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The joint IODP-ICDP 364 expedition in 2016 extracted a unique, continuous sequence of upper peak ring material from the Chicxulub impact structure in Mexico. The interval between core section 40R-1 and 95R-3 consists of a c. 130 m thick succession of suevite and impact melt rock that holds important clues about the composition and modification of the Chicxulub target lithologies (Morgan et al., 2017). The suevite unit is characterized as a melt-bearing polymict impact breccia with a clastic matrix that displays a generally gradual fining and a more well-sorted upward trend. This trend is most likely caused by the gradual decrease in settling velocity of ejecta after the asteroid impact. More subtle changes in the suevite succession, such as the transition between the fallback of ejecta material and the wash-back by tsunamis into the crater, are difficult to recognize. High resolution chemostratigraphy along the entire suevite sequence is therefore essential to identify the provenance of the various clasts and to link them to different formational processes.

Micro X-ray fluorescence (μXRF) is an ideal technique for such a task, since it combines rapid, non-destructive elemental analysis such as semi-quantitative trace element mapping and quantitative line and point measurements at a 25 μm resolution (de Winter et al., 2017). Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) provides additional highly sensitive major and trace elemental analyses, which can be coupled to petrographic observations to further distinguish between different types of clasts and matrix.

The main end-members discovered inside the Chicxulub suevite are (sub)angular clasts of fossiliferous limestone and chert in the top part versus clasts of granite and fragments of mafic lithologies that dominate the lower part. These clasts are remnants of a mixed target composed of a 2-3 km thick Mesozoic carbonate and evaporite platform and a Pan-African gneissic-granitic basement. The suevite matrix changes upward from green to grayish brown and represents a mixture of calcite and a clay component dominated by smectite (Morgan et al., 2017). Another important observation is the clear lack of sulfur in the entire suevite interval, which is suggested to be caused by the shock vaporization of major parts of the pre-impact evaporite platform on the Yucatán Peninsula. The only sulfuric components in the core are linked to pyrite crystals, as verified by petrography and μXRF. By integrating the μXRF and LA-ICP-MS results with XRF and Computed Tomography scan data of the different core sections, it is possible to extrapolate microscopic data on the studied samples towards the entire core. This may shed light on the ongoing debate about emplacement mechanisms of suevite and on the relative contributions of the various lithologies to the Chicxulub pre-impact target.

Morgan, J., et al., 2017. *Chicxulub: Drilling the K-Pg Impact Crater.* Proceedings of IODP, 364. https://doi.org/10.14379/iodp.proc.364.2017.

de Winter N., et al., 2017. Trace element analyses of carbonates using portable and micro-X-ray fluorescence: Performance and optimization of measurement parameters and strategies. J. Anal. At. Spectrom., 2017, 32, 1211.