

**KSAR EL GORAANE (H5): THE LATEST MOROCCAN METEORITE FALL ON 2018.**

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**Introduction:** Morocco experienced since 2000 a large number of meteorite falls [1]. During 2018, at least two fireballs ending with a meteorite fall were reported. The first one was Gueltat Zemmour, which fell in the south of Morocco on August 21<sup>st</sup> [2, 3]. It is an L4 ordinary chondrite (presented at this meeting). The second one was witnessed on October 28<sup>th</sup> around 22:30 (GMT+1) in the east of Morocco very close to a small village called “Ksar El Goraane”. Many people from this area and even from Erfoud (about 80 km in the South) saw the fireball. On the day after, the first pieces of the newly fallen meteorite were found by a Ksar El Goraane inhabitant. Many Moroccan meteorite hunters went to the site searching for more pieces. We received a 20 g piece from the “Moroccan Association of Meteorites” and 20 g from one of the finders of the meteorite for classification purposes.

**Field mission report:** On November 11<sup>th</sup>, we organized a field mission to the fall area to document it, by collecting the eyewitness testimonies, the coordinates of most found pieces, the direction of the fall, and the extent and orientation of the strewnfield. Many nomads living in this area (local nomadic tribe is called Ait Sgharouchent) and people from the southeast of Morocco reported a very bright light that was first yellow, then red, not very high in the sky. The light was comparable to brightness of sunlight entering nomad tents. The fall was coming from the east and headed west in the direction of Kaddoussa barrage. It was followed by 5 sonic booms, then a whistling sound that lasted 1 second, followed by a noise comparable to the unloading of a truck of rocks for about 5 seconds. The sound awakened sheep and scared people. On morning of October 29, the first piece weighting 185 g was found by a shepherd around 5 km east of Ksar El Goraane village, south of Jebel Tabouaroust lakbir and close to Jebel Tabouaroust Essghir, in Izanarzen plateau. Most middle size pieces were collected in this plateau, small ones were collected east of this area in Essnam plateau. A few days later, the largest piece collected so far (350 g) was found close to Kaddoussa barrage west of Ksar El Goraane village. This establishes the strewnfield as extending for about 15 km from ENE to WSW direction.

**Physical description:** We have seen complete pieces of 350 g, 32 g and 5 g totally covered by black matte to slightly shiny fusion crust; the 185 g piece was broken. Small pieces show primary and secondary fusion crust. Fusion crust is submillimeter in thickness. The interior of the meteorite is dark gray. Metal and sulfides are fine grained. Overall texture is fine-grained and homogeneous, no brecciation is visible. Small-sized (up to one mm) chondrules were visible. The rock is friable. Magnetic susceptibility measured in the field by SM30 was  $\log\chi = 5.28$  to 5.42. Our estimation of the total known mass is around 2 kg.

**Petrography and Geochemistry:** Microprobe examination of a polished mount shows numerous porphyritic chondrules set in a recrystallized groundmass. Plagioclase grains are ubiquitous with sizes up to 25 microns in diameter. Abundant FeNi-metal and troilite observed throughout. Olivine composition is  $\text{Fa}_{19.0\pm 0.2}$  with a ratio  $\text{Fe/Mn} = 38 \pm 2$ ; low-Ca pyroxene composition is  $\text{Fs}_{16.5\pm 0.2}\text{Wo}_{1.4\pm 0.3}$ .

**Classification and discussion:** Based on the mineral compositions, chondrule forms and sizes, metal and sulfide size and distribution and magnetic susceptibility, the Ksar El Goraane meteorite is an ordinary chondrite of H5 class, with shock level S3, and no weathering present (W0). It is the 18<sup>th</sup> Moroccan official Moroccan meteorite fall and the 4<sup>th</sup> H5 fall occurring in Morocco after Tamdakht on 2008 [4], Izarzar on 2012 [3] and Tinejdat on 2014 [5]. In total, 175 H5 falls are known in all over the world.

**References:** [1] Chennaoui Aoudjehane H. (2016). *Meteoritics & Planetary Science* 51:S1 abstract 6119, [2] Chennaoui Aoudjehane H. et al. (2019). *Meteoritics & Planetary Science* 55, this meeting. [3] [www.lpi.usra.edu/meteor/metbull.php](http://www.lpi.usra.edu/meteor/metbull.php). [4] Chennaoui Aoudjehane H. et al. (2009). *Meteoritics & Planetary Science* 44:S1 abstract 5038, [5] Chennaoui Aoudjehane H. et al. (2016). *Meteoritics & Planetary Science* 49:S1 abstract 5195.