



Rapid compositional change and significant loss of plant species diversity among Triassic-Jurassic palynofloras in East Greenland

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The Triassic-Jurassic (Tr-J; 200Ma) transition coincides with the eruption of massive flood basalts associated with the opening of the Atlantic Ocean. This is thought to have lead to a fourfold increase in palaeoatmospheric carbon dioxide, a consequent rise in global temperatures of between 3 and 6 degrees Celsius, and a rise in atmospheric pollutants such as sulphur dioxide. Recent work has employed either plant macrofossils (mostly leaves) or sporomorphs (pollen and spores) to reconstruct the response of terrestrial vegetation to this episode of major environmental change. Investigations of the macrofossil record at Astartekloft in East Greenland indicate a rapid loss of plant diversity in the Late Rhaetian, culminating in an 80% species turnover at the Tr-J boundary interval. However, evidence for such catastrophic diversity loss is conspicuously absent from the sporomorph record. This fossil group indicates that the Tr-J boundary interval in central and northwest Europe is characterized by compositional change and a transient shift from gymnosperm forests to fern-dominated vegetation. In order to address this uncertainty regarding Tr-J vegetation change according to macrofossils versus sporomorphs, we present an analysis of sporomorph diversity and compositional change across the Tr-J at Astartekloft, East Greenland. Sporomorph diversity was estimated using individual and sample-based rarefaction techniques, and compositional differences between sporomorph samples were assessed using non-metric multidimensional scaling. These analyses reveal that sporomorph assemblages from the Tr-J boundary interval at Astartekloft are between 23 and 27% less taxonomically diverse than other Triassic assemblages, and that this interval is characterized by a dramatic shift in the composition of the standing vegetation. These results are statistically significant and are also unrelated to changes in the environment of deposition. These results indicate that the magnitude of plant diversity loss across the Tr-J in East Greenland is apparently greater in the macrofossil record than the sporomorph record. Comparison of these results with taphonomic work on the representation of different groups of plants in macrofossil and sporomorph records at Astartekloft is used to understand this discrepancy.