TIN BIDER IMPACT CRATER (ALGERIA): GEOLOGICAL DESCRIPTION AND SHOCK STAGES

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Introduction: Tin Bider is a 6km diameter crater that affects a thick sedimentary rocks (500m). [1] described three anticlines (A1, A2 and A3) separated by three synclines (S1,S2 and S3) without definition of different parts of an impact crater (central pick, rings…). [2] reported different types of folds from the crater center to its rim.

TanDEM-X Radar images and field study: TanDEM-X Radar images are recovered from « German Aerospace Center (DLR) » show four circular ridges: R1, R2, R3 and R4 of respectively 1,5 km, 2 km, 3,5 km and 6 km diameter. Our field investigation allows us to define from the center to rim: R0 vertical and formed on albian sandstones; R1 and R2 are monoclinal and formed on cenomanian and turonian limestones; R3 is completely folded and affected senonian limestones; R4 is also folded (but more complicated) and affects turonian to senonian limestones. Based on our field investigations and modelisations done on impact craters into thick sedimentary rocks, we concluded that Tin Bider is consistent with a complex crater with: 1) a central pick (R0, R1, R2), 2) an inner ring (R3), and 3) an outer ring (R4).

Shock metamorphism and shock stages: shock effects in the target rock (Albian sandstones of the central pick) at Tin Bider include fracturing, ondulatory extinction, mosaicism (which are not diagnostic of shock when not associated to other diagnostic shock effects), PFs, PDFs and toasted quartz. The impactites recovered inside the crater show fracturing, ondulatory extinction and shearing that affect quartz grains already showing mosaicism, PFs and PDFs. Some grains are characterized by PFs associated with FFs. In addition, shock effects of low stage including inclined lamellae, selective deformation, partial isotropization and complete isotropization of twins are defined on feldspars. At Tin Bider, sandstones of the central pick are shocked to class 3a (P= 10-20, T=1000) using PDFs and PFs [3]. Toasted quartz is believed to be a post-shock feature, either resulting from the exsolution of water from glass (primarily along PDFs), or formed by vesiculation after pressure release, at high post-shock temperature and thus, represents the beginning of quartz breakdown due to heating. Impactites inside the crater show “two shock phases”; the first one is characterized by shock effects of relatively high pressure (PDFs with some orientations); the second one is less intense, testified by PFs, FFs and structural changes on feldspars. This second phase presents a shear that can be due to deviatoric pressure that took place some instants, far from the impact point after the principal shock.

References: [1] Lambert P. et al. 1980. *Meteoritics,vol 16, N°3.* [2] Belhai D. et al. 2006. *Bulletin du Service Géologique de 1 ‘Algérie. Vol. 1 7, n2, p. 95-112.* [3] Kieffer S. 1971. *Journal of GeophysicalResearch. Vol. 76, N23, p. 5449- 5473.* [4]Osinski G. R. 2007. *Meteoritics&Planetary Science* 42, Nr 11, 1945–1960. [5] Poelchau M. H. and Kenkmann T. 2011. *Journalof GeophysicalResearch, vol. 116, b02201.*