

(Paléolithique supérieur). On la trouve sous forme de fragments clivés ou de pièces façonnées polies et/ou perforées. Les sites des grottes de Spy (Jemeppe-sur-Sambre, vallée de l'Orneau), de Chaleux (Hulsonniaux, vallée de la Lesse), du Trou Magrite (Pont-à-Lesse, vallée de la Lesse), du Trou du Frontal (Furfooz, vallée de la Lesse) et de Verlainne (Tohogne, vallée de l'Ourthe) ont livré quelques pièces de taille centimétrique à pluricentimétrique. Aucun cristal n'a été observé.

La fluorite est fréquente en Belgique et très largement associée aux calcaires dévoniens et dinantiens. Les occurrences majeures, sous forme de masses cristallines de dimension suffisante pour avoir pu servir de matière première aux Magdaléniens, sont localisées dans la Bande Calesienne (surtout la Formation de Fromelonne, Givetien) et dans les calcaires viséens de Seilles (Andenne).

Les analyses des terres rares par LA-ICP-MS et des isotopes du strontium ont été pratiquées sur 4 fluorites archéologiques issues de 3 sites et comparées avec 13 fluorites géologiques provenant de Seilles et de plusieurs sites des régions de Givet, de Han-sur-Lesse et de Villers-en-Fagne. D'après ces résultats, ni Seilles, pourtant plus proche de Spy, ni les sites de Han-sur-Lesse, pourtant proches des grottes de Chaleux, du Trou Magrite et du Trou du Frontal, n'ont pu fournir la fluorite. Les résultats analytiques identifient les sites proches de Givet, de Foisches (France) et/ou de Doisches (Belgique) comme étant les points d'approvisionnement en matières premières des Magdaléniens. Ces résultats sont cohérents avec la disposition topographique des gisements, leur richesse en fluorite, la taille des masses cristallisées et les couleurs du minéral. La Meuse, puis ses affluents comme la Lesse et l'Orneau (via la Sambre), ont probablement servi de voies de communication entre le lieu de récolte et le site anthropique.

#### Can we use authigenic phosphate minerals in cave entrance sequences as palaeoenvironmental data recorders? A case study from Walou cave (Belgium)

Stéphane PIRSON<sup>1</sup>, Frédéric HATERT<sup>2</sup>, Mona COURT-PICON<sup>1</sup>, Freddy DAMBLON<sup>1</sup> & Paul HAESAERTS<sup>1</sup>

1. Royal Belgian Institute for Natural Sciences, Dep. of Palaeontology. E-mails : stef.pirson@skynet.be;

freddy.damblon@naturalsciences.be;

mona.courtpicon@ymail.com;

paul.haesarts@naturalsciences.be

2. University of Liège, Dep. Geology, Lab. of Mineralogy.

E-mail : fhatert@ulg.ac.be

A systematic program centred on the stratigraphic and sedimentological study of several cave and rock shelter sequences of the Meuse Basin has been recently undertaken, in close collaboration with researchers from different disciplines. In this framework, the potential of

these sedimentary environments as palaeoenvironmental and palaeoclimatic recorders is tested. Thanks to the archaeological excavations recently conducted by C. Draily (Région wallonne) between 1996 and 2004, an exceptional stratigraphic sequence was studied in Walou Cave (Pirson et al., 2006; Pirson, 2007). Its multidisciplinary study leads to the reconstruction of a complex climatic sequence, mostly relying on pedosedimentary and palaeobotanical data. The excellent correlation with the loess reference sequence of Middle Belgium together with tephrostratigraphy, mineralogy, <sup>14</sup>C and TL dates as well as archaeology gave this exceptional record a coherent chronostratigraphic context.

Secondary phosphates have been identified in the sedimentary sequence of Walou cave, either as epigeny of calcite on the rim of limestone fragments or as phosphate impregnations in the silty matrix. Authigenic phosphates are frequently reported in a cave context. They most likely derive from the percolation of water through the phosphate-rich guano of bats or birds. But the difficulty of controlling the chronostratigraphic context in cave sequences prevents most of the time to test if these phosphates are related to climatic improvements or not. The high resolution chronostratigraphic and palaeoenvironmental framework of Walou sequence allows to test this hypothesis. The most important authigenic phosphates are concentrated in the part of the sequence attributed to marine isotopic stage 5 (top of cycle DI and cycle CV) thanks to climatostratigraphy, pedostratigraphic comparison with the loess reference sequence as well as TL dates and the presence of the well-known Rocourt Tephra. The climatic indicators in this part of the sequence point to rather temperate, interglacial and early glacial, conditions. On top of cycle DI, the phosphates are associated with a leached soil B2t horizon. Their presence indicates relatively acid conditions which led to the decalcification of the matrix. Anthracology further demonstrates the temperate character of the environment with the occurrence, at the bottom of cycle CV, of several mesophilous taxa (e.g. Quercus, Fraxinus, Carpinus and Prunus). We can therefore conclude that in Walou, the secondary phosphates are clearly related to a strong climatic improvement. The study of another cave sequence in Belgium (Scladina cave) in which authigenic phosphates have been recognised led to the same conclusion (Pirson et al., 2008), suggesting that these phosphates can provide some palaeoclimatic information.

PIRSON, S. et al., 2006. *Geologica Belgica*, 9/3-4: 275-286.

PIRSON, S., 2007. Thèse de doctorat inédite, Ulg et IRSNB.

PIRSON, S. et al., 2008. In: Damblon F., Pirson S. & Gerrienne P. (eds). *Memoirs of the Geological Survey of Belgium*, 55 : 71-93.