EGU24-15732, updated on 09 Mar 2024
https://doi.org/10.5194/egusphere-egu24-15732
EGU General Assembly 2024


**Poster** | Friday, 19 Apr, 16:15–18:00 (CEST), Display time Friday, 19 Apr, 14:00–18:00 Hall X1, X1.67

# Deciphering the dynamics of the Mulde Event—Bayesian ultra-high-resolution ostracod paleocommunity analysis

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Silurian period witnessed a series of global extinction events, such as the Mulde/lundgreni Event during of the late Wenlock epoch. These events triggered complex and abrupt changes in Earth's biota. The brief nature of these events requires a high sampling resolution for paleontological studies, a feat seldom achieved. By integrating published data with new samples from the Gėluva-118 core, we have attained resolution of ≈ 10 Ka in examining ostracod paleocommunities during the Mulde/lundgreni Event.

Our approach involved a custom-made binary recursive segmentation algorithm for the hierarchical subdivision of stratigraphically contiguous segments. This algorithm was applied to the ostracod taxonomic compositional time series data from the Gėluva-118 core (Lithuania). The results revealed significant changes in ostracod community composition, enabling us to delineate the event's stages. We employed a Bayesian Age-Depth model to assess the timing of these changes. The median and 95% Highest Density Interval (HDI) durations for each stage, as well as for the entire event, are as follows: Collapse – 50 Ka (11 – 171 Ka), Maximal Stress – 120 Ka (31 – 601 Ka), Recovery – 80 Ka (21 – 576 Ka), and the entire Mulde/lundgreni Event – 260 Ka (100 – 1,136 Ka). Our analysis of bootstrapped sample averages of diversity indices revealed that the Maximal Stress stage, marked by a severe scarcity of ostracods, signified a distinct shift in community diversity state. Prior to this stage, ostracod communities were less diverse, yet exhibited higher increases in evenness with growing diversity, indicating distinct community assembly and community structure patterns. Ostracod communities from the Collapse and Recovery stages resembled those adjacent to the Mulde/lundgreni Event interval but showed significantly reduced abundances, lower inverse Simpson index, and higher evenness. Furthermore, our findings suggest a nonlinear recovery stage, punctuated by setbacks and stabilization phases.

These insights demonstrate the potential of high-resolution paleontological studies in deciphering the chronology and pace of intermittent global events.

This research was supported by S-MIP-21- 9 “The role of spatial structuring in major transitions in macroevolution”.

**How to cite:** Daumantas, L., Rinkevičiūtė, S., Radzevičius, S., and Spiridonov, A.: Deciphering the dynamics of the Mulde Event—Bayesian ultra-high-resolution ostracod paleocommunity analysis , EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-15732, https://doi.org/10.5194/egusphere-egu24-15732, 2024.