

## **Contribution of the $^{40}\text{Ar}/^{39}\text{Ar}$ method to improve Middle-Pleistocene archaeological/palaeontological sites from the Italian Peninsula**

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European Middle-Pleistocene archaeological and/or paleontological sites lack a unified and precise chronological framework. Despite recent efforts mostly focused on methods such as OSL, ESR/U-series or cosmogenic nuclides, the age of numerous sites from this period fundamentally still relies on qualitative and speculative palaeoenvironmental and/or palaeontological/palaeoanthropological considerations. The lack of robust chronologies, along with the scarcity of human fossils, prevent coherent correlations between European sites which in turn limits our understanding of human diffusion dynamics, understand techno-cultural evolution or correlate archaeological sites with palaeoclimatic and environmental records. With the goal of providing an accurate and precise chronological framework based on a multi-method approach, a research network including geochronologists, archaeologist and paleoanthropologists from various French and Italian institutions launched in 2010 a wide study of Middle-Pleistocene archaeological sites of central and southern Italy. This study combining the  $^{39}\text{Ar}/^{40}\text{Ar}$  method with palaeo-dosimetric methods applied to European sites in the age range of 700 ka to 300 ka is unprecedented. In parallel, a large effort has been done to improve the regional Middle-Pleistocene tephrostratigraphic database through a massive application of both high-precision  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronological and geochemical investigations. We illustrate our approach and results in addressing several key-sites such as Notarchirico, Valle Giumentina; Ceprano-Campogrande and La Polledrara di Cecanibbio. The accurate and precise chronological framework we built permits us to replace all the investigated archaeological and palaeontological records into a coherent climatic and environmental context. Furthermore, our work provides the opportunity to compare lithic industries from a technical and evolutionary point of view within a homogeneous temporal frame. These preliminary results border the current limitations of the  $^{40}\text{Ar}/^{39}\text{Ar}$  method and will guide expected advances to apply our approach to other European sites.