The exploitation of siliceous raw materials during the Upper Paleolithic in Southwestern Iberia

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Background

The Late Pleistocene was marked by the cyclical occurrence of abrupt climatic events which severely impacted the environment at a regional level (Sanchez-Goñi and Harrison, 2010). These phenomena of environmental change may be correlated with multiple processes of cultural and demographic reorganization across space and time (Bradtmöller et al., 2012). Lithic raw material exploitation, processing and use are key aspects to understand such adaptations, as raw materials were a crucial part of hunter-gatherer technological organization.

Fig 1 – Left: Location of the archaeological site of Vale Boi; Right: Vale Boi. Topographic plan, schematic profile and general view, with location of the excavation loci. After Cascalheira et al. (2017).

Research Goals

- ❖ Understand the processes of stability, resilience and change in the technological, cultural, and social organization of human groups, and its correlation to the environmental shifts occurring during the Upper Paleolithic (from c. 40,000 to 10,000 years ago) in southwestern Iberia.
- ❖ Identify patterns of lithic raw material procurement, processing and use at the site of Vale Boi (southern Portugal; Fig. 1).

Strategy

- ❖ Analyze the siliceous raw materials recovered during several archaeological campaigns in two of the main areas (Terrace and Shelter) of Vale Boi - all Upper Paleolithic chrono-cultural sequence of the region (i.e., Gravettian, Proto-Solutrean, Solutrean and Magdalenian).
- ❖ Use of a multi-method approach, combining macroscopic, mineralogical, and geochemical aspects, and correlate this information with technological, spatial and paleoenvironmental data.
- ❖ Creation of an open-source database for regional sources of lithic raw materials.

Project Modules

❖ Fieldwork

Identify samples of chert in the region (southwestern Portugal, in proximity to Vale Boi). Sample chert from outcrops and pebbles to compare with the archaeological artifacts and establish sources.

❖ Mineralogical Analysis

Qualify, correct, and explain macroscopic observations, as well as identify the mineralogical composition of the analyzed samples and define petrological groups. These methods include: study of thin sections by optical microscopy under plane and cross-polarized light and X-ray Diffraction (XRD).

❖ Fire-induced alteration analysis

Identify the impact of fire-induced alterations through an experimental approach for the heating of geological samples and analysis through Fourier-Transform Infrared Spectroscopy (FTIR). Comparison of experimental geological samples with archaeological materials, following Schmidt et al. (2013).

❖ Macroscopic Analysis

Describe, classify, and organize the artifacts and samples into groups based on their visual similarities (e.g., color, texture, cortex, and inclusions. Macroscopic observations will also be used to detect the presence of fire-induced surface alterations in the archaeological artifacts.

❖ Geochemical Analyses

Collect data on the chemical composition and the amount of specific elements in the samples. Comparing archaeological samples with geological samples will allow strong inferences about the sources of the raw materials. These methods include: Field-Portable X-ray Fluorescence (PXRF) or Laser-Ablation Inductively Coupled Plasma – Mass Spectrometry (LA-ICP-MS).

❖ Interpretation and Spatial Analyses

The obtained data will be analyzed and correlated with stratigraphic/spatial data, chronological data (radiocarbon dates), technological data and environmental data. All spatial and statistical analyses will be made in R environment.

Bibliography

Bradtmöller, M., Pastoors, A., Weninger, B., Weniger, G.-C., 2012. The repeated replacement model–rapid climate change and population dynamics in Late Pleistocene Europe. Quaternary International. 247, 38–49.

Sanchez-Goñi, M.F., Harrison, S.P., 2010. Millennial-scale climate variability and vegetation changes during the Last Glacial: Concepts and terminology. Quaternary Science Reviews. 29, 2823–2827.

Schmidt, P., Léa, V., Sciau, PH., Fröhlich, F., 2013. Detecting and quantifying heat treatment of flint and other silica rocks: a new non-destructive method applied to heat-treated flint from the Neolithic Chassey culture, southern France. Archaeometry, 55, 5, pp. 794-805.

Acknowledgments and funding

Research grant for PhD project 2020.08722.BD, funded by the Fundação para a Ciência e a Tecnologia.

Project ALG-01-0145-FEDER-27833, funded by the Fundação para a Ciência e a Tecnologia.