the Ordovician–Silurian boundary in the type section of the unit. This work aims to clarify the controversial discussions that successively assigned the studied deposits to the Devonian, based on marine faunas of brachiopods, trilobites, tentaculitids and conularids, and to the Silurian, based on brachiopods and poorly preserved graptolites of uncertain stratigraphic position. Although the age of the Salar del Rincón Formation was previously considered to span the Ordovician–Silurian boundary based on palynological studies (chitinozoans) from the Upper Member of the unit, new records of graptolites collected below from those fossiliferous levels suggest a lower position for the Ordovician–Silurian transition in this part of the section. The graptolite fauna consists of small forms that accord with the dimensions of young specimens of *Normalograptus mirnyensis*, associated with poorly preserved fragments, probably corresponding to other characteristic early Llandoverian (Rhuddanian) taxa. Furthermore, the marine organic-walled phytoplankton (acritarchs and prasinophytes) would confirm the Silurian age upward in the section. The graptolites were recorded approximately 5 meters under the level that yielded chitinozoans dated as early Rhuddanian, mainly based on the presence of *Cyathochitina* cf. *C. caputoi*. The organic-walled phytoplankton recorded throughout the Upper Member of the Salar del Rincón Formation, as well as terrestrial palynomorphs represented by cryptospores, are common taxa in the Ordovician–Silurian transition, spanning the systemic boundary. The presence of the acritarch *Tylotopalla* cf. *T. digitifera*, circa 6.5 meters above the level with graptolites would corroborate the Silurian age for the upper part of the upper member of the stratigraphic unit. Noteworthy, *T. digitifera* first appearance is in the Aeronian (upper *Stimulograptus sedgwickii*-lower *Spirograptus turriculatus* Zones in the Argentinian Precordillera), therefore, the Rhuddanian age is not registered by acritarchs. The new findings of graptolites and acritarchs allow the review of the biostratigraphic framework previously proposed for the type section of the Salar del Rincón Formation. Consequently, the age of the yielding graptolite deposits is here constrained to the earliest Silurian (Rhuddanian), and, therefore, the Ordovician–Silurian transition begins immediately above the plane bedded quartz sandstone located in the upper part of the Upper Member of the studied unit.

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DIRECTIONALITY OF DISPERSAL PATHWAYS IN THE LATE ORDOVICIAN: A CASE STUDY OF LAURENTIAN BRACHIOPODS (ATRYPIDA: ANAZYGINAE AND CATAZYGINAE)

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Speciation events drive diversification, but ecological and biogeographic constraints moderate the speciation process itself. The Late Ordovician was a period of substantial environmental change. The co-evolution of earth systems changes involving tectonic uplift and eustasy and biotic changes, such as dispersal and speciation, are recorded in the Late Ordovician in Laurentia. Notably, the final stages of the Ordovician Radiation include the origination, diversification, and extinction of the widespread brachiopod family Anazygidae. In this study, the two anazygid subfamilies Anazyginae and Catazyginae are examined as a focal group for understanding the dispersal pathways of minute brachiopods within eight sedimentary basins. The tempo and mode of potential dispersal pathways and speciation events for species attributed to *Zygospira*, *Anazyga*, and *Catazyga* in the Late Ordovician (Katian Stage) were examined using a probabilistic assessment of evolutionary biogeography conditioned on a recently developed phylogenetic framework for the group. Stochastic analysis applied to the Bayesian phylogenetic tree for anazygid species using BioGeoBEARS facilitated prediction of basin-to-basin dispersal events and speciation modes within the clade. Three algorithms were implemented, Dispersal-extinction-cladogenesis (DEC), DIVALIKE, and BayArea-like. Additionally, the founder-event effect was included in each model run to account for hopping or jump dispersal (+J parameter). The DEC+J parameter was the most strongly supported model (Posterior probability: -54.82; AICc: 115). Results provide a framework to identify intra- and extracratonic dispersal events and indicate a dispersal trend from the more northerly basins toward the southern-most basins in Laurentia. Dispersal within the group was found to be explained by hopping dispersal events, with marginal-Laurentian islands acting as "stepping stones" to intracratonic species. Anazygidae originated from an ancestral vicariance event after which anazyginid species largely evolved in the cratonic interior, whereas catazyginid species evolved primarily on the continental margins. Most subsequent speciation events occurred via dispersal (total of 14 distinct episodes vs. 2 additional vicariance events). Dispersal is linked to connectivity and isolation pulses between the mid-continent and southern basins related to episodic tectonic events and regional sea level changes. These results indicate that anazygid species followed dispersal pathways similar to those previously observed in other brachiopod groups, and that diversification was affected by increase in dispersal capacity across different Laurentian basins.

FIRST CONODONT FAUNA (FLOIAN, LOWER ORDOVICIAN) FROM VEGA PINATO, WESTERN ARGENTINEAN PUNA

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The arc-related volcaniclastic rocks of the Aguada de la Perdiz Formation, exposed at the Vega Pinato section, have yielded the first Floian conodont fauna identified in the Western Puna Eruptive Belt, NW Argentina. Despite presenting frequent fractures, the conodont elements are sufficiently preserved for taxonomic identification. The collection, comprising 375 elements, is notable diverse and includes *Acanthodus lineatus, Acodus* sp., *Aloxoconus* aff. *A. staufferi, Bergstroemognathus extensus, B. robustus, Colaptoconus* sp., *Diaphorodus* cf. *D. delicatus, Drepanodus arcuatus, Drepanodus*? sp., *Drepanoistodus pitjanti, Drepanoistodus* aff. *D. pitjanti, Drepanoistodus basiovalis, Gothodus* cf. *G. andinus, Juanognathus jaanusoni, Juanognathus variabilis, Oelondadus*? sp., *Oneotodus costatus, Paroistodus* sp., *Periodon flabellum, Pohlerodus heligma, Protopanderodus gradatus, Protopanderodus leonardii, Reutterodus andinus, Rhipidognathus* sp., *Scalpellodus* aff. *S. striatus, Scalpellodus* cf. *S. tersus, Scolopodus striatus, Scolopodus* sp., *Tropodus australis, Zentagnathus* cf. *Z. argentinensis*, and Gen. et sp. A. The assemblage, middle–late Floian in age, includes typical warm water taxa, which is unusual compared to contemporaneous assemblages from the Andean Gondwana margin. Instead, it is more closely related to faunas from Laurentia, China, Australasia, and the Precordillera basin, regions that are generally considered to have been at lower paleolatitudes during the Lower Ordovician.

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FLOIAN TRILOBITES FROM THE SAN JOSÉ FORMATION, PERUVIAN CORDILLERA ORIENTAL. PALEOBIOGEOGRAPHIC SIGNIFICANCE

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A newly discovered trilobite fauna from upper Floian deposits in central-southern Perú (San José Formation, Kimbiri, Libertad, and Catarata sections, 80 km NE of Ayacucho city) fills an important gap in the knowledge of the Ordovician faunas from the Central Andean Basin. This basin includes extensive shallow marine, Lower Paleozoic successions, ranging from offshore to shoreface settings, developed in a retroarc foreland basin located at mid to low paleolatitudes at the proto-Pacific margin of Gondwana. So far, trilobites are well-known from Furongian–Lower Ordovician successions in the south of the basin (NW Argentina) and scattered localities in Bolivia. Trilobites from the lower part of the San José Formation include asaphids, raphiophorids, trinucleids, pliomerids, nileids, calymenids, telephinids, and olenids, as well as few agnostids. The association shares several species with the Acoite Formation (Floian 1–Dapingian 1) from the Argentine Cordillera Oriental. The age of both units is well constrained by graptolite records that, together with identity in trilobite species, support a direct correlation between bearing levels of both units. Numerous species in common with the Bolivian Cordillera Oriental allow to integrate otherwise scattered records throughout this extensive area of west South America. The Peruvian trilobite assemblages can be included in the well-known *Famatinolithus* Fauna (Fl2–Fl3), significantly expanding its geographical range. From a paleobiogeographic perspective, Floian assemblages from the Central Andean Basin yielded several endemics belonging to different trilobite families, such as *Famatinolithus, Fantasticolithus, Branisaspis, Hoekaspis, Pliomeridius,* and two new genera of Asaphidae and Nileidae, along with widespread forms including *Megistaspis* (*Ekeraspis*), *Porterfieldia*, and *Hypermecaspis*. Some elements indicate affinities with peri-Gondwanan areas (*Neseuretus, Colpocoryphe, Merlinia,* and *Ogyginus*). Forms such as *Lonchodomas* so far recorded in younger successions of Baltica, Laurentia, and South China, and the epipelagic *Carolinites* exhibiting a pan-Equatorial distribution, as well as *Oopsites*, also recognized in Spitsbergen, suggest connections with warm water faunas. Notably, some of these taxa (*Famatinolithus, Pliomeridius, Neseuretus, Merlinia, Lonchodomas, Carolinites,* and *Oopsites*) are also recorded at Sierra de Famatina (Suri Formation), the southern extreme of a magmatic arc and associated volcano-sedimentary basin fringing the South American margin. This biogeographic pattern showing both, low- and high-latitudinal faunas, is consistent with the location of the region around the edge of the paleotropical belt. As well, the high percentage of endemics may result from the development of a shallow seaway, with restricted connections with the oceanic water masses, probably mediated by the active volcanic arc placed to the west.

INTEGRATED BIOSTRATIGRAPHY AND STABLE ISOTOPE CHEMOSTRATIGRAPHY FROM THE TREMADOCIAN OF THE YANGTZE PLATFORM, SOUTH CHINA

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A Tremadocian (Tr1–Tr2) carbonate succession was sampled in the Xiangshuidong section in Hubei Province (South China) and analysed for conodont biostratigraphy. 24 species belonging to 16 genera were recovered from the Nantsinkuan Formation and the lowermost part of the Fenhsiang Formation. Based on their succession, three conodont zones are recognized (*i.e.*, the *Rossodus manitouensis* Zone, the *Colaptoconus quadraplicatus–Paltodus pristinus* Assemblage Zone, and the *Paltodus deltifer* Zone, in ascending order). The lower Ordovician *Cordylodus angulatus* Zone, previously published from the Yangtze Platform, cannot be recorded. Instead, we recognize a biostratigraphic gap spanning the *Cordylodus lindstromi* and *Cordylodus angulatus* zones, implying a major hiatus spanning the Cambrian/Ordovician boundary interval on the Yangtze Platform. A remarkable conodont faunal turnover is evident within the uppermost *Rossodus manitouensis* Zone and the *Colaptoconus quadraplicatus–Paltodus pristinus* Assemblage Zone, corresponding to the Lower Tremadocian Base Stairsian Mass Extinction event (BSME). This turnover took place at the Tr1–Tr2 stage slice boundary during a stratigraphic interval corresponding to the rising limb of the Top Skullrockian Isotopic Carbon Excursion (TSICE). The TSICE represents the largest Tremadocian carbon isotope excursion with peak values comparable to the Cambrian Ordovician Transition Isotopic Carbon Excursion (COTICE), which just like the TSICE has been first established in the Argentine Precordillera. According to our revised conodont biozonation in the Xiangshuidong section, a small but distinct positive shift in $\delta^{238}U$ values starts contemporaneously with the TSICE in the lower part of the *Colaptoconus quadraplicatus–Paltodus pristinus* Assemblage Zone. This post-BSME positive shift in $\delta^{238}U$ suggests a significantly improved oxygen supply to environments at the sea-floor during the early Tremadocian after the extinction event. There are no apparent $\delta^{238}U$ changes before the BSME. Therefore, stress related to an expansion of anoxia into shallow sea settings may not represent the trigger for the BSME.

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HIRNANTIAN RECORD AT THE PARANÁ BASIN, BRAZIL: A NEW GELID DIVERSITY REVEALED

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The Iapó and Vila Maria formations record an interval linked to the Hirnantian glaciation. Both formations were taphonomically surveyed for macrofossils in the following sections: COHAB (1) (Barra do Garças city, Mato Grosso State; Aldeia Creek (2), and Três Barras Farm (3) both at Bom Jardim de Goiás, Goiás State, Brazil). The glacially related Iapó Formation is better developed in sections 1 and 2. At the sections 2 and 3, the fully transgressive facies have expressive thickness. Section 1 is 13 m thick, and the layers of interest begin in a 2.8 m thick siltstone, with centimetric sandstone lenses and a 2 m thick conglomerate. Above the conglomerate, 1.5 m thick siltstone with dropstones is intercalated with diamictites, in millimetric to centimetric laminae. To the top, 5.5 m siltstones and mudstones with dropstones and sandstone lenses are common. At the 30 m thick Section 2 there are 9 m thick glacial conglomerates, followed by 4 m thick siltstones with dropstones. To the top, the sequence has 11 m of dark grey mudstones. The 19 m thick Section 3, begins as 5.7 m of sandstone layers, intercalated by conglomerates. These are followed by siltstones with dropstones until 7.0 m. Above them, there are 5.0 m thick mudstones. These layers are followed by red siltstones. All three sections have sandstones at their uppermost portion. At Section 1, the fossil assemblage occurs in the glacial interval, between 6 to 13 m high. Two specimens of a Dalmanitidae trilobite (articulated thorax-pygidium and one isolated thorax) were recovered, while six specimens of the rhynchonellid brachiopod *Dalmanella* cf. *D. testudinaria* (four articulated, two disarticulated valves, and one fragmented specimen) were found. Disarticulated brachiopod *Kosoidea australis* are abundant. Conjoined ostracod valves, mollusks, lingulide shells, as well as scolecodonts, were also reported. Depositional conditions point to a transgressive-regressive context, close to the glacier. At Section 2, siltstones with dropstones recorded diversity´ is high and includes ostracods (*Harpabolia harparum*, a diagnostic species of the Hirnantian, as well as *Sattielina paranaensis* and *Conchoprimitia brasiliensis*), the conodont element *Promissum pulchrum*, and low abundance of *K. australis*. At Sections 2 and 3 transgressive facies (Vila Maria Formation) the most abundant fossil invertebrates are autochthonous to para-autochthonous mollusks and ostracods. All data points to a higher diversity and abundance of groups while in glaciation event, that is followed by a decline in the benthic diversity and abundance in a post-glacial setting.

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SCIENTOMETRIC STUDY OF ORDOVICIAN: A TOOL TO PERCEIVE SCIENCE EVOLUTION IN LATIN AMERICA

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Scientometrics can investigate how a field of study changed over time, looking at partnerships of the authors, themes within a scientific area, or even how the most common words cited in titles and abstracts can indicate perceptions of the investigated field, for example. In this work we have analyzed titles and abstracts, available at OpenAlex database. Then, we used a particular set of terms that would be directly related to the Ordovician period such as synonyms and names for the smaller period subdivisions. These words were used to query for titles and available abstracts. All papers on Ordovician topics, not only paleontological ones, were obtained. We analyzed the most productive institutions over the years, ever since the field is mentioned in publications with authors affiliated with Latin American institutions. We traced most relevant researchers and the research networks around them using community detection based on the graphs of collaborations, also focusing on Latin American institutions. Communities of authors were studied as they shape and split with time considering one decade window interval in each period. Following the methodology for topic classification, we applied the clustering algorithm to the set of works and obtained a set of clusters to represent the topics for the field we are studying. We applied a Large Language Model to produce descriptions using the intersection of the 100 most cited and central papers on the field. We evaluated the productivity of every cluster along the years and their relative productivity, which means works divided by total number of works in the year. Our results indicate the Argentinian institutions with the most production and occupying the first four positions with the Consejo Nacional de Investigaciones Científicas y Técnicas, Universidad Nacional de Córdoba, Research Center on Earth Sciences, and University of Buenos Aires. Brazilian and Mexican institutions follow with much less production. Most cooperation happens between Consejo Nacional and other Argentinian universities by means of multiply affiliated authors, such as Córdoba, Buenos Aires, San Juan, and La Plata. A collection of all citations amounts to 14345 citations in the cited works that could be grouped into 41 clusters of subjects with the largest 16 of them containing over 150 works at least. Their productivity is non decreasing even though some clusters are increasing at larger rate the average, such as related to Palaeozoic fossil records and Paleogeographical reconstructions and works related to Ordovician biodiversity and stratigraphy.

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