TWO SHOCK STAGES AT THE 6 KM DIAMETER TIN BIDER IMPACT CRATER, ALGERIA

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The6 km Tin bider diameter impact crater is situated 265 km East of In Salah town (Algeria); it affects a thick sedimentary rocks (500m) [1]. TanDEM-X Radar images recovered from « German Aerospace Center (DLR) » show four circular ridges: R1 (1,5 km diameter), R2 (2 km diameter), R3 (3,5 km diameter) and R4 (6 km diameter). Our field investigation allow us to define 1) a central pick formed on albian sandstones (R0 which is not visible on Radar images) and cenomano-turonian limestones (R1 and R2) , 2) an inner ring that affected senonian limestones (R3) and 3) an intensely folded outer ring formed on turonian to senonian limestones (R4).

Analyzed samples: in order to investigate shock effects recorded in Tin bider crater and define shock stages, 25 thin sections were made for petrographic observations by optical and electron microscopy. 10 thin sections derived from sandstones of the central pick, 10 thin sections from Breccias 1 (formed by fragments of limestones and sandstones within a clayey matrix) and 5 thin sections were made on Breccias 2 (formed by fragments of sandstones, limestones, flint and quartz grains).

Two shock stages are detected at Tin bider impact carter: a high shock stage identified on the albian sandstones of the central pick while the low shock stage is identified on Breccias 1. Unless fracturing and ondulatory extinction, Breccias 2 show no shock effects.

High shock stage: it is attested by: 1) decorated PFs parallel to{1013}and mechanical Brazil twins parallel to (0001); 2) decorated PDFs parallel to{1012},{1122},{5161},{1010} to{1011},{2131}, {1121}and 3) toasted quartz believed to be a post-shock feature that represents the beginning of quartz breakdown due to heating. Albian sandstones of the central pick are shocked to class 3a (P= 10-20, T=1000) according to [2] and [3].

Low shock stage: is identified on quartz grains and feldspars.

Low shock stage on quartz grains including 1) Differentiated mosaicism affecting quartz grains already showing PFs and PDFs and 2) thick curved feather features (FFs) that appear in combination with PFs parallel to (0001), angle between PFs and FFs is of 40°. Their formation is linked to shearing along the associated PFs during shock deformation at pressure range of ~7–10 GPa [4]. According to [4], curved FFs start to form at pressures less than HEL (Hugoniot Elastic Limit).

Low shock stage on feldspars including 1) inclined lamellae within twin planes (short, oblique lamellae, 1–4 mm wide, and spaced 7–10 mm apart), 2) selective deformation is identified as grain portions that show distinct changes in optical relief and 3) partial isotropization attested by the presence of patchy, negative-relief, zones within individual feldspar grains. Complete isotropization of twins is also identified. The combination of inclined lamellae and twin deformation; observed only in one sample; is calibrated to threshold pressures of 10 GPa [5]. It is always associated with PDFs parallel to{1013}. The other samples contain feldspars that record a single feature and contain no indication of co-occurring quartz deformation.

The less second shock phase presents a shear that can be du to deviatoric pressure that took place some instants, far from the impact point after the principal shock [4].

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