

A New Understanding of the Lower Cretaceous Jiufotang Formation in Western Liaoning

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Abstract

The Lower Cretaceous Jiufotang Formation in western Liaoning is the most important fossil production horizon of the Jehol Biota, which is widely distributed in the Mesozoic basins of western Liaoning. Due to the influence of historical data, previous scholars believed that there was no volcanic activity in the Jiufotang Formation in western Liaoning. In a field investigation in western Liaoning, the authors discovered basalt and andesite in the Hujiayingzi bed. In addition, a conformable boundary was found between the Yixian and the Jiufotang formations. It indicates that both the Jiufotang Formation and the Yixian Formation are strata containing volcanic-sedimentary rocks, only differing in strength of volcanic activity.

Keywords

Western Liaoning, Lower Cretaceous, Jiufotang Formation, Volcanic Rocks, New Discoveries

1. Introduction

Because the Jiufotang Formation is the most significant producer of fossils from the Jehol Biota, it is favored by paleontologists. It produces birds, dinosaurs, pterosaurs, turtles, mammals, fish and many other fossils like clam shrimps. The fossils from the Jiufotang Formation are complete and numerous, thus, they make them rare treasures in the world of paleontology. As a lithologic unit, the Jiufotang Formation is defined as a set of layers of ash, which is widely distributed in various Mesozoic basins in western Liaoning, above the Yixian Formation, under the Fuxin Formation, or under the Binggou Formation. It contains typical Jehol Biota fossils amongst yellow-green siltstone, shale, sandstone, and combinations of conglomerate and oil shale [1].

2. Discussion

Scholars often correlated the Jiufotang Formation in western Liaoning with the Longjiang Formation, the Guanghua Formation in the Daxinganling or the Xiaoling Formation and the Lishugou Formation in eastern Liaoning [2]. However, it was previously believed that there was no volcanic activity during the deposition period of the Jiufotang Formation in western Liaoning. According to the regional geological records of Liaoning Province, the Jiufotang Formation does not contain volcanic rocks, and is thus distinguishable from the Yixian Formation. However, the Jiufotang Formation has been found to contain a large amount of tuff components (tuff, siltstone, etc.). Previous reports have interpreted this volcanic ash as evidence of volcanic activity from the northern Hebei or Daxinganling area. Because they are adjacent to the south of the Pingzhuang Basin in western Liaoning, the Jiufotang Formation in the Kailu Basin and the Guanghua Formation in the Xing'anling area possess andesite, basalt, and volcanoclastic rocks. The authors have reported that gray-black basalt and gray andesite were found in the Hujiayingzi area in Dapingfang-Meileyingzi Basin, but due to the established viewpoint, the previous researchers put this volcanic rock combined in the Daxingzhuang Formation [3]. According to the authors' investigation, this set of volcanic rocks is integrated with the sedimentary rocks of the Jiufotang Formation and should belong to the Jiufotang Formation. At the same time, some people think that the rhyolite and basalt found in the Xintaimen area of Huludao belong to the Jiufotang Formation [4]. Therefore, it has been proven that there are lavas such as andesite, rhyolite, and basalt in the Jiufotang Formation in western Liaoning.

Since the andesite is also present in the Jiufotang Formation, the boundary between the Jiufotang Formation and the Yixian Formation is questionable. The authors find that the previous definition of the Jiufotang Formation was not accurate according to our aforementioned field investigation. Therefore, the authors speculate that the Jiufotang Formation and the Yixian Formation are combinations of volcanic and sedimentary rocks, and there is no obvious unconformity boundary between the two formations.

3. Conclusion

Based on the above data, the authors believe that the Jiufotang Formation and the Yixian Formation are lithologic formations of a set of volcanic-sedimentary rhythmic interbeds and affected by volcanic activities from different regions. And the boundary between the two should be a conformable interface.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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