EGU Galileo Conferences
GC5-Mass-67, 2019
Mass extinctions, recovery and resilience
© Author(s) 2019. CC Attribution 4.0 license.

The assessment of end-Permian ozone shield strength using Fourier transform infrared spectroscopy to investigate sporopollenin chemistry

Matthew Kent (1), Wenchao Shu (2), Wesley Fraser (3), Jeffrey Benca (4), Cindy Looy (4,5), Ivo Duijnstee (4), and Barry Lomax (1)

(1) University of Nottingham, United Kingdom (matthew.kent@nottingham.ac.uk), (2) State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Wuhan, China, (3) Geography, Department of Social Sciences, Oxford Brookes University, Oxford, UK, (4) Department of Integrative Biology and Museum of Palaeontology, University of California, Berkeley, USA, (5) University and Jepson Herbaria, University of California, Berkeley, USA

Sporopollenin is a primary constituent of pollen and spore walls, that is extremely recalcitrant and which allows the identification and study of palynomorphs hundreds of millions of years after they formed. Sporopollenin typically contains ultraviolet (UV) absorbing compounds (UACs) that protect the genetic contents of the palynomorph from UV-B radiation. As plants can regulate UAC production according to UV exposure, abundances of UACs have been used as a proxy for historic UV and ozone shield health.

A large proportion of palynomorphs from the end-Permian mass extinction (EPME) are malformed and it has been hypothesised that these malformations resulted from high levels of UV-B. High levels of UV-B suggest that the Earth's ozone shield was severely compromised during this time, which may have been caused by extensive magmatism at the Siberian Traps large igneous province. We are using chemopalynology to seek more direct, chemical evidence of catastrophic ozone collapse during the EPME by investigating end-Permian sporopollenin with a view to linking changes in UAC abundance to Siberian Traps magmatism.

We will discuss the cutting-edge Fourier Transform infrared (FTIR) spectroscopy imaging we have employed to investigate the effects of end-Permian levels of UV exposure on the sporopollenin chemistry of extant plants. This work has provided a reference from which we can estimate prehistoric ozone shield strength at biologically catastrophic UV doses. Further we will explore the sporopollenin chemistries of End-Permian palynomorphs sourced from areas that would have spanned the supercontinent, Pangea.