

SIDI ALI OU AZZA (L4): A NEW MOROCCAN FALL.

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Introduction: On Tuesday 28th of July 2015, around 5:30 pm local time (6:30 GMT), many people from Tissint and its vicinity heard three sonic booms in the direction of Ouel El Kharouâ south west of Tissint. The sonic booms has been also noticed by many people in this area even from Tata. Immediately after, numerous people began searching for the meteorite in the area. Two days after the fall, many small pieces from 5 to 109 g were recovered close to Sidi Ali Ou Azza marabout and El Kharouâ well at the foothill of “Jebel Bani”, about ten kilometers south west of Tissint village. The direction of the bolide was from North to the South and a small strewnfield can be draw on about 4 km. The coordinates of the fall is 29° 47' 3"N, 7° 23' 22"W in the Guelmim – Es-Smara province in the South East of Morocco.

Physical characteristics: So far about 10 pieces has been collected (109, 100, 75, 50, 40, 37, 20, 10, 7, and 5.7 g). Most of them are complete and mostly covered by shiny black and brown patchy fusion crust. The interior is dark and brecciated, with a few clear green zones. Numerous distinct small and well-defined chondrules are visible as well as fine grained sulfides and metal. Clasts dark and clear gray are millimetric sized. Magnetic susceptibility logX 4.8 $10^9 \text{ cm}^3/\text{kg}$ is consistent with an L chondrite.

Petrography: Microprobe examination of a polished mount shows numerous porphyritic chondrules, a few BO chondrules, and an enstatite-rich chondrule. Mesostasis and very fine-grained plagioclase is ubiquitous. Kamacite, taenite, troilite, chromite, and a phosphate phase were observed throughout. One dark angular clast described above has an igneous texture with ~50% zoned euhedral olivines (up to 50 μm) and ~50% fine spinifex quench crystals, with sparse scattered metal or sulfide blebs (up to 10 μm).

Geochemistry: EMP analysis at UNM on chondrule olivine, chondrule low-Ca pyroxene, chondrule enstatite clast olivine and one clast olivine; gave the following results: on the chondrule olivine $\text{Fa}_{25.7 \pm 0.9}$, $\text{Fe/Mn}=50 \pm 3$, $\text{Cr}_2\text{O}_3=0.03 \pm 0.03$ (wt%), $n=24$; chondrule low-Ca pyroxene $\text{Fa}_{20.4 \pm 1.7}$, $\text{Fe/Mn}=29 \pm 1$, $n=10$; chondrule enstatite $\text{Fs}_{2.1 \pm 0.2}\text{Wo}_{0.6 \pm 0.2}$, $n=2$; plagioclase $\text{An}_{8.3 \pm 3.9}\text{Ab}_{86.9 \pm 3.1}\text{Or}_{4.9 \pm 0.9}$. Clast olivine $\text{Fa}_{19.3 \pm 4.1}$, $\text{Fe/Mn}=47 \pm 4$, $\text{Cr}_2\text{O}_3=0.45 \pm 0.21$ (wt%), $n=6$.

Classification: Sid Ali Ou Azza is classified as an L4 ordinary chondrite OC, with a shock level of S3 and a weathering grad W0 [1, 2].

Discussion: Sidi Ali Ou Azza is one of the “420” L OC falls and one of the “23” L4 OC approved falls and the 1424 L4 falls and finds know so far [2]. The fall occurred about 40 kms far from the Tissint martian meteorite fall [3] on July 18th 2011, about 4 year separating both falls. Sidi Ali Ou Azza is interesting to study as a rare L4 fall and a fall very close to a previous one in the same area on a very limited time. Also, during 2015, two small L4 falls has been reported: Porangaba in Brazil on January 9th [2] and Sidi Ali Ou Azza. It can be interesting to perform a statistical study of these falls to prospect a possible indications on the original parent body of L4 OC.

References: [1] Bouvier A. et al. 2016, *Meteoritics & Planetary Science* Metbull 105. [2] <http://www.lpi.usra.edu/meteor>. [3] Chennaoui Aoudjehane H. et al. 2012, *Science* 10.1126/science.1224514.