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内蒙古早二叠世构造古地理的再造

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摘要:

针对近年来关于内蒙古中部早二叠世古亚洲洋存在和向南北两侧大陆俯冲的观点, 本文通过构造古地理图的编制, 结合早二叠世沉积岩相、古地理、生物组合、陆源碎屑以及烃源岩的讨论, 认为中亚陆块和华北克拉通之间晚古生代存在的是陆壳基底之上发育的陆表海和裂陷槽, 而不是大开大合的大洋。我们的研究揭示了该区的演化过程。早二叠世早期伴有强烈火山喷发的沉积作用受到三条近东西向分布的同沉积裂陷槽的控制, 由北向南, 其滨-浅海相的沉积-火山岩厚度分别>8000m; >5000m和2900m, 显示基底为不稳定的裂陷槽。沉积作用受到深断层控制的观点得到本区深部地球物理探测资料的佐证。早二叠世早期沉积岩以粗碎屑岩为主, 其中成熟度低的硬砂岩、长石砂岩分布广泛。此外, 从陆源碎屑的组分和来源可见, 蚀源区具有新生陆壳的组成, 近源沉积物具有快速堆积的特征。早二叠世晚期沉积岩为夹有灰岩透镜体的炭质粉砂岩、板岩。由于海相暗色泥岩有机质丰度的提高, 形成分布于前三角洲, 浅海, 半深海的烃源岩(R_0 值=1.01%~3.67%)。上述沉积组合反映了陆壳成熟度不断提高, 构造活动性减小, 陆表海逐渐萎缩的特征。本区早二叠世的古生物以腕足类、珊瑚、苔藓类为主, 这一生物组合形成于滨-浅海环境, 其中珊瑚大多生活在低潮线以下温暖清澈的水域——几米至50米的滨-浅海区。植物化石及碎片的存在反映海陆交互的环境。早二叠世晚期本区生物已经混生, 主要以北极区生物为主, 以*Spiriferella*为代表的腕足动物群到处可见, 但也混有暖水型的分子, 如*Richtofenia*, *Enteletes*等。生物混生现象暗示早二叠世之前板块已经拼合, 不存在深海洋盆。根据毛登地区哲斯组放射虫和菊石、螺、双壳类及植物化石共生的事实, 作者认为放射虫可以生活在不同深度的水体中, 不能作为深海大洋存在的确切证据。本区的岩浆作用具有以下特点: 早二叠世大石寨组双峰式火山岩(281~270Ma)的玄武岩岩浆来自亏损地幔, 在岩浆上升过程中受到地壳物质的混染($I_{Sr}=0.7024\sim 0.7069$, $\epsilon_{Nd}(t)=-3.6\sim +7.9$)。同期的碱性花岗岩和大型基性岩墙群(299~263Ma)呈带状展布在大型地槽带中, 它们也具有幔源岩石的Sr-Nd同位素特征: $\epsilon_{Nd}(t)=3.0\sim 5.4$, $I_{Sr}=0.7053\sim 0.7088$, $\epsilon_{Hf}(t)=-2.7\sim 2.4$ 。从区域构造演化的背景上看, 本区岩浆活动与蒙古境内同期的裂谷型岩浆活动(双峰式火山岩和过碱性的深成岩)一致, 均属于伸展背景下受裂陷槽控制的岩浆作用, 而非挤压体制下与俯冲作用相关的岩浆作用。本区晚古生代宝力格裂谷带与蒙古的戈壁-天山裂谷带联接为一条延伸数千千米规模的大陆裂谷带, 清楚地显示了中亚造山带自石炭-二叠纪以来在伸展构造的背景下进入新陆壳演化的阶段。

英文摘要:

In contrast of the recently promoted view of point that there was a Paleo-Asian Ocean plate subducting towards the continents on its north and south sides in the Early Permian, the present authors prefer a different understanding. Through compilation of a tectono-palaeogeographic map of the concerned area based on all the facts about the sedimentary petrography, palaeogeography, biologic association, detrital materials of terrigenous origin, and hydrocarbon source rock in the Early Permian, it seems to the authors that what existed between the Central Asian massif and the North China Craton was a Late Paleozoic epicontinental sea and rift instead of a large-scale ocean experiencing spreading and closure. Our studies reveal the actual evolution of the concerned area in the Early Permian. In the early stage, the sedimentary process accompanying strong eruption of basic-acidic volcanic rocks is controlled by three syn-sedimentary rifts with near EW strike, with the thicknesses of sedimentary rocks of the littoral-shallow marine facies and volcanic rocks being >8000m, >5000m, and 2900m separately from north to south. The view point of sedimentation being controlled by deep faults is supported by the deep geophysical data. The sedimental rocks of the early stage are mainly consisted of coarse clastic rocks in which the greywackes and arkoses with lower maturity are distributed widely. Besides, the denudation areas are composed of neogenic continental crusts and the proximal sediments are characterized by quick-accumulation, as seen from compositions and origins of the terrigenous detrital materials. In the later stage, the sedimentary rocks appear as grey blocks of carbonaceous siltstone and slates interlaced with limestone lenses, in which the dark marine mudstones with increased organic abundance form hydrocarbon source rocks ($R_0=1.01\%\sim 3.67\%$) in prodeltas, shallow seas, and bathyal regions. The resulted sedimentary association reflect processes in which maturity of the continental crust become increased, the tectonic activities declined, and the epicontinental sea shrined. The Early Permian palaeocoenosis is mainly consisted of Brachiopods, corals, fusulinidss and bryozoa formed in a littoral-shallow sea environment, among which the corals can only live in clear and warm littoral-shallow seas just outside the low-water lines and not deeper than 50 meters. Occurrence of phytoclasts also reflects the settings being paralic facies. By the end of the Early Permian, the palaeocoenos has become mixotrophic, with its main part consisted of the kind of the Arctic region such as *Spiriferella* everywhere and mixed with such elements of polytherm as *Richtofenia*, *Enteletes*, etc. Such a phenomenon indicates that collision of the two plates has already occurred b

efore and no ocean basin exists in the Early Permian. Radiolarians could not be as the definite evidence of existence of an ocean crust because radiolarians may exist in waters of different depths, as shown by coexistence of fossils of the radiolarians, ammonites, gastropods, bivalves, and even plants in the Zhesi Formation in Maodeng area. The magmatism of the area is featured as that the bimodal volcanic rocks of the Early Permian Dashizhai Formation (281~270Ma) have their basaltic magma coming from a depleted mantle and mixed with crustal matters when uplifting ($I_{Sr}=0.7024\sim0.7069$, $\epsilon_{Nd}(t)=-3.6\sim+7.9$), and that the synchronous alkaline granites and large basic dykes (299~263Ma) are distributed in large grabens as belts, and have Sr-Nd isotopic features of mantle source rocks: $\epsilon_{Nd}(t)=3.0\sim5.4$, $I_{Sr}=0.7053\sim0.7088$, $\epsilon_{Hf}(t)=-2.7\sim2.4$. The regional tectonic evolution of the area is characterized by that its magmatism is consistent with that of the synmagmatic rifting type (bimodal volcanic rocks and peralkalic plutonic rocks) in Mongolia, belonging to magmatism controlled by rifts in extending settings rather than one related with subduction in a compressive regime. The Late Palaeozoic Baolige rift in the concerned area is connected with Gebi-Tianshan rift in southern Mongolia to consistent so large-thousands of kilometers-a continental rift, clearly showing that the Central-Asia orogenic zone has already entered a new continental-crust evolution stage since Carboniferous-Permian under the extended tectonic setting.

关键词: [早二叠世](#) [构造古地理](#) [陆表海](#) [裂陷槽](#) [古亚洲洋](#)

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