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Magnetostratigraphic age of the Aïn Hanech Formation and associated paleontological and archaeological record

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The area of Aïn Hanech is a unique place to better understand geological, faunal, paleoenvironmental, and behavioral patterns of the earliest human occupation in Northern Africa. The Aïn Hanech type section is about 30 m thick and comprises gravels, silts and sandstones, overall well stratified and are related to a fluvio-lacustrine environment. The chronology of the archaeo-paleontological record has been a matter of debate in the past. In order to correct this situation, we carried out a detailed paleomagnetic and rockmagnetic study at the locality type of the Aïn Hanech Formation, aimed to establish a continuous magnetostratigraphic record and hence to resolve the question of the chronology of the important early paleolithic sites of Aïn Hanech and Aïn Boucherit.

We studied and sampled a new section with a thickness of about 35 meters below the archaeological site of Aïn Boucherit. The section is located NE of Aïn Boucherit site, and follows an E-W trending gully that begins at the main drainage, Oued Boucherit. The section is characterized by a reddish clay-silt unit with abundant carbonate concretions towards the top. At about a height of 8 m from the bottom the appearance of calcrete horizons begins. The clays become rather rich in carbonate concretions upwards. A conspicuous, 2.5 m thick calcrete layer is present at about a depth of 18 m, which has distinct lateral continuity. Above this reference layer, carbonate concretions are more abundant within the clays, and at about eight meters above, a 1 meter thick poorly consolidated gravel appears. The section ends with a 2 meters thick, well cemented gravel unit with heterometric clasts.

Oriented samples were taken in the field as small oriented blocks, typically three by horizon. All measurements were made at the Paleomagnetism Laboratory (CENIEH), including a 755-4K superconducting rock magnetometer, and samples were demagnetized using both thermal and alternating field methods. Characteristic directions were used to calculate the Virtual Geomagnetic Pole (VGP) position at each sampling site, and the mean value of the VGP Latitude used to build a local magnetostratigraphy.

The new magnetostratigraphy led to the identification of a succession of normal and reverse polarity intervals. The ESR age estimates enable to anchor the local magnetic stratigraphy to the Geomagnetic Polarity Time Scale (GPTS) and hence to identify the upper normal interval to the Oluduvai Chron (1.77-1.94 Ma), while the lower ca. 20 m thick dominantly normal magnetozone can confidently be attributed to the Gauss Chron (2.58-3.58 Ma). These correlations are supported by the biochronological evidence. The combination of these independent approaches enables to establish a robust chronostratigraphic framework for the Aïn Boucherit archaeo-paleontological levels.

On a larger scale, our magnetostratigraphy establishes the first chronostratigraphy of the Cenozoic infill of the Beni Fouda Basin. In addition, it provides an age context for the development of the large alluvial and lacustrine systems that extended in the intramontane basins in Eastern Algerian High Plateau.

Keywords **-** Magnetostratigraphy - Aïn Hanech Formation - Biochronology - Archeo-paleontological levels.

La première occupation humaine en Afrique du Nord : nouvelles données de la séquence plio-pleistocène d'Aïn Boucherit, Algérie

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L'essentiel de l'information sur l'évolution biologique et comportementale des premiers homininés émane d'un certain nombre de sites plio-pléistocènes d'Afrique sub-saharienne, notamment Gona et Omo (Éthiopie), Koobi Fora (Kenya), Olduvai (Tanzanie), ainsi que Sterkfontein et Swartkrans (Afrique du Sud). En effet, les plus anciens outils oldowayens associés aux ossements fossiles portant des traces de boucherie datent entre 2,6 à 1,9 million d'années (Ma). Jusqu'à récemment, la plupart des paléo-anthropologues pensaient que les premiers homininés ont habité l'Afrique du Nord beaucoup plus tard.