TISSINT: THE FIRST MARTIAN METEORITE FALL OF THE CENTURY IN MOROCCO.

H. Chennaoui Aoudjehane1,2,1, A. Jambon2, O. Boudouma2, J.A. Barrat1, R.C. Greenwood1, I.A. Franchi1. 1Hassan II University Casablanca, GAIA Laboratory, Morocco. E-mail: h.chennaoui@fsac.ac.ma. 2ISTEP, Université Pierre et Marie Curie Paris6, France. 3UBO-IUEM, UMR 6538 Brest, France. 4Planetary and Space Sciences, The Open University, UK

Introduction: Tissint is the fifth Martian meteorite fall [1]. A fireball was observed by people from Tata city and some nomads on July 18th 2011 at about 2:00 am, first samples were recovered by hunters at the end of October 2011 on the Oued Drâa area, ESE of Tata and SSW of Tissint village in a desert area, a military zone near the border between Morocco and Algeria, with a very few nomads living around. It was recognized as a Martian meteorite at the end of December 2011. Since then, hundreds of people went searching for samples across this area. Many complete small pieces and a few big pieces from less than 1 g to about 2 kg has been recovered, totalling about 17 kg of material collected. Most of recovered pieces had been sold to private collectors, a few ones preserved in national museums and collections from all the world.

Trajectory and strewnfield: In the field, we collected the coordinates of the most significant masses and met eyewitnesses. The coordinates are reported on the 1/100,000th maps of Tata and Ain Boumellous, with the inferred trajectory NW to SE and the approximate strewnfield. These information are in accordance with the reported testimonies.

Physical characteristics: Most Tissint pieces are complete and recovered by a primary and sometimes secondary shiny fusion crust. Numerous veins and pockets of black glass are seen, more than in any other known shergottite. The interior is grey with olivines macrocrysts that can be distinguished under the thin fusion crust and a matrix with microphenocrysts of olivines, pyroxenes, maskelynite and minor phases as oxides and phosphates.

Petrography and Mineralogy: Olivine (cores of large macrocrysts Fa16-26, FeO/MnO=42-44; rims Fa43-61, FeO/MnO=50-55), cores of microphenocrysts Fs29-36, FeO/MnO=45-46; rims up to Fs33, FeO/MnO=53), orthopyroxene cores (Fs53-63, Wo4.5, FeO/MnO=26-30), pigeonite (Fs26-29, Wo12-17, FeO/MnO=31-35), subcalcic augite (Fs22-25, Wo29-34, FeO/MnO=26-28), plagioclase (An54-64, Or5-8). Plagioclase (maskelynite) is slightly zoned but does not include silica or mixed silica rich glass as seen in other shergottites [2]. Minor phases are Ti-poor chromite, ilmenite, titanomagnetite (amounting to less than 1%), pyrrhotite, apatite and merrillite.

Cathodoluminescence images and spectra of maskelynite show relics of plagioclase twin lamellae, indicating a lower shock intensity compared to other shergottites. The abundance of F and S in glass cannot be derived from simple melting of the mesostasis. This suggests that the abundance of glass veins and pockets is not related to a high shock intensity but indicates the contribution of more fusible material possibly from the Martian soil.

Oxygen isotopes fit well with the Martian fractionation line.

Conclusion: Tissint is a fresh Martian meteorite fall with no terrestrial alteration, it is a pristine material that permits to show the contribution of Martian interior, atmosphere and soil, especially in melted pockets and veins.