

Residue Preservation in Open-Air Archaeological Contexts: Evidence from Final Pleistocene and Early Holocene Lithic Assemblages in Flanders (Belgium)

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Abstract (250 words):

Residue analysis has traditionally focused on artefacts from caves and waterlogged sites, contexts assumed to provide optimal preservation conditions. Consequently, open-air sites—which comprise the majority of the prehistoric archaeological record—are often dismissed as unsuitable for residue studies due to presumed poor preservation. This research challenges these assumptions through systematic analysis of Final Pleistocene and Early Holocene stone tools from multiple open-air sites across Flanders.

Our study examines residues from contrasting preservation environments, from waterlogged contexts to arid sandy deposits. These Late Glacial and early Postglacial assemblages provide critical insights into hunter-gatherer adaptations during major climatic transitions.

Through integrated microscopic, chemical, and contextual analyses, we assess how environmental factors influence residue preservation and detectability, crucially evaluating the "functional potential" of preserved residues—their reliability for reconstructing prehistoric tool use and subsistence practices. Results show that residues survive in open-air conditions previously considered unsuitable, with some categories proving remarkably resilient while others degrade predictably based on residue type, depositional environment, and post-depositional processes.

This research demonstrates the underestimated potential of residue analysis in open-air Late Pleistocene and Early Holocene lithic assemblages in temperate regions. By establishing preservation parameters and developing site-specific analytical protocols, we show that open-air contexts should not be automatically excluded from residue studies. Targeted approaches can extract meaningful functional information from these abundant contexts, expanding understanding of hunter-gatherer technology and subsistence strategies.