



DEPARTMENT OF GEOLOGY

Exploring the Environmental Tolerance of Pteridosperms

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Introduction

Pteridosperms were major components of forests in the Paleozoic. These vascular plants survived two major enviomental events, the Paleozoic Ice Age and the Permian-Triassic extinction. This project focuses on pteridosperm clades Callistophytales, Medullosales, and peltaspermales and explore how these plants moved and tolearated climate change.

Hypothesis

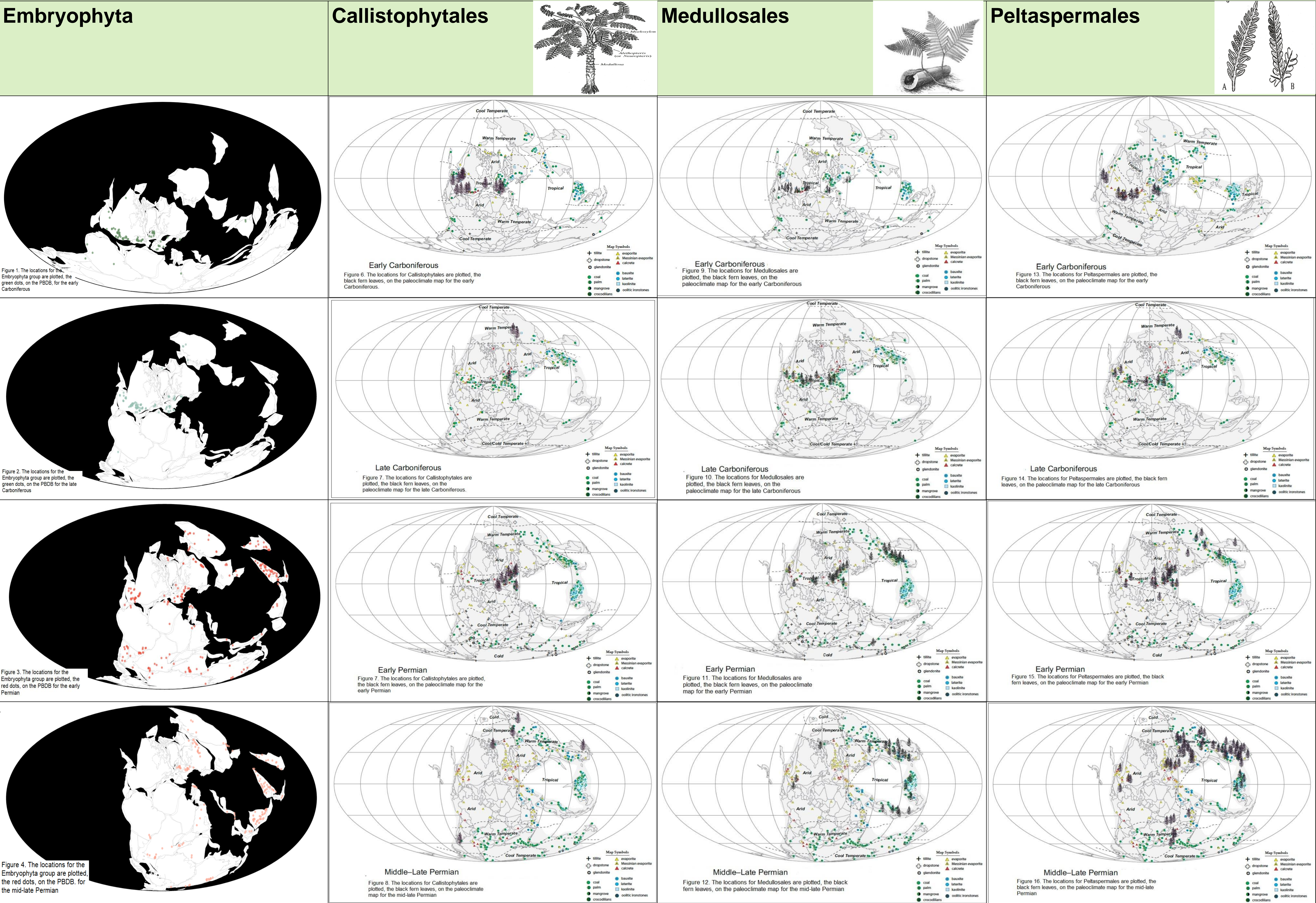
There is a relationship between climate conditions and changes in Peridsoerm fossil locations over time.

Methods

Hypothesis was tested using fossil locations of the clades and the Embryophyta group, control group, obtained from the Paleobiology database. Climates were determined by paleoclimate maps. Chi-squared test was used to determine p-value and statistical relationship.

Paleozoic Ice Age

Permian-Triassic extinction



Chi-Squared Results

Most of the p values are < 0.05 indicating there is a statsical correlation. The pattern of location changes for the clades is distictly different from Embryophyta, other land plants. The results also indicate a relationship between fossil location and climate changes.

Early Carboniferous	Yes, p <0.000001	Early Carboniferous	Yes, p <0.000001	Early Carboniferous	Yes, p <0.0021
Late Carboniferous	No	Late Carboniferous	No	Late Carboniferous	Yes, p <0.000001
Early Permian	No	Early Permian	Yes, p <0.0013	Early Permian	Yes, p <0.000001
Mid-late Permian	No	Mid-late Permian	Yes, p <0.000001	Mid-late Permian	Yes, p <0.000001

Obervational Conclusions

Preferred climate type order: Tropical, warm temps., arid, cool temps., and then cold.

The Ice Age had little to no affect on clade location.

The Ice Age had a minor affect on the population of clades, Medullosales was impacted the most with a decrease in occurences.

The Permian-Triassic extinction had a larger effect on clade location changes.

The Permian-Triassic extinction had a larger effect on the population of clades, increase in occurrence for Peltaspermales and decrease for Callistophytales and Medullosales

Future Research

Explore pteridosperm clades, like Peltaspermales, into the Triassic.

Explore other plants in the Paleozic for their envirometal tolerance and if there iare similar patterns

References

Boucot, A. J., Xu, C., & Scotese, C. (2013). *Phanerozoic Paleoclimate: An Atlas of Lithologic Indicators of Climate* (G. J. Nichols & B. Ricketts, Eds.; Concepts in Sedimentology and Paleontology).

The Paleobiology Database. (n.d.). Paleobiodb.org. <https://paleobiodb.org/>