

Late Triassic palaeoclimate and palaeoecosystem variations inferred by palynological record in the northeastern Sichuan Basin, China

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The end-Triassic mass extinction is one of the five largest extinctions in the Phanerozoic. However, the terrestrial records of Triassic-Jurassic transition are still limited in Asia. In China, the Triassic and Jurassic strata are well-developed in the Sichuan Basin, especially in the northeastern margin of the basin. In particular, the Upper Triassic Xujiahe Formation is widely distributed and well cropped-out in this region, containing rich fossil plants. This provides a significant reference for the study of the palaeoecological environment variations during the Triassic/Jurassic transition.

In this study, we focus on the Late Triassic palynological record from the Qilixia section in Xuanhan County, northeastern Sichuan Basin. In this area, the Upper Triassic Xujiahe Formation is composed of black mudstone, shale, and grayish white feldspar-quartz sandstones. This formation is divided into seven lithological members. Among them, Members I, III, V and VII are mainly dominated by mudstones, whereas the Members II, IV and VI are mainly represented by sandstones.

The palynoflora of the Xujiahe Formation in Xuanhan shows a high diversity of spores and pollen grains, including 151 species of 64 genera. A sporo-pollen assemblage, i.e. *Dictyophyllidites* - *Cyathidites* - *Pinuspollenites* - *Cycadopites* (DCPC) assemblage is recognized, characterized by a dominance of spores and abundance of pollen grains, dated as Rhaetian of Late Triassic in age. Palaeovegetation reconstruction shows a predominance of fern floras, followed by gymnosperms represented by conifers. This palynoflora indicates that a tropical-subtropical humid and warm climate generally prevailed during the Late Triassic in Xuanhan.

The Sporomorph Ecogroup Model (SEG) (Abbink et al., 2004) is applied to analyze the palaeoecosystem of the Late Triassic in Xuanhan of the Sichuan Basin. Four SEG groups have been recognized according to the habitat of the parent plants, including Lowland SEG, Highland SEG, River SEG and Pioneer SEG. The

palaeoenvironment is reconstructed with the variations of the four SEG ecogroups. It suggests that the overall humid and warm climate condition was not static and unchanging throughout the Late Triassic episode, but was punctuated by several climatic and ecosystem variations: two warm and humid climate events in the Members V and VII of the Xujiahe Formation, accompanied by a cool and dry trend in the end-Triassic episode. This is in accordance with the macroflora study (Huang, 1995) and the clay minerals and eigen elements analysis (Xu et al., 2010). The study reveals the terrestrial ecosystem variations before the Triassic/Jurassic boundary in the Sichuan Basin, and thus provides important evidence for understanding the response of terrestrial vegetation to regional and global environmental changes across the Triassic/Jurassic transition.

References

- Abbink, O.A., Van Konijnenburg-Van Cittert, J.H.A., Visscher, H., 2004, A sporomorph ecogroup model for the Northwest European Jurassic - Lower Cretaceous: concepts and framework. *Netherlands Journal of Geosciences/Geologie en Mijnbouw*, 83(1), 17-38.
- Huang, Q.S., 1995, Paleoclimate and coal-forming characteristics of the Late Triassic Xujiahe stage in northern Sichuan. *Geological Review*, 41(1), 92–99. (in chinese with English abstract)
- Xu, Z.H., Wang, Z.C., Hu, S.Y., Zhu, S.F., Jiang, Q.C., 2010, Paleoclimate during depositional period of the Upper Triassic Xujiahe Formation in Sichuan Basin. *Journal of Palaeogeography*, 12(4), 415-424. (in chinese with English abstract)