

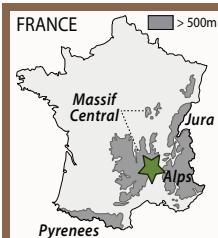
HOLOCENE CLIMATE & ANTHROPOGENIC IMPACT REVEALED BY MACROFOSSILS

from the Béage volcanic plateau peat stratigraphies (S-E Massif Central, France)



André-Marie DENDIEVEL^{a,b}, Hervé CUBIZOLLE^a, Jacqueline ARGANT^c, Benjamin DIETRE^{b,d}, Christine OBERLIN^e & Jean Nicolas HAAS^b

andre.marie.dendievel@univ-st-etienne.fr



INTRODUCTION

Geoarchaeological and palaeoecological research carried out on the Béage volcanic plateau (Upper Ardèche, South-Eastern Massif Central, France) aimed at reconstructing Holocene palaeoenvironmental changes under anthropogenic and climatic impact [1,2]. Here, we focus on the macrofossil content from the Béage plateau peat sequences.

STUDIED MIRES

The Béage plateau is well known for its recent volcanic activity [3,4]. Its elevation (900 to 1,500 m a.s.l.) and its location provide a local climate typified by many contrasts, between oceanic and mediterranean influences.

The two main studied sites, situated in the upper catchment area of the river Loire, are:

- The **La Narce du Béage fen** ($N44^{\circ}49'54''$, $E4^{\circ}05'58''$, alt. 1,220 m a.s.l.), located in a small granitic basin surrounded by basaltic outcrops and by several open field block streams.
- The **Pialeloup peat bog** ($N44^{\circ}51'03''$, $E4^{\circ}09'57''$, alt. 1,220 m a.s.l.), seated on the granitic basement of the Béage plateau.



MATERIALS & METHODS

PALAEOECOLOGY:

- Twin cores obtained on each site using a manual peat corer (fig. 1 & 2)
- 40 and 60 samples analysed for macrofossil and palynological content
- Age-depth models based on 17 AMS radiocarbon datings and realised using R and its Clam package [5]
- Cross comparisons of palaeoecological data with Tilia software [6]
- Constitution of a palaeoecological index describing local and rapid changes

- ARCHAEOLOGY (within a regional project):**
- Literature review, pedestrian prospections and excavations

RESULTS & DISCUSSION

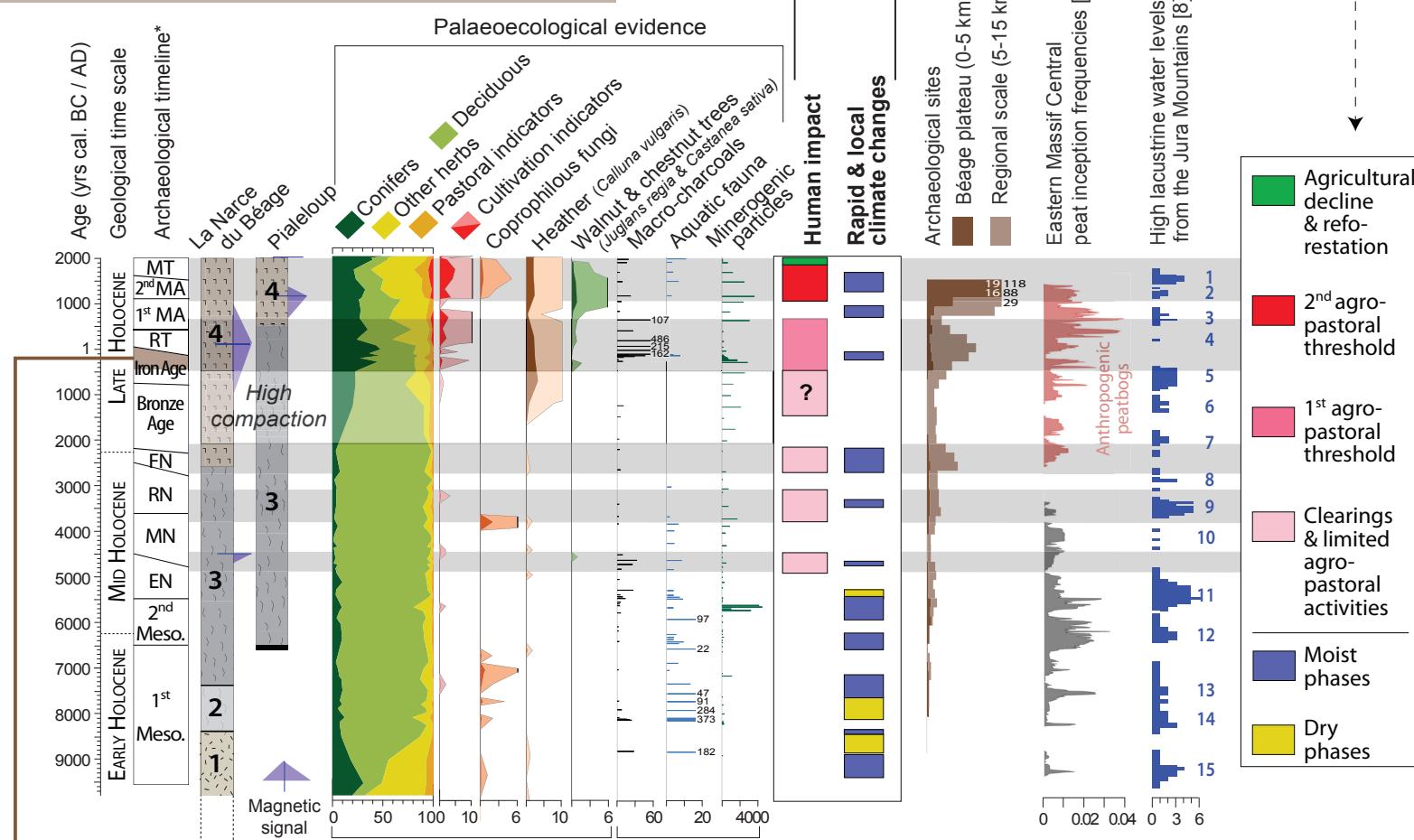


Fig. 3: Synoptic diagram of human impact evidence on the Béage plateau during the Holocene

MAJOR FINDINGS

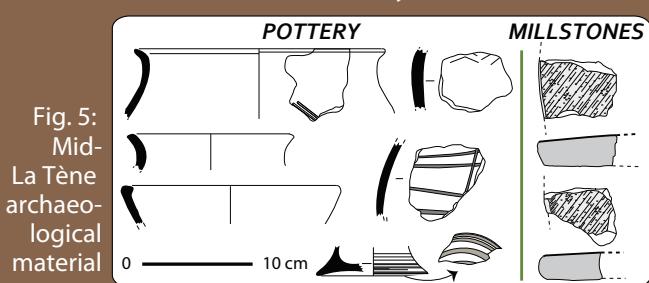
- Eleven episodes of local humidity during the Holocene associating minerogenic inputs, remains of aquatic fauna and flora, findings of terrestrial fungi, etc. Among these, several events reveal local changes as a response to global oscillations.
- Limited agro-pastoral impact of Neolithic groups, with cyclic clearings around 4,950 - 4,500 (end of the EN), 3,750 - 3,050 (MN2-RN transition) and at 2,850 - 2,150 years cal. BC (FN).
- Continued human presence from the mid-La Tène period (2nd Iron Age) to the Early Middle Ages, including clearings of beech forests and local cereal cultivation.
- Increasing anthropogenic impact after AD 1,000. It leads to massive erosion due to food-producing agriculture and livestock grazing, in particular after the XIIIth c. AD.
- Recent increase of coniferous forests (national reforestation plan - R.T.M. & F.F.N.), end of cultivation due to a regional demographic loss, but cattle breeding specialisation.

CASE STUDY: SECOND IRON AGE LANDSCAPE

Archaeological background



Fig. 4: Archaeological windows at Le Crouzet-La Veysse (Mid-La Tène site)



Palaeoecological data from La Narce & Pialeloup

Willow and birch groves, acidophilous alder forest with *Sphagnum* mosses, bog-sedges or heaths
Rush beds around peatbogs
Damp meadows
Clearings of beech and fir forests for agro-pastoral purposes (local wheat farming and livestock grazing)

SOME MACROFOSSILS

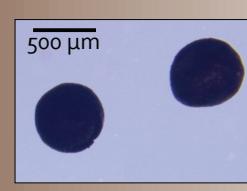


Fig. 6: *Coenococcum geophilum* sclerotia

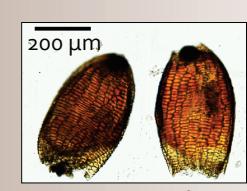


Fig. 7: *Juncus effusus* / *conglomeratus* type seeds

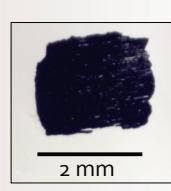


Fig. 8: Macro-charcoal

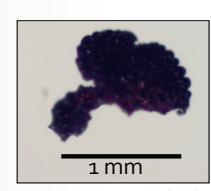


Fig. 9: Caryophyllaceae seed fragment



Fig. 10A: *Molinia caerulea* seed
Fig. 10B: *Glyceria fluitans* seed

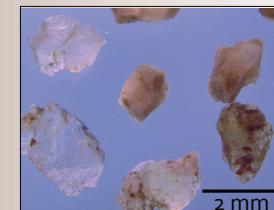


Fig. 11: Minerogenic particles

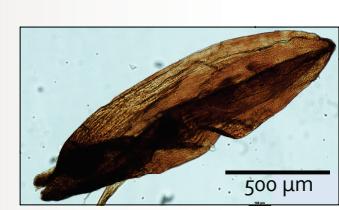


Fig. 12: *Poa palustris* seed

REFERENCES:

- [1] Dendievel A.-M., Haas J.N., Delrieu F. & Cubizolle H., 2014 - Nouvelles données paléoenvironnementales et archéologiques sur le plateau du Béage. La tourbière de La Narce et ses environs, premiers résultats. *Ardèche Archéologie*, 31, 27-33.
- [2] Dendievel A.-M., Cubizolle H., Dietre B., Gaertner V., Jouannic G. & Haas J.N., 2015 - Environmental changes from the Late Glacial to the mid-Holocene in the eastern Velay: the sedimentary sequence of La Narce du Béage in Ardèche (Massif Central, France). *Quaternaire*, 26, 4, 265-278.
- [3] Guérin G. & Gillot P.-Y., 2007 - New elements of chronology of Bas Vivarais' Pleistocene volcanism (Ardèche, France) by thermoluminescence dating. *C.R. Geoscience*, 339, 40-49.
- [4] Nomade S., Sasco R., Guillou H., Scao V., Kissel C. & Genty D., 2014 - Dating of the youngest volcanoes of Ardèche (Massif Central, France) using $^{40}\text{Ar}/^{39}\text{Ar}$ and unspiked K/Ar. *Geophysical Research Abstracts*, 16, EGU2014-4901-2.
- [5] Blaauw M., Bennett K.D. & Christen J.A., 2010 - Methods and code for « classical » age-modelling of radiocarbon sequences. *Quaternary Geochronology*, 5, 512-518.
- [6] Grimm E.C., 2011 - *Tilia*. Illinois State Museum, Springfield. Version 1.7.17.
- [7] Cubizolle H., Fassion F., Argant J., Latour-Argant C., Galet P. & Oberlin C., 2012 - Mire initiation, climatic change and agricultural expansion over the course of the Late-Holocene in the Massif Central mountain range (France): Causal links and implications for mire conservation. *Quaternary International*, 251, 77-96.
- [8] Magny M., 2013 - Orbital, ice-sheet, and possible solar forcing of Holocene lake-level fluctuations in west-central Europe: A comment on Bleicher. *The Holocene*, 23, 8, 1202-1212.