A pristine dual-layer Chicxulub ejecta sequence with shocked carbonates from the Cretaceous-Paleogene (K-Pg) boundary, Demerara Rise, western Atlantic

Peter, Schulte[1] Alex, Deutsch[2] Tobias, Salge[3]
[1]GeoZentrum Nordbayern, Univ. Erlangen, D-91054 Erlangen, Germany [2]Institut f. Planetologie, Univ. Münster, Germany [3]Bruker AXS Microanalysis GmbH, Schwarzschildstr. 12, 12489 Berlin, Germany

A ˜2 cm thick Chicxulub ejecta deposit marking the Cretaceous-Paleogene (K-Pg) boundary (the "K-T" boundary) was recovered in six holes drilled during ODP Leg 207, Demerara Rise, tropical western Atlantic [1,2]. Stunning features of this deposit are its uniformity over an area of 30 km^2 and the total absence of bioturbation. High-resolution mineralogical, petrological, elemental, isotopic (Sr - Nd) and rock magnetic data reveals a complex range of composition and textures and a distinct microstratigraphy. The deposit is well graded and composed predominantly of aluminian dioctahedral Na-rich smectite spherules, 0.1-1 mm in size, with textures varying from hollow to vesicle-rich to massive. Some spherules show in situ collapse whereas others show internal textures and compositional differences indicating the original presence of distinct Fe-Mg-enriched melt globules and/or quench crystals. Both altered glass spherules and the clayey matrix (Site 1259B) display strongly negative ${\epsilon_{\mathrm{Nd}}}^{\mathrm{T=65Ma}}$ values (–17) indicating uptake of Nd from contemporaneous ocean water during alteration. The Fe-Mg-enriched spherules, shocked quartz and feldspar grains, porous carbonate spherules, and "accretionary" carbonate spherules, all are concentrated in the uppermost mm of the deposit. The carbonate phases are in part shock-metamorphosed (cf. [3]), and display a variety of very unusual textures. Preservation of delicate spherule textures, normal grading with lack of evidence for traction transport, and mm-scale compositional trends provide evidence for this spherule deposit to be a primary air-fall deposit. The stratigraphy strongly resembles the dual-layer K-Pg boundary deposits in the terrestrial Western Interior of North America (although there carbonate phases are not preserved [4]). The ODP Leg 207 is the first known dual-layer K-Pg boundary in marine settings; it incorporates compositional and stratigraphic aspects of both proximal and distal marine sites. The layered nature of this K-Pg boundary deposit documents the compositional differences between material derived from the ballistic ejecta, forming the majority of the spherule deposit, and material falling out from the vapor (ejecta) plume which is concentrated in the uppermost millimeters.

References

[1] MacLeod K.G., Whitney D.L., Huber B.T., Koeberl C. (2007). Impact and extinction in remarkably complete K/T boundary sections from Demerara Rise, tropical western North Atlantic. Geol. Soc. Amer. Bull., 119, 101-115.

[2] Schulte P., Deutsch A., Salge T., Berndt J., Kontny A., MacLeod K. G., Neuser R. D., Krumm S. (2008). A pristine dual-layer Chicxulub ejecta sequence with shocked carbonates from the Cretaceous-Paleogene (K-Pg) boundary, Demerara Rise, western Atlantic. Submitted to Geochim. Cosmochim. Acta

[3] Agrinier, P., Deutsch, A., Schärer, U., Martinez, I., 2001, Fast back-reactions of shock-released CO2 from carbonates: An experimental approach. Geochimica et Cosmochimica Acta, 65(15), 2615-2632

→

Abs. No. **345**
Meeting: **DMG 2008**
submitted by: **Deutsch, Alex**
email: **deutsca@uni-muenster.de**
date: **2008-05-31**
Req. presentation: **Poster**
Req. session: **S03**