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Damage distribution and block sizes mapped in granitoids in the peak ring of the Chicxulub crater

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Over 500 m of deformed granitoid rocks have been recovered from Chicxulub's peak ring at the IODP-ICDP Expedition 364. The identification of discrete structural units within the peak ring drill core is essential for the understanding of the deformation processes that occur during cratering and peak-ring formation.
High resolution line scan images of the halved cores of the basement rocks (∼747-1334 mbsf) were screened and mapped every 10 cm for deformational characteristics. This included an estimation of the percentage of rock affected by fracturing, cataclasis and crenulated mineral fabrics. A general classification scheme was applied for each core section that describes the amount and type of deformation. Furthermore, intrusions of impact melt rocks and suevites into the granitoids were characterized based on the deformation mode, i.e. pure tensile fracturing, shearing, or mixed mode. On the basis of this classification, a structural map was created in order to locate different subdivisions within the granitoid rocks.
Large stretches of basement rocks were recognized with no important deformation. Other portions consist of moderately deformed rocks that show a high density of shear fractures. Stronger deformed zones are often pervasively penetrated by localized cataclasites or crenulated foliation. Of particular interest are the regions that have impact melt rock intrusions with an additional shear component within the melt. These regions often occur together with thick localized cataclasites. We interpret these regions as zones of higher strain relative to the surrounding basement rocks. In total, 28% of the basement rocks were categorized as intact, 15% have tensile fractures, 28% have shear fractures, cataclasites and ultracataclasites, 14% have crenulated foliation and 14% have impact melt rock and suevite intrusions as the dominant feature.
The largest structural unit consists of the majority of the granitoids from 750 to ∼1250 mbsf and is bounded by the thick impact melt and suevite sequence at the bottom of the core (as well as melts and suevites above it). These basal melts and suevites may have either been injected between the granitoids during an early stage of cratering, or they were overridden as a basal glide sheet during crater modification. Thus, a ∼500 m block can be postulated that forms this part of the peak ring.
This block may be subdivided into two ∼150-200 m units that are separated by a ∼150 m thick zone of higher deformation. From ∼750 to ∼916 mbsf and from ∼1074 to ∼1216 mbsf, two comparatively intact segments of granitoids occur with subdued deformation. They are intersected by a zone of increased shear fracturing and crenulated foliation from ∼916 to ∼1074 mbsf which coincides with the second deformation zone described above. The degree to which displacement and deformation took place in this zone remains to be quantified and will be the focus of future studies.