CONCEPTION AND DEVELOPMENT OF A DECISION-MAKING SYSTEM FOR THE CLASSIFICATION OF METEORITES (SICAM).

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Introduction: Classification of a new meteorite is a preliminary step to its declaration to the Nomenclature Commitee (NomCom) of the Meteoritical Society. Although classification is a routine task for experimented meteoriticists, it is not in case of unusual samples and it is not in countries where experimented meteoriticists are scarce, like in Algeria. Yet Algeria counts among the largest reservoirs of meteorites in the world. In this context we are developing a decision-making tool focused on the classification of Algerian meteorites, based on artificial intelligence and data analysis, and we report a preliminary test on the meteorite "El Idrissia", a L6 ordinary chondrite [1].

Material and method: The SICAM (System for Identifying and Classifying Automatically Meteorites) comprises two major parts. The first is DBMS (DataBase Management System) a data base on meteorites in Algeria, which comprises 3 stages: 1) Detailed field information and name according to locality, 2) Petrographic and geochemical datas which are used to classify automatically the meteorite with SICAM, 3) Declaration of the sample to the NomCom nomenclature committee of the Meteoritical Society. The second part is the operational tool with two inquiry options: 1). Research in the DataBase: the SICAM has a multicriteria search function, allowing to find a similar sample to the meteorite whose information has already been integrated into the system, and localize it in the geographical space. 2). Statistics of the meteorites listed: The data visualization allows displaying the different information and statistics on these meteorites, as charts and maps. The charts display digital data in an easy-to-understand format, while the maps diffuse those data on geographic location. This requirement also covers the statistical study of the information displayed.

Automatic identification and classification of new meteorite procced by comparison and match after filling the data base with the petrographic and geochemical datas of a new meteorite, and cross-checking with of those of the meteorites contained in the System.

Result and discussion: The El Idrissia meteorite is the most recent fall observed in Algeria It occurred on March 10, 1989 in Ain Lahdjar, 5 km from El Idrissia town, wilaya of Djelfa, coordinates 34 ° 25'N, 2 ° 75'E [1]. Three fragments were collected, representing a total mass of about 10 kg. A fragment of 3kg was deposited at CRAAG-Algiers, another fragment of 20.45g was deposited at the National Museum of Natural History of Paris and a small fragment of 150g was conserved at USTHB. According to the petrographic study El Idrissia is an ordinary chondrite cross-cut by a network of shock veins [1]. The chondritic texture displays chondrules with diffuse contours, a recrystallized matrix, grains of metal and sulphide. Electron-microprobe analyzes yielded compositions Fa24.8 for olivines and Fs21.7 for Ca-poor pyroxenes. It was classified and declared as ordinary L6 chondrite with a low degree of weathering W1 and a shock degree of S3-4 [1].

We performed a preliminary test of our decision-making system on the 150g fragment at USTHB. First, we constructed DBMS (DataBase Management System) filling it with all data on identified meteorites. Then we carried out the mineralogical, petrographic and geochemical analyzes of the sample in the laboratory, and injected all the results into DBMS. The system responded by giving precisely and correct classification of the sample showing that it is an Ordinary Chondrite of type L6. Then we tried to validate this information by providing another name "X" to the same sample. The system this time has answered by a warning message telling that the same given information, already exists in the database under another name, highlighting the name of the Meteorite El Idrissia.

Secondly, we selected only a few criteria (eg. interval: of a given chemical composition with degree of oxidation, oxygen isotopic composition, abundance and size of chondrules, abundance of metal…), the system displayed some ordinary chondrites (H, L, LL), indicating that all of these parameters probably reflect their formation in different regions of the solar nebula [2], or formation at substantially different times during the formation of the solar system. Adding to these criteria a given mineralogical composition, the system displays only meteorites characterizing a petrological type 6, indicating a thermal metamorphism at temperatures of about 900°C [1].

Conclusion: We tested a preliminary version of a decision-making tool to help the classification of new meteorites in Algeria. Results are promising and we consider such a tool could be expanded to a larger data set and to other countries and would be of help to new scientists engaging in the task of meteorite classification, but also to more experienced meteoriticists in the case of unusual samples.

References: [1] Messaoudi-Belabbes M., Belhaï D. Bourot-Denise M. and Devouard B. (2009): *Bull. Serv. Geol. Nat.* 20: 1-10. [2] Sears D. and Dodd, R. (1988): *Meteorites and the early solar system: 3-31, Kerridge J. F. and Matthews, M. S., Eds. The University of Arizona Press.*