**IMPLICATIONS FOR THE CHICXULUB FIREBALL DERIVED FROM A SYSTEMATIC ANALYSIS OF ITS DEPOSITS.**

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**Introduction:** A continuous record of the Chicxulub fireball deposits is intersected in the ICDP-Chicxulub Yaxcopoil-1 (Yax-1) drilling that is located in the structure's annular moat, ~60 km SSE' from the crater's center [1]. Systematic, image analysis-based study of this 100 m sequence of suevite-like rocks was conducted on photographs of half-cores and thin sections of ~40 samples to reconstruct emplacement conditions of these impact breccias.

**Samples and Methods:** Modal abundance of components and particle shape parameters were determined for the lapilli particle size range recorded in the half-cores. Bulk chemical compositions were derived from EMP analyses of 90 impact melt particles (MP).

**Results:** Five MP types were distinguished. The first type was rapidly quenched and is only abundant in the uppermost units and in dike breccias. The second type is variably quenched, rich in vesicles, and exhibits shard morphologies, thus indicating airborne transport. This MP type only occurs in the upper four units that are interpreted as airfall suevites. The third MP type is thoroughly crystallized with Pl and Cpx phenocrysts and is the most abundant MP type in the three basal units that overlie sedimentary megablocks. In these units, shape parameters of these MP indicate thermal softening and some corroded rims, suggesting post-depositional temperatures >~700°C [2]. The fourth MP type bears abundant Fe-O crystals and is only abundant in the airfall suevites. This suggests $fO_2$ conditions in excess of the FMQ-buffer for the formation of this MP type [3]. The variation in bulk chemical compositions of the MP is more pronounced on the unit-level than between particle types. This could suggest a homogenized impact melt that underwent compositional differentiation due to alteration and variable degrees of quenching. Carbonate target clasts in the lower airfall suevites and the impact melt unit indicate contact metamorphism. Below the impact melt unit, carbonate occurs with melt textures [1]. Particle size distributions in the uppermost unit agree with models for condensation from an impact vapor plume [4]. Distinct sorting is only indicated in the uppermost unit. Alignments of MP indicate increasing turbulence with depth and melt injections in dikes.

**Conclusions:** Petrologic characteristics of MP in Yax-1 suggest variable $fO_2$ and T-t conditions during their formation: Shape parameters indicate sorting processes, alignments and modifications of MP. Indications for thermal alteration of the MP above ~700°C and reworking features suggest the presence of a hot region of the fireball that collapsed with an erosive surge after the deposition of a melt unit that capped a ground-surged ejecta curtain deposit. Melt textures indicate that degassing of anhydrite and carbonate was inhibited below the melt unit.

**References:** [1] Stöffler, D. et al. 2004. *Meteoritics & Planetary Science* 39:1035-1067. [2] von Engelhardt et al. 1995. *Meteoritics & Planetary Science* 30:279-293. [3] Frost, B. R. 1991. *Reviews in Mineralogy* 25:1-9. [4] de Niem, D. 2002. *GSA Special Paper 356*:631-644.