STRATIGRAPHY AND CHRONOLOGY OF GEOLOGICAL EVENTS IN THE AGOUDAL IMPACT STRUCTURE AREA (IMILCHIL DISTRICT-MOROCCO) AND FURTHER EVIDENCE OF CRATER SIZE BASED ON NEW STRUCTURAL MAPPING.

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Since the discovery of shatter cones at the Agoudal (Morocco, Central High Atlas Mountains) in 2013 [1], the impact site has received various interpretations in terms of its relation to the Agoudal meteorite fall, its size(s) or number of impact structures [1, 2, 3, 4, 5]. The characteristics of the impact site may only be constrained by indirect arguments, in the absence of an ubiquitous circular signature. In this context, critical information are obtained from new detailed structural and geological mapping. The first detailed geological map (9 km^2) of the Agoudal impacted site documents the distribution of well preserved outcrops of shatter cones, the location of the vertical and the overturned strata, along with the breccias, and puts in evidence the chronology of the geological events that took place in this area. The stratigraphy, from the bottom to the top, may be summarized as follow:

1. The Jurassic (Bajocian) substratum.
2. A major discontinuity corresponding to a huge time gap (about 160 Ma) and important erosion.
3. A coarse-grained Calcareous consolidated breccias deposits "br1" (≥ 10 cm) at the Eastern area on the strong topography, filling the fractures, and a coarse-grained breccia with dispersed shatter cones fragments overcome by fine-grained breccia "br2" (fragments size < 1 cm). A mid-size grained breccia "br1-2" localized on the Western area. The different types of breccias are attributed to the Amirian-Tensiftian (?) of the Moroccan Quaternary (Middle Pleistocene, between 0.781 Ma and 0.126 Ma).
4. An important sedimentary discontinuity corresponding to a radical climate change, between a hyperhumid periods, with generalized runoff on the slopes, and a subsequent period with rubefacient climate (a tropical climate allowing the formation of red oxides).
5. Red silt deposits, often with a thickness reaching several meters. They correspond to the Soltanian (Upper Pleistocene, between 0.126 Ma and 0.017 Ma).
6. A sedimentary discontinuity marking the end of the oxidizing rubefacient climate and the beginning of the current temperate period.
7. Non-consolidated colluvial deposits connected with the alluvium of the bottom of the thalwegs (-6000 years to present).

Considering that the shatter cones contained in the breccia are not *in situ* but scattered and oriented in different directions, the event responsible for their formation is prior to the breccias deposit. This event was followed by an erosive period leading to their surface layout (probably a long period), then to their reworking on the slope followed by their cementation, with the surrounding limestone blocks. This event has also caused the submidian flexures of the substratum. The ferrous meteorite fall came after the red silt deposit. It is separated from the impact event, that engenders the shatter cones, by at least two periods of climate change. Given the relative chronology of deposits, the impact event and the Agoudal meteorite fall are two chronologically distinct events.

In the other hand, the recent geological and structural mapping (September 2017) over the area of 9 km^2, shows that the shatter cones occurrences define a single impact structure. As shatter cones are not unambiguously reported for structures smaller than 1 km in diameter [6] and from the fact that they generally occur within an area corresponding to 1/6 to 1/2 of the estimated original diameter of the impact crater, the original impact crater of Agoudal had a diameter of 1 km to 3 km, based on the current distribution of the in-situ shatter cones within it. Since the presence of shatter cones in the rim area of a simple crater is unlikely, we favor the interpretation that the area of shatter cone occurrence may be the relict of a central uplift.

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