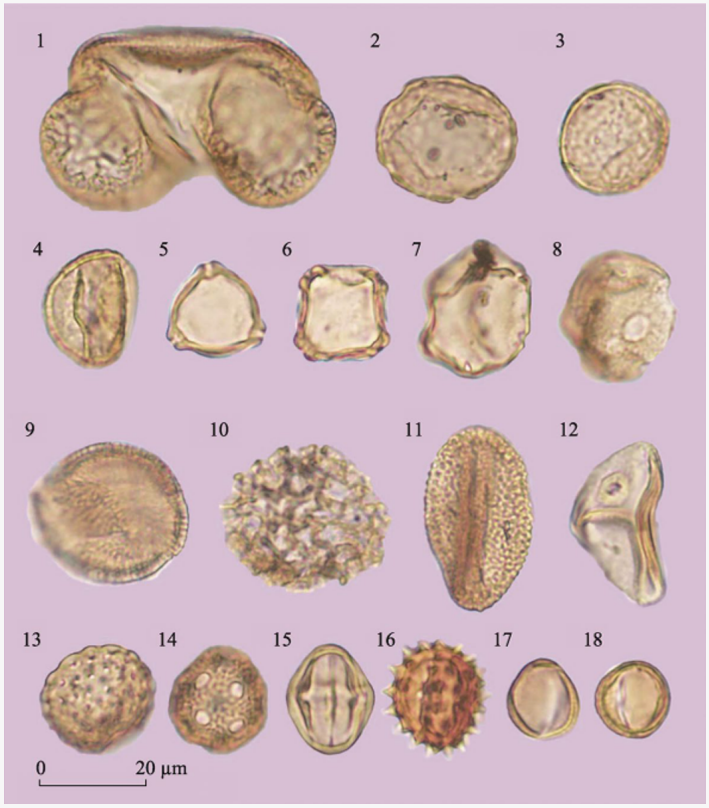
How Late Pleistocene Climate Shaped Hominin Adaptations in South China

GA, UNITED STATES, November 7, 2025 /EINPresswire.com/ -- New evidence from South China reveals how early humans adapted to environmental transformations during the Late Pleistocene. Using pollen, isotopic, and published lithic evidence from the Sandinggai site (96.6–13.3 ka BP), researchers quantitatively reconstructed the region's vegetation and climate evolution, showing a transition from warm-temperate evergreen forests to temperate deciduous woodlands. Correspondingly, hominins shifted their toolmaking strategies—from producing large handaxes in humid forested landscapes to crafting smaller flake tools as conditions became cooler and drier. This study provides an ecological link between environmental dynamics and technological evolution, highlighting how climate fluctuations shaped human survival and behavioral resilience across one of East Asia's key prehistoric corridors.



Major palynomorphs from the Sandinggai section.

The Late Pleistocene was a period of dramatic climatic oscillations, marked by alternating glacial and interglacial cycles that profoundly influenced human dispersal and technological adaptation. South China, positioned between tropical and temperate zones, served as a crucial crossroads for early modern humans and the transmission of handaxe technology. However, most previous studies have relied on qualitative interpretations of vegetation and climate from archaeology sites, leaving a gap in precise understanding of how climate and vegetation shifts affected hominin behavior. Due to these limitations, there is a need for integrated multi-proxy analyses that can objectively link environmental changes with human adaptation in this pivotal region of East Asia.

A research team from the Institute of Vertebrate Paleontology and Paleoanthropology, Chinese

Academy of Sciences, together with collaborators from Hunan Provincial Institute of Cultural Relics and Archaeology, Institute of Tibetan Plateau Research, Chinese Academy of Sciences and Griffith University, published (DOI: 10.1007/s11442-025-2387-3) a study in Journal of Geographical Sciences (August 2025) that quantitatively reconstructs climate and vegetation changes at the Sandinggai site in central South China. Covering nearly 80,000 years of stratigraphic records, the study reveals that early humans responded to ecological changes through distinct shifts in tool production—offering new insights into environment-driven technological adaptation in Late Pleistocene East Asia.

The team applied palynological and isotopic analyses to sediments from four stratigraphic layers at Sandinggai. Results showed a long-term shift from a warm-temperate evergreen and deciduous mixed forest to a temperate deciduous forest, as the mean annual temperature declined from 18.6°C to 13.3°C and annual precipitation dropped from 1255 to 798 mm. During the earlier warm and humid phase (ca. 83–50 ka), forests flourished, biodiversity peaked, and large cutting tools made of coarse quartz sandstone were dominant—indicating stable habitation and abundant resources. In contrast, as the environment became cooler and drier (ca. 50–15 ka), vegetation openness increased, plant diversity decreased, and handaxes were replaced by small flake tools made of chert. This lithic miniaturization reflected an adaptive response to reduced resources and shifting ecosystems. The study further compared these trends with global sites such as Jurreru Valley (India) and Boomplaas Cave (South Africa), showing that environmental instability universally promoted smaller, portable tools—a key strategy for human resilience during climatic stress.

“By integrating pollen, isotopic, and archaeological data, our research provides an ecological perspective linking human behavioral changes with climate evolution,” said Professor Zhao Keliang, corresponding author of the study. “The Sandinggai site demonstrates how early humans adjusted their technology and subsistence strategies in response to environmental shifts. This not only deepens our understanding of Late Pleistocene life in South China but also contributes to the broader narrative of human adaptability and innovation in the face of global climate challenges.”

The findings offer vital implications for understanding human-environment interactions under climate stress. By establishing a precise link between vegetation dynamics and lithic technology, the study highlights South China as a key region for exploring the evolutionary pathways of modern humans in East Asia. The research framework—combining palynology, isotopic geochemistry, and archaeological analysis—sets a precedent for reconstructing ancient human adaptation mechanisms elsewhere. Moreover, as modern societies confront increasing climate instability, these paleoenvironmental insights emphasize the enduring importance of behavioral flexibility and technological innovation for human survival.

DOI
10.1007/s11442-025-2387-3

Original Source URL
https://doi.org/10.1007/s11442-025-2387-3

Funding information
National Natural Science Foundation of China, No.42471185, No.T2192952; National Key Research and Development Program of China, No.2022YFF0801502.

Lucy Wang
BioDesign Research
email us here

This press release can be viewed online at: https://www.einpresswire.com/article/865201185

EIN Presswire's priority is source transparency. We do not allow opaque clients, and our editors try to be careful about weeding out false and misleading content. As a user, if you see something we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.
© 1995-2025 Newsmatics Inc. All Right Reserved.