EPSC Abstracts
Vol. 10, EPSC2015-80, 2015
European Planetary Science Congress 2015

African meteorites falls: some statistics

Fouad Khiri (1,2) and Abderrahmane Ibhi (1)
(1) Geoheritage and Geomaterials Laboratory, Faculty of Sciences, University of Ibn Zohr, Agadir, Morocco. (2) Regional Center of Trades of Education and Training, Inzegane, Agadir, Morocco.

Abstract

Since 1801, the number of meteorites falls in Africa continues to grow. 152 falls totaling a mass of 2024.24 kg were recorded, whose 80% were recovered during the period 1920-2014 with an average of 20 falls every 15 years. The average rate of falls is low in Africa with only 0.023 per million km^2 per year. This rate is variable in time and in space with privileged regions namely those bordered by the Sahara and southern Africa. Other factors are also involved in the spatial variation of those falls' number: the population, its density, the percentage of forest cover, and the level of awareness about meteorites. As in the worldwide falls, these meteorites are dominated by chondrites (76%).

1. Introduction

The scientific contribution of meteorites from Africa is undeniable, they are highly coveted by scientists and collectors worldwide. We are interested in this paper to "falls" that are meteorites seen when they fell from the sky and were subsequently collected. The African continent covers 7% of the terrestrial surface with 30,415,873 km², and 20.3% of the surface of the emerged lands [1]. This large area is supposed to host a large part of the flow of meteorites falls on the Earth.

2. Statistics and distribution

152 observed meteorites falls were recorded since 1800, the date when they were recognized as objects falling from the sky. They are totaling a mass of 2024.24 kg. The oldest meteorite fall (L6, 22 grams) was in 1801 in Mauritius [2]. The most recent, dated July 9, 2014, is an Eucrite fragment of more than 10 kg which has exploded in the Tighirt region in southeastern Morocco [3].

Almost all the classes are represented in the collection of meteorites falls in Africa during the study period (Figure 1).

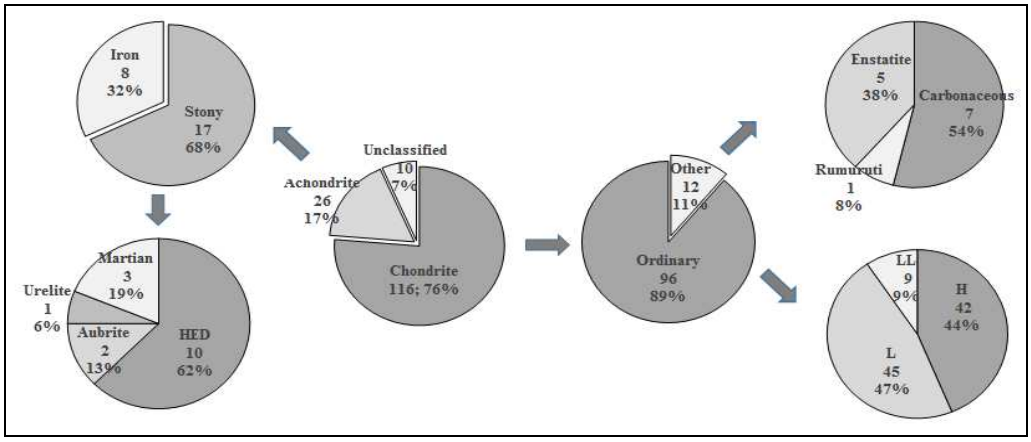

Figure 1. Types and percentages of meteorites falls in Africa.

They include 116 chondrites, 26 achondrites and 10 not classified or uncertain. However, iron meteorites are the rarest types that are seen fallen, representing only 5.9. Three Martian meteorites are present in this collection (Nakhla of Egypt, Tissint of Morocco and Zagami of Nigeria), but no lunar meteorite.

The quantitative study of meteorites falls in Africa reveals varied temporal and spatial distribution. The falls spreading rate has increased from 0.025 meteorites / 10^6 km^2 every 15 years (3 falls only in the continent) during the period 1800-1860, to 0.2 falls / 10^6 km^2 every 15 years (24 falls) between 1860 and 1920. This rate is timed into 3.3 (0.663 falls / 10^6 km^2 / 15 years) during the period 1920-2010 which recorded 121 falls. That is, 80% of collection in the study period (Fig. 1).

The inter-sector comparison allowed to distinguish the regions which host the most meteorites falls: The West Africa has recorded 42 falls totaling mass of 666.12 kg, the third of which has fallen in Nigeria. Moreover, 36 falls totaling mass of 515.40 kg were recorded in East Africa: Tanzania presents the

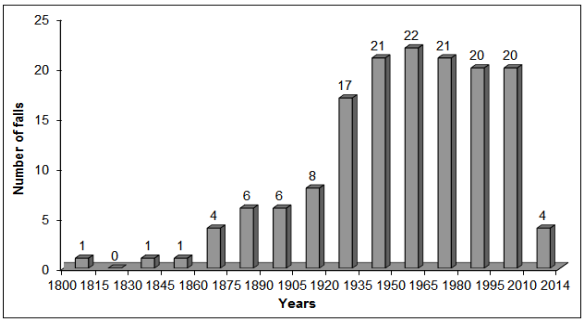

Figure 2: Evolution of meteorites falls' number in Africa between 1800 and 2014.

highest number (8 falls). The North Africa has documented 35 falls (666.77 kg), 11 of which fell in Sudan. Furthermore, the 9 falls of Morocco totalize the biggest mass recorded (376 kg) in comparison with other countries of the continent. On the other hand, other areas have recorded a low rate of falls. The southern Africa has recorded 26 falls whose 85% fell on South African territories, representing a small mass of about 165 kg. Whereas, the Central Africa has recorded only 15 falls whose mass does not exceed 18.50 kg.

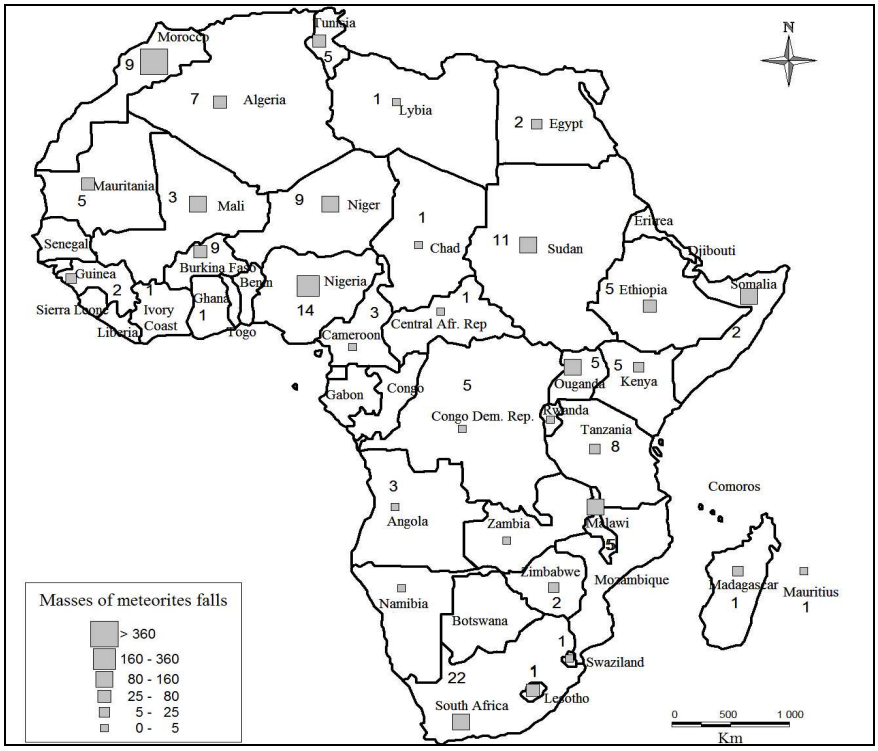

Figure 3: The distribution of numbers and masses (in kg) of meteorites' falls in Africa between 1800 and 2014.

The principal components' analysis applied on 6 variables and the 57 African countries showed that the meteorites falls number in many any of these countries, like Nigeria and South Africa, increases with population and its density. The uneven distribution of the population in other countries makes it difficult for the falls to be discovered. Their rate is low, for example in Libya and Chad and null in many African countries despite their large desert area. The spreading rate is linked to a uniformed distribution of the inhabitants [4].

3. Discussion and conclusion

The abundance of chondritic falls in Africa (76.3%) is similar to that observed worldwide representing 86.2% of falls [5]. Almost all the countries bordering the Sahara have a relatively large spreading rate. The discovery of meteorites falls is facilitated by the contrast between these fragments and desert sand and vegetation lack in these areas. Instead, the countries hosting dense rainforest over a large area, have seen little or no falls.

The rate of meteorites' falls in Africa ($0.023/10^6$ km^2/year) is twice higher than that known in Australia ($0.011/10^6$ km^2/year). Yet, it is still low. This is due to the lack of culture and education about meteorites.

References

[1] FAO. 2002. Evaluation des ressources forestières mondiales 2000. Etude FAO forêts, 140. Rome.

[2] Meteoritical bulletin database, 2014. The meteoritical society. http://www.lpi.usra.edu/meteor .

[3] Ibhi A., 2014. Tighert: A New Eucrite Meteorite Fall from Morocco. International Meteor conference, Giron (France): 1-3.

[4] Rasmussen, K.L., 1991. Historical accretionary events from 700 BC to AD 1850 – A 1050 year periodicity. Quarterly Journal of the Royal Astronomical Society 31: 95-108.

[5] Bevan, A.W.R., 1992. Australian meteorites. Records of the Australian Museum Supplement 15: 1-27.