The Aftermath of the Cretaceous-Paleogene Bolide Impact

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It is now widely acknowledged that the Cretaceous–Paleogene (K/Pg) mass extinction (65.5 Ma) is related to an asteroid impact. However, the detailed environmental consequences of this impact are still unclear. Proposed responses include a brief cooling episode and subsequent long term warming. However, rather than a single cooling event, distribution patterns of organic-walled dinoflagellate cysts (dinocysts) at the El Kef section (Tunisia) suggest multiple cooling and warming pulses during the earliest Danian. These fluctuations have yet to be confirmed elsewhere and their interference with (long term) background environmental variations is unknown. This emphasizes the need for high resolution temperature records across the K/Pg boundary.

The expanded Elles K/Pg section (Tunisia), close El Kef, provides such a record. Therefore, dinocyst assemblages from the Elles section have been studied to verify earlier reported environmental changes. Dinoflagellates are highly sensitive to changes in environmental parameters and therefore ideal to qualitatively assess climatological and ecological turnover across the K/Pg transition. Indeed, our preliminary findings confirm the patterns as recorded at El Kef earlier, suggesting multiple cooling pulses and major changes in productivity in the earliest Danian. Although the palynological record shows distinct trends in environmental parameters, other methods are required to further quantify these changes. In the past decade, various novel quantitative proxies have been developed based on Glycerol Dibiphytanyl Glycerol Tetraethers (GDGTs) i.e. TEX_{86}, MBT/CBT and the BIT-index. These proxies are applied to the Elles section to quantify changes in sea surface temperature, mean annual air temperature and the input of soil organic matter, respectively, and confirm the environmental trends as recorded by dinocysts. This complete, high resolution climate record across the K/Pg boundary allows verification of earlier reported environmental changes and enables worldwide correlation and comparison. Next steps will be to generate higher resolution temperature records based on the used organic biomarker indices.