

New rock magnetic results from Galería cave in the Atapuerca palaeoanthropological site (northern Spain). Influence of solar irradiation in the edaphic generation of superparamagnetic grains?

Bógalo, M.F.¹, Villalaín, J.J.¹, Calvo-Rathert, M.¹, Ortega, A.I.², González, M.I.¹, Heller, F.³, and Pérez-González, A.²

¹ Dpto. Física, Universidad de Burgos. Escuela Politécnica Superior, Avda. Cantabria s/n 09006, Burgos, Spain.

² Centro Nacional sobre la Investigación Humana. Paseo Sierra de Atapuerca, s/n 09002, Burgos, Spain.

³ Institute of Geophysics, ETHZ, CH-8092, Switzerland.

Corresponding author: mfbogalo@ubu.es

Abstract: A rock magnetic study has been carried out on a sedimentary sequence in the Galería cave in the Sierra de Atapuerca karst system, which is located in the Duero Basin (northern Spain). This cave belongs to the world-famous archaeological site of Atapuerca which contains hominin remains of Pleistocene age.

In the present study, four (G.I to G.IV) from the five infill colmatation phases which can be distinguished in Galería cave have been analysed. The oldest one (G.I), with ages ranging from Early to Middle Pleistocene, represents mainly cave-interior facies, whereas the G.II to G.IV infill phases (with ages between ~500 and ~200 ka) show a strong outside influence due to the proximity of a cave entrance located in the ceiling of the cave.

The rock magnetic properties are mainly influenced by the highly variable concentration of ferrimagnetic phases (magnetite and/or maghemite) along the whole profile. Detritic and authigenic goethite and hematite have been identified throughout the sedimentary section, although their presence is more evident in unit G.I where a minimal concentration of ferrimagnetic minerals has been observed. The magnetic signal in the interior facies could be related to different types of sediment input. In the younger part of the sedimentary section ferrimagnetic minerals (magnetite and/or maghemite) dominate the magnetic signal.

The high concentration of superparamagnetic (SP) ferrimagnetic grains in the entrance facies of units G.II and G.III could be related to direct solar radiation through the

entrance in the cave ceiling. A good correlation between the average yearly irradiation and the amount of ferrimagnetic SP grains is observed, which could be explained by the influence of solar irradiation in the cave pedogenic processes. A model for this correlation is proposed.

Keywords: Environmental magnetism; rock and mineral magnetism; cave sediments; Atapuerca; Spain.