

**Teasing apart the mechanisms behind prehistoric cultural adaptations:  
an interdisciplinary approach combining paleoclimatology, ecology, and archaeology.**

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# Key Questions

- ❑ **Did Human populations culturally respond to millennial-scale climatic variability? If so, how?**
- ❑ **What is the range of relationships between ecological niche and cultural adaption (technology, mobility, social networks, cultural transmission, etc.)?**
- ❑ **What mechanisms are at work behind culture-environmental relationships? Are these mechanisms consistent through time?**

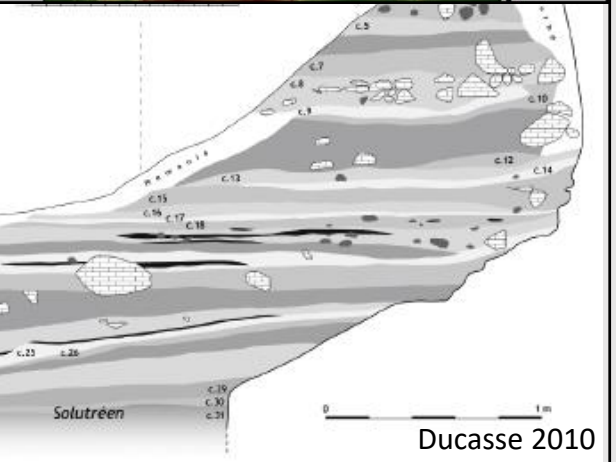
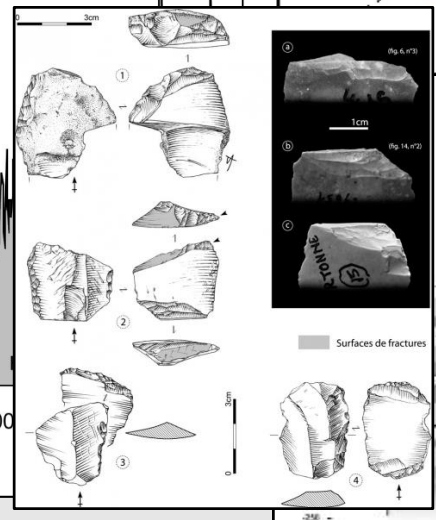
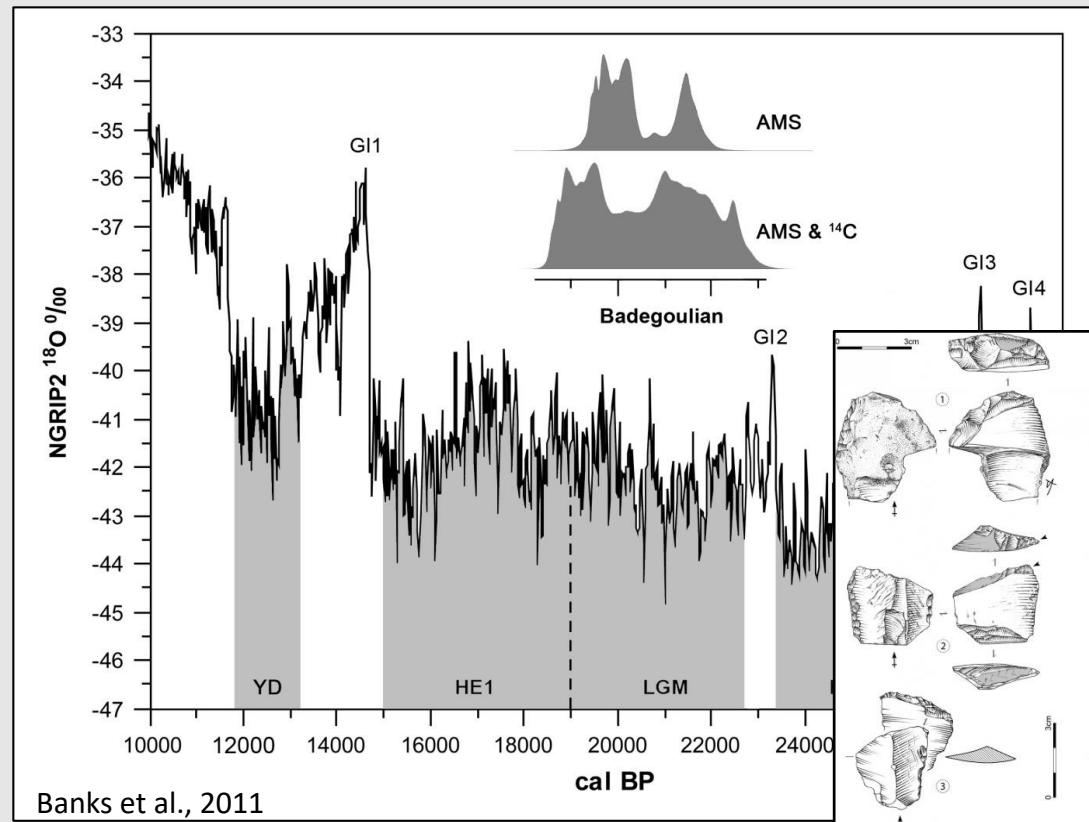
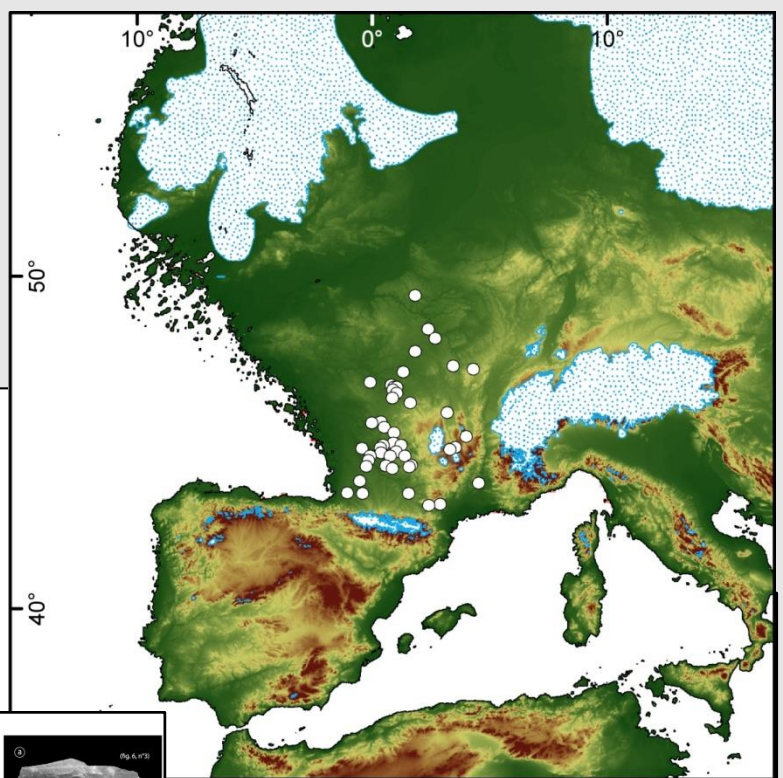
# « Eco-Cultural » Niche Modeling

- ❑ **Use of predictive modeling architectures to:**
- ❑ Reconstruct the ecological niche exploited by a past human population or archaeological culture
- ❑ Identify and quantify the ecological parameters that shaped a past niche
- ❑ Use to better understand culture-environmental relationships and identify the mechanisms at work behind past cultural variability



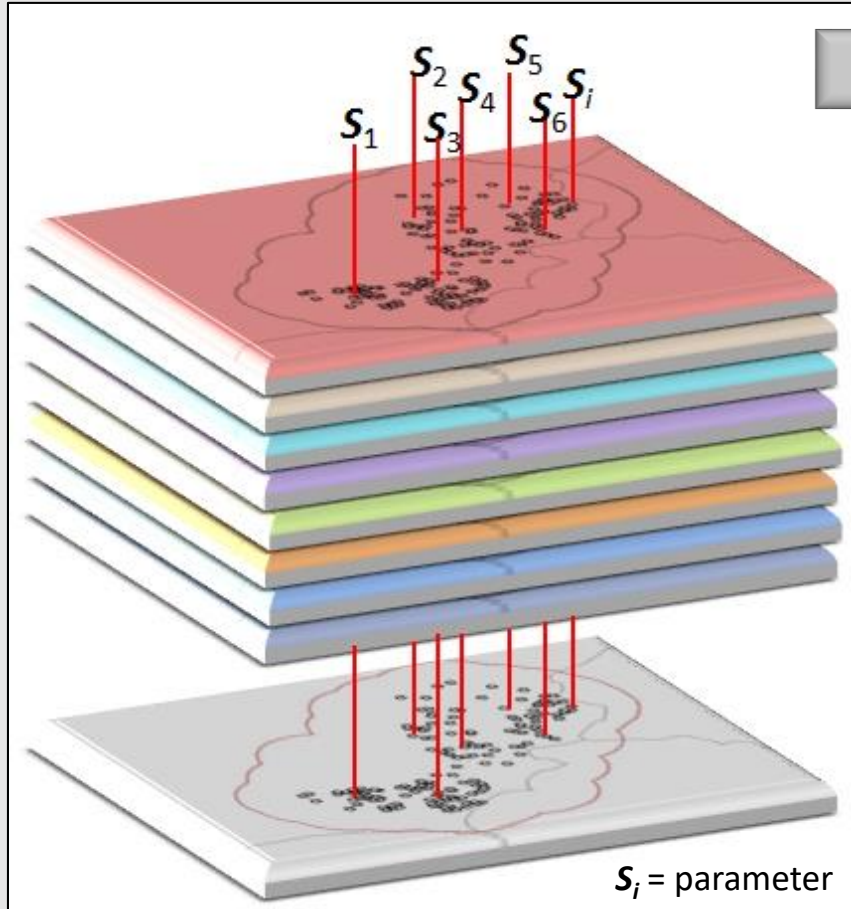
# Archaeological Data

- ❑ Cultural attributions (typo-techno)
- ❑ Archaeological context
- ❑ Chronological data
- ❑ Geographic coords. of sites

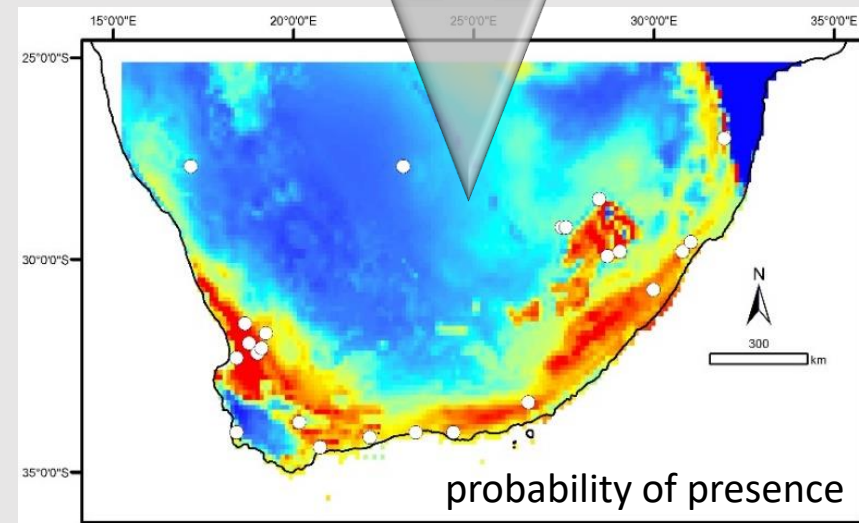
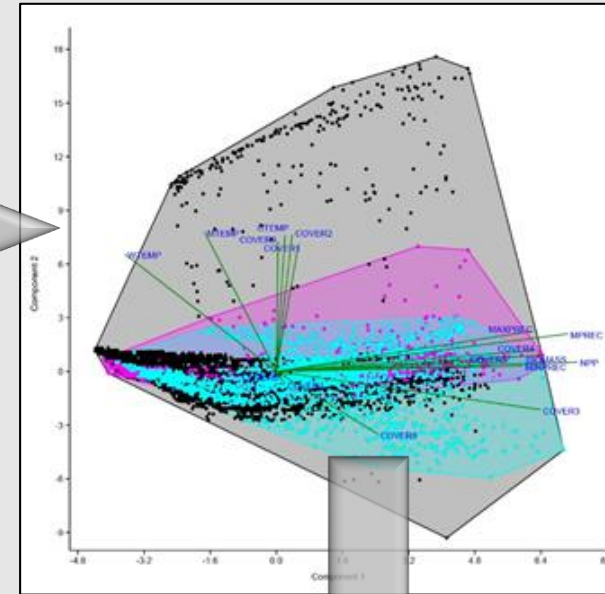


# Ecological Niche Estimations

Predictive method and environmental data layers

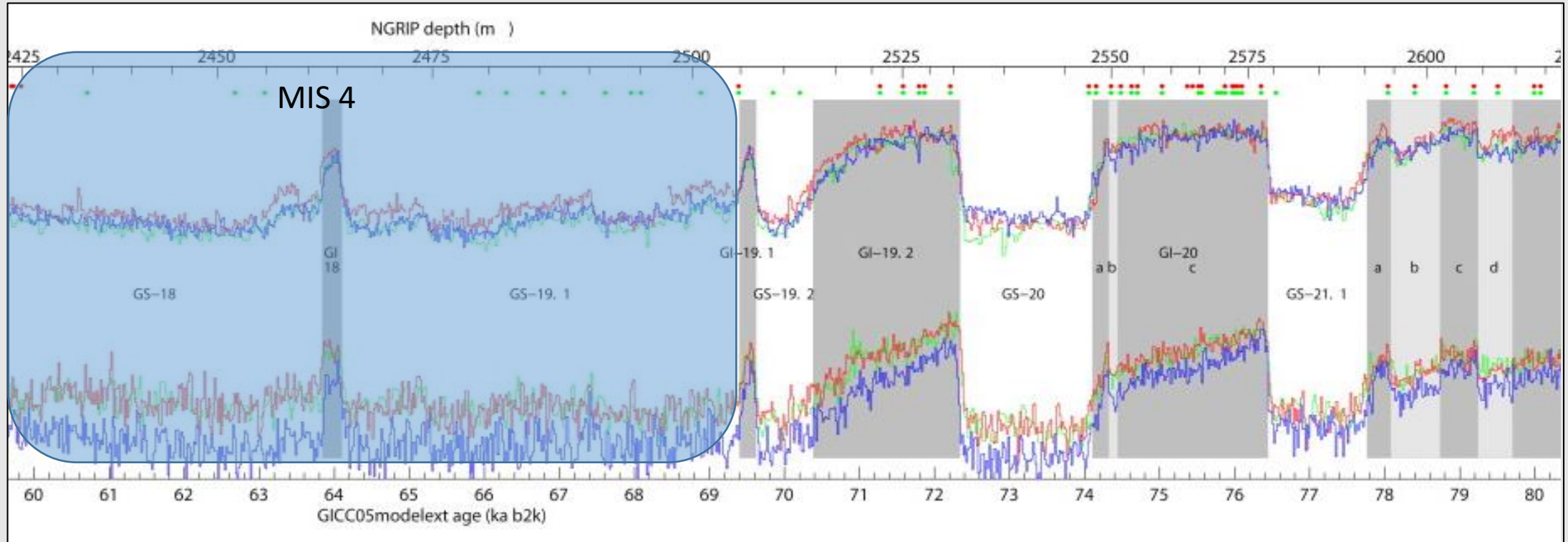


Ecological Niche Estimation



Geographic projection

# Neanderthals in Western Europe 80-60k cal BP



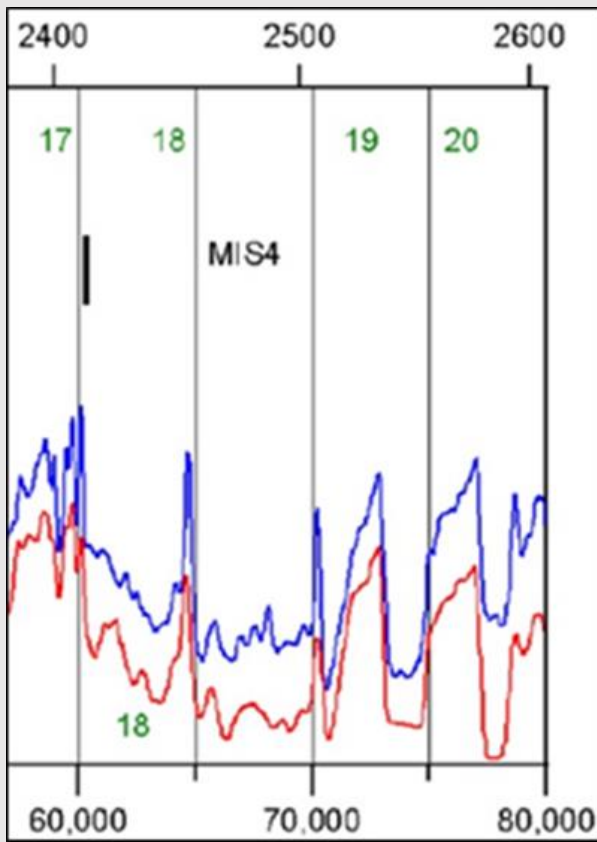
- Appearance of the Quina typo-techno complex during MIS 4
- Is this cultural innovation associated with an ecological niche change?

# Neanderthals in Western Europe 80-60k cal BP

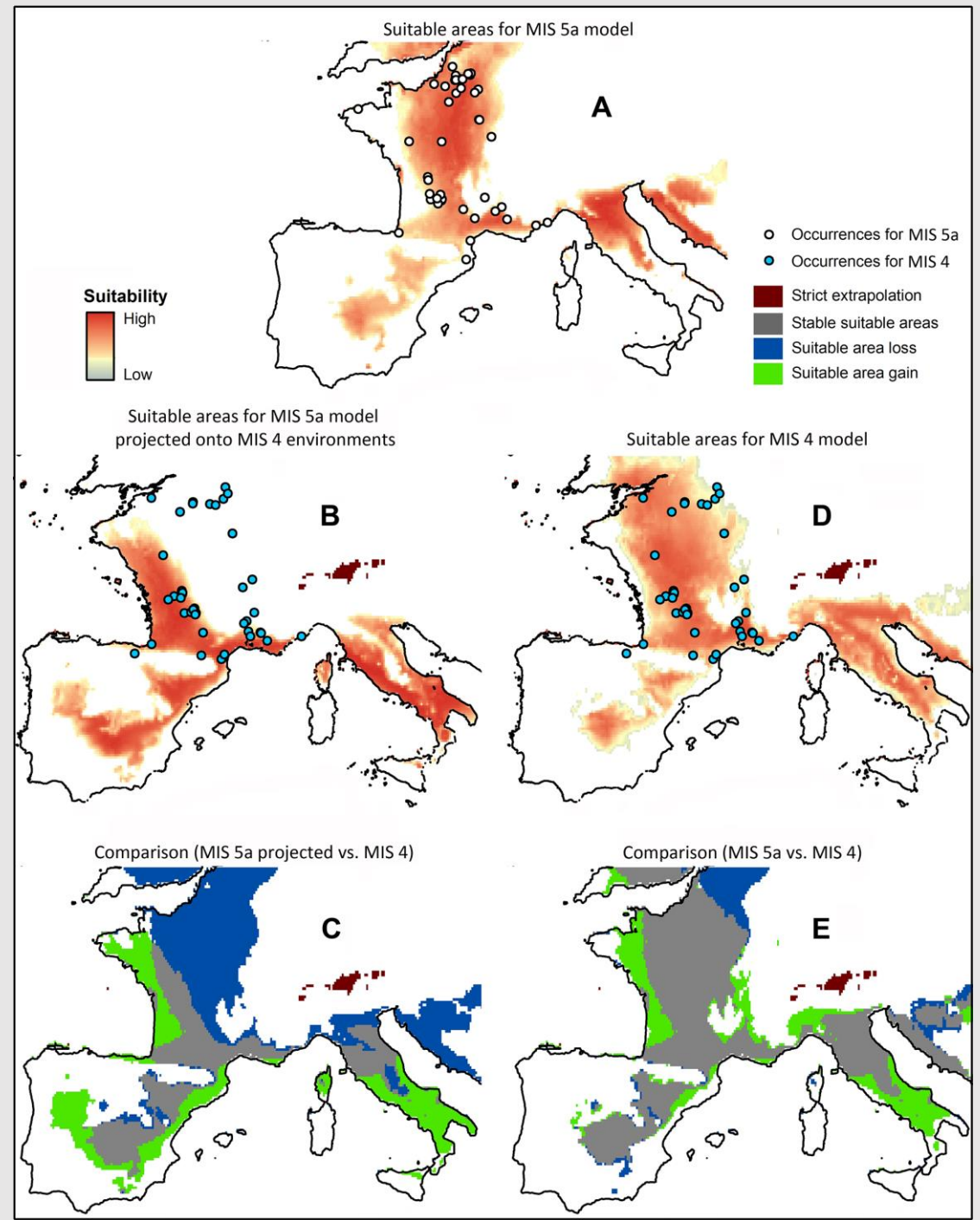
scientific reports

**OPEN** An ecological niche shift for Neanderthal populations in Western Europe 70,000 years ago

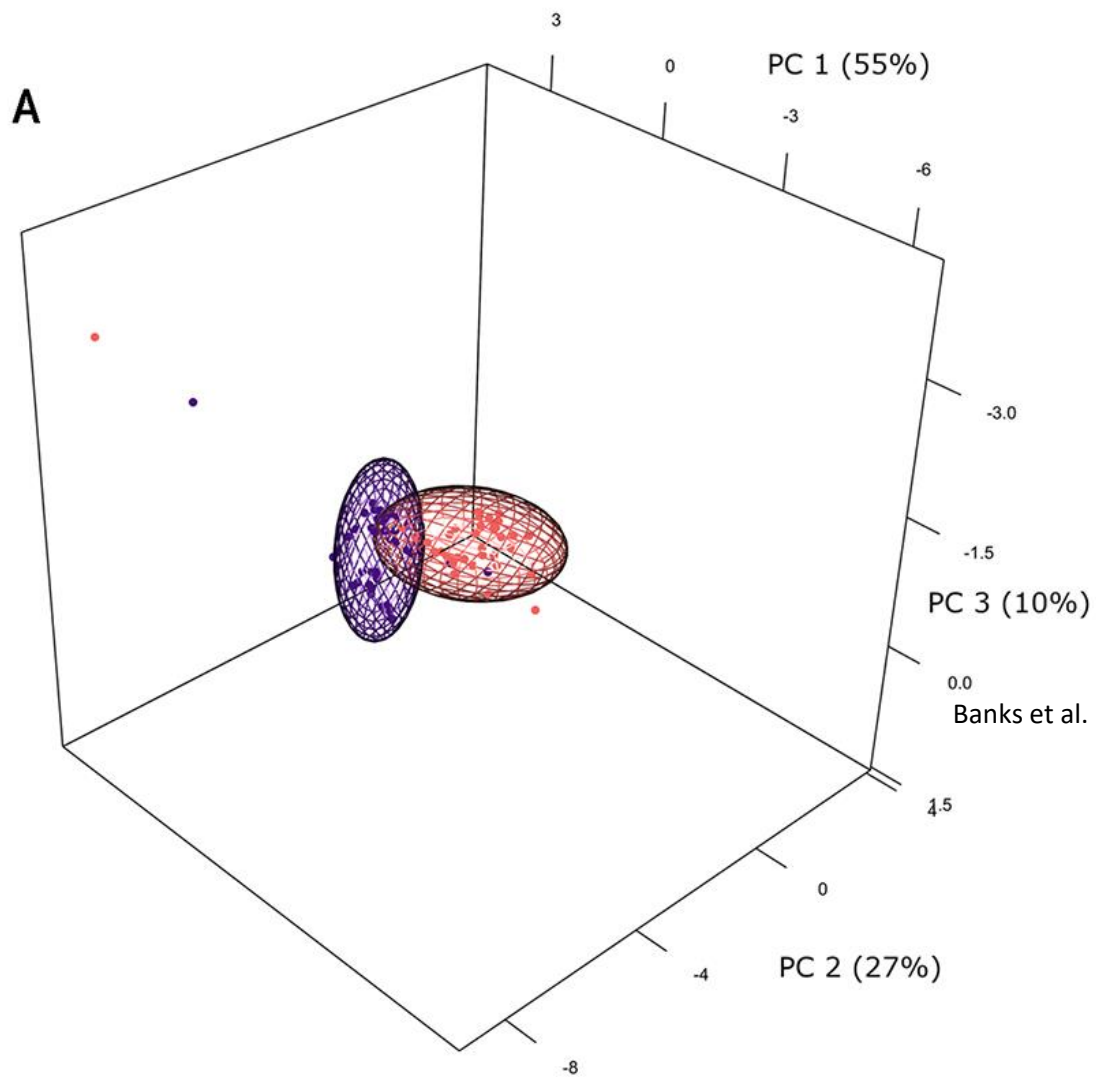
Check for updates



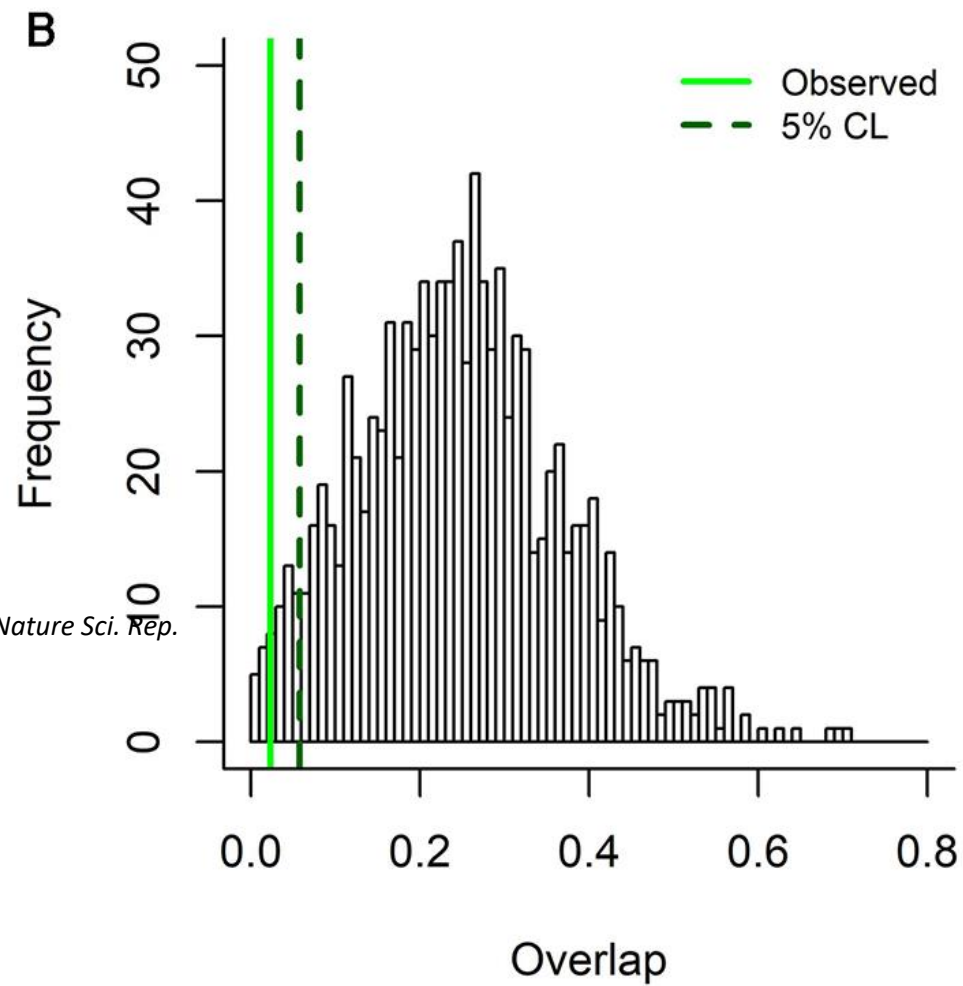
Banks et al. 2021 *Nature Sci. Rep.*



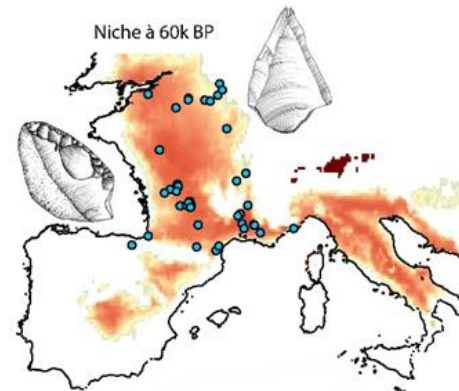
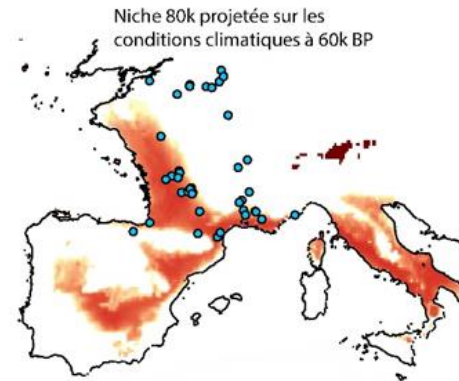
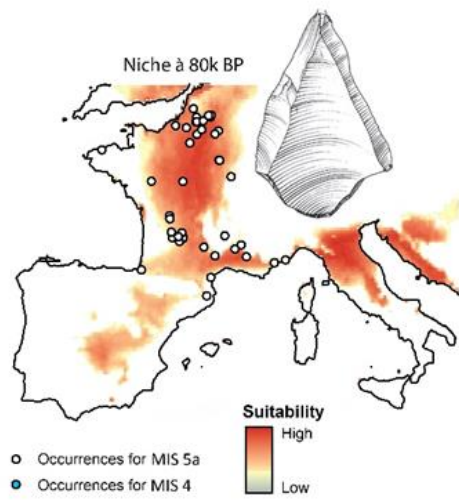
# Neanderthals in Western Europe 80-60k cal BP



Banks et al. 2021 *Nature Sci. Rep.*







**eco-cultural niche of Neanderthal populations in west-central France 80,000 years ago, associated with a Levallois technology**

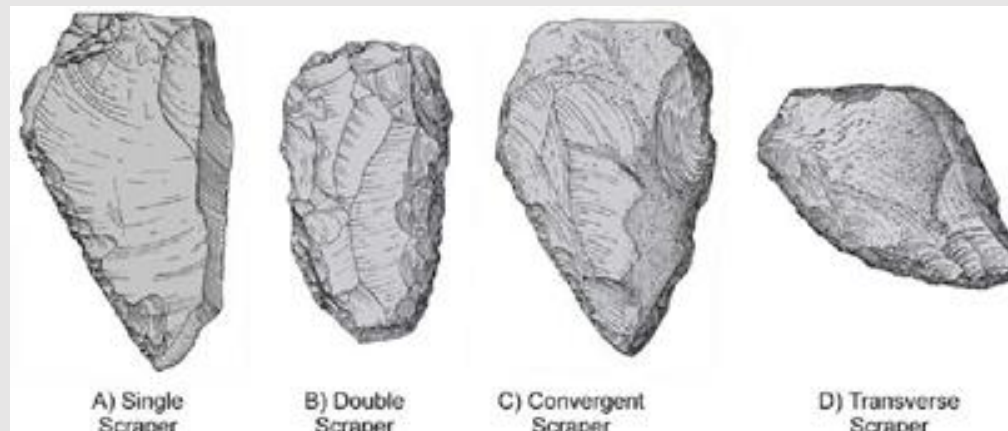
**80,000 year old niche projected onto Isotopic Stage 4 environmental conditions to show where Neanderthal populations would have had to move if they had continued to exploit the same environments during this period of climatic cooling between 70,000 and 60,000 years before present (BP)**

**eco-cultural niche exploited by Neanderthal populations during Stage 4. During this period we observe the "Quina" technology emerging in the south of the study area.**

*(Drawing of the Levallois point by J-L Locht and of the Quina scraper by J-P Faivre)*

# Neanderthals in Western Europe 80-60k cal BP

- Ecological niche contraction and shift between MIS 5a and MIS 4
- Niche shift due to Neanderthals remaining fixed to territories
- They responded to changing ecological conditions by innovating culturally – Quina in the south and southwest and different mobility strategies with same lithic technology in the north
- Culturally flexible but different culture-environment relationships than what has been observed in the two AMH regional trajectories that we have examined.



# Understanding a threshold in Human evolution at 450-350 ka through the roots of Neanderthal behavior.

## NEANDROOTS

-Threshold in human evolution

-Innovations

-Under-investigated

Reasons:

-rooted in previous traditions

-new populations?

-population increase and regional networks?

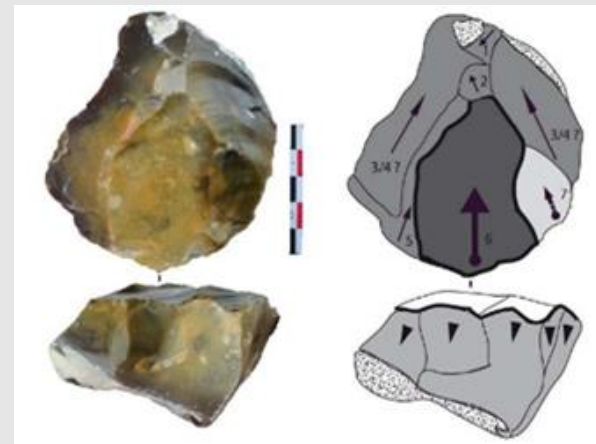
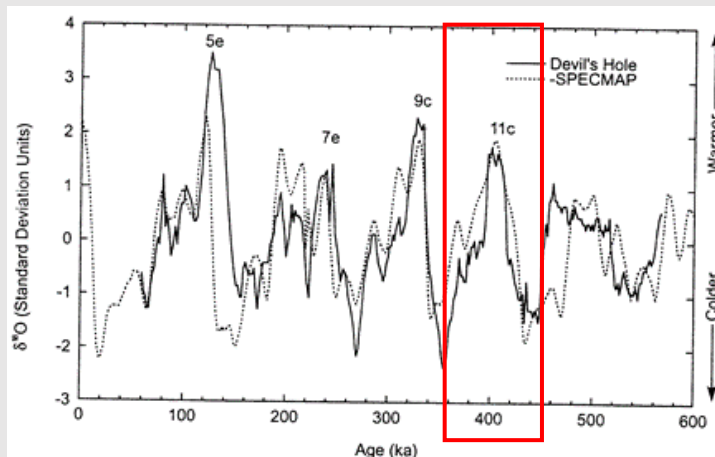
Environmental adaptation? **Long interglacial MIS 11**

MNHN, LSCE, IGE, IPSL

PACEA, EPOC, LGP, Universités de Lille, Nanterre, Paris

Network of researchers from the British Museum

Universities of Ferrara, Tarragona, Roma, Liverpool



Cagny-la-Garenne Levallois



Terra Amata fire place

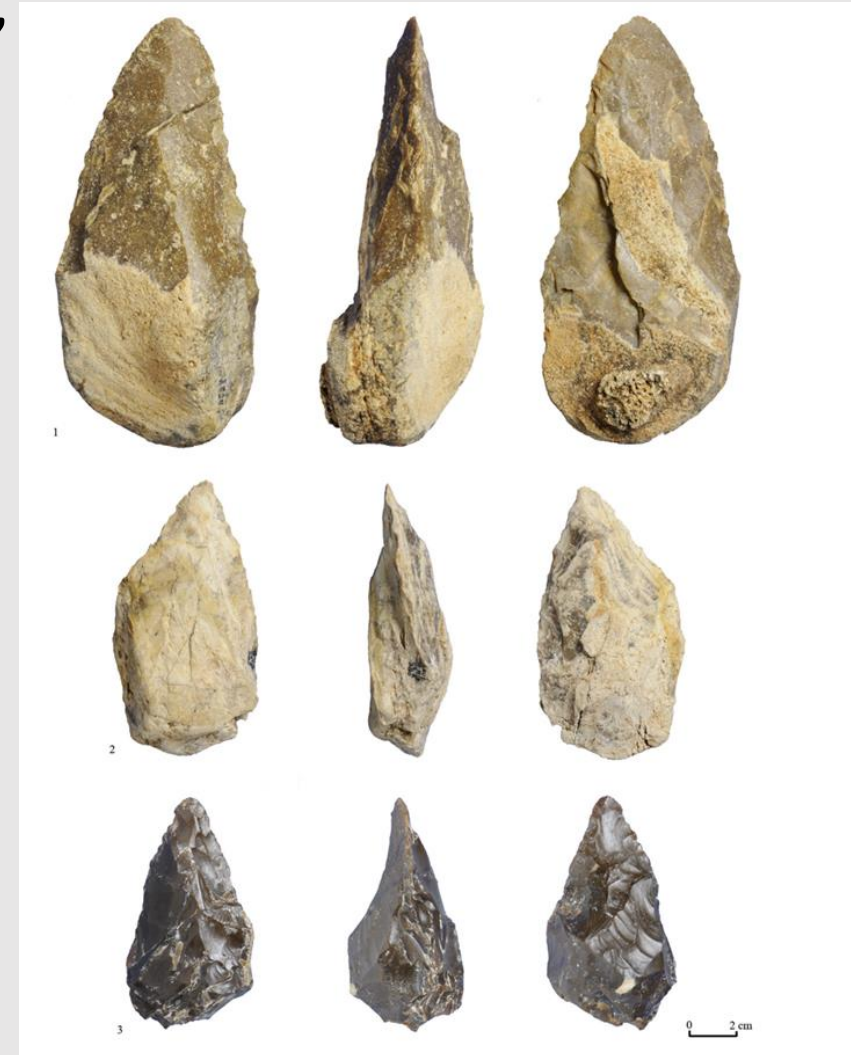
**(1) to build a large comprehensive database for the 450 to 350 ka period,**

**(2) to bridge the gap in chronological and environmental data,**

**(3) to develop methodological approaches to identify regional patterns and diffusion models of innovations,**

**(4) to question the role of population size and structure by modeling,**

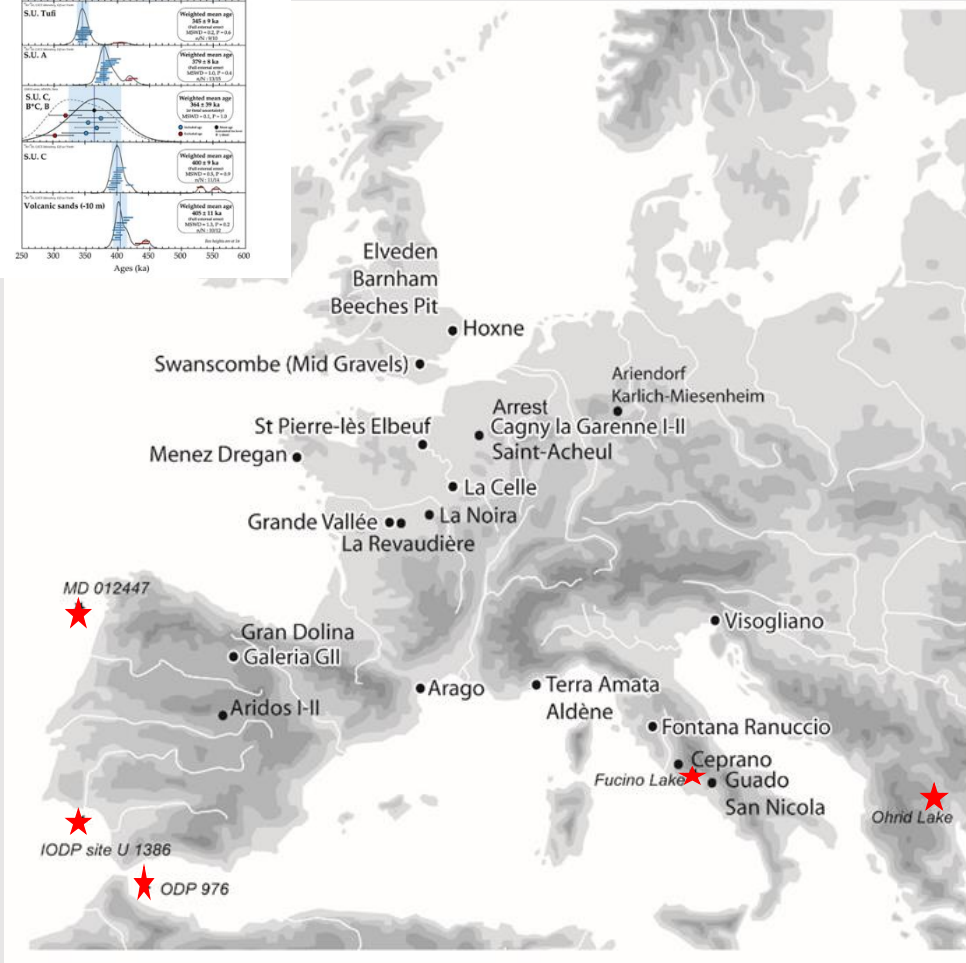
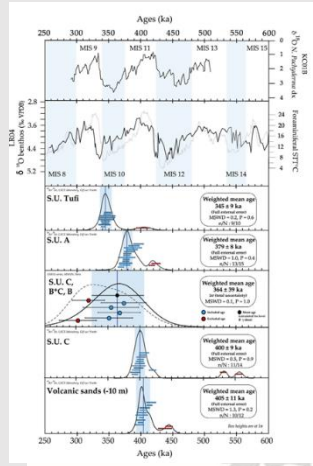
**(5) to test the impact of climate evolution on hominin adaptation by iLOVECLIM model and **Eco-cultural-niche modeling.****



# Chronology of sites into the MIS 11

## Two groups: temperate and less temperate patterns

Oscillayers



★ Carottes marines ou lacustres (pollens). Tufs.

