



## **Graded Suevite in the IODP-ICDP Expedition 364 Chicxulub M0077 Core: Clues to Crater Modification and Material Transport**

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Core from Hole M0077A shows a sequence that begins with ~110m of post-impact Paleogene hemipelagics and pelagics that are followed downwards by ~130m (617 to 747mbsf) of impact-related polymict suevite. This suevite overlies clast-poor impact melt rock and felsic basement rocks with pre-impact mafic and felsic dikes, as well as impact-generated melt and suevitic dykes (747 to 1334.73mbsf). We have estimated the effect of marine environment on deposition of the suevite, timing in relation to peak ring formation, as well as provenance of material likely carried by a water resurge to the location of Site M0077. We have used the same line-logging method as we have previously applied in the studies of water-laid sediments at other marine impact craters. Instead of using actual drill core, in this instance our technique was applied to high-resolution core photos. In the suevite (core unit 2), 2376 clasts were analysed between depths 672.01mbsf and 715.93mbsf, and note was also made of matrix/clast support.

Number of clasts increases upwards. Below 706mbsf, clast size and sorting, and matrix/clast support varies strongly. Above 706mbsf, there is a general fining-up trend, and gradual increase in sorting from moderately to well sorted. At 697mbsf, there is a second noteworthy shift in several parameters, especially a break in an otherwise upwards increase in roundness to a level of high angularity that continues to the top of the logged section. The interval between 697mbsf and 706mbsf is also characterized by a near absence in the otherwise rather common brown carbonate ("upper target II") clasts and green melt. Instead the interval is dominated by grey melt fragments, and the amount of tan carbonate ("upper target I") and other target rocks remain essentially unchanged over the 697-706mbsf interval, followed by a relative decrease upwards.

The high amount of angular melt fragments above 697mbsf may indicate both fall-back of melt into the sea-water surrounding the crater, as well as subsequent rip-up of melt fragments from rapidly quenched impact melt and avalanche breccias at the peak ring inside the crater. The high angularity suggest explosive disruption of melt in contact with the water, and insignificant abrasion during strong, but short duration, aquatic transport. Field observations in the area of Belize-Guatemala-Mexico suggest that tan carbonates likely come from the upper part of the Yucatan Group, whereas brown carbonates likely come from the lower part.

We think that an initial stage of slumping from the newly formed peak ring is followed (at 706mbsf) by a forceful resurge flow that carries mainly grey melt fragments, and uppermost target material (e.g., tan carbonate) and some lower target material. The flow then shifts (at 697mbsf) to carry mostly green melt fragments and lower parts of the upper target (e.g., brown carbonates) as well as some lower target material. The resurge was followed by oscillating water movements.