

LAGO GRANDE DI MONTICCHIO DNA ANALYSIS

Laura Parducci*, Kevin Nota#

W Tinner, J van Leeuwen, P van der Knaap&

D Sachse, Z Liang, S Wulf, A Brauer, MJ Schwab, XR Zhao§

A Marchetto, A Lami§

* La Sapienza University of Rome, Italy.

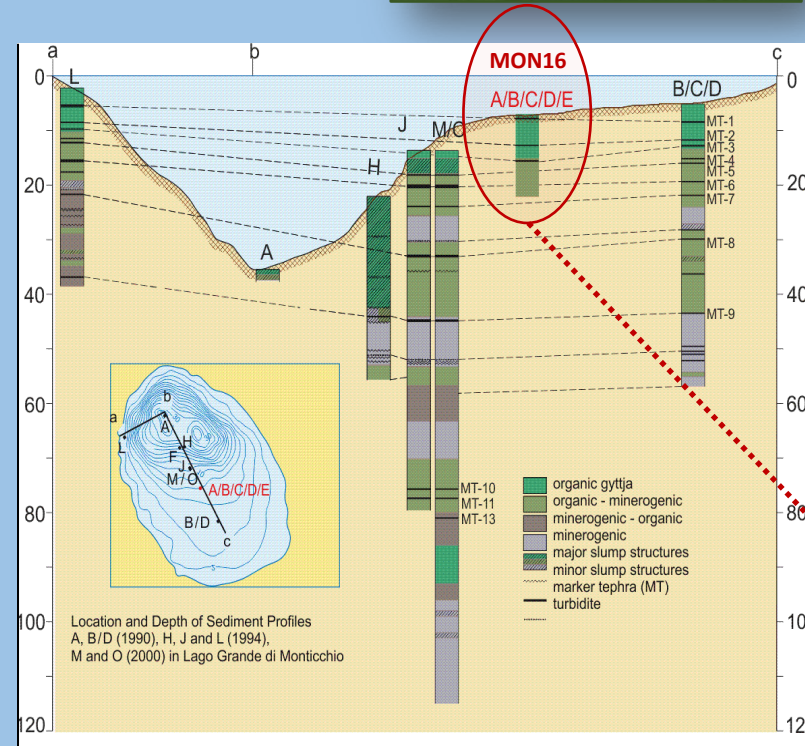
Uppsala University; Sweden,

& University of Bern, Switzerland.

§ German Research Centre for Geosciences, Germany.

\$ National Research Council, Italy

laura.parducci@uniroma1.it



STUDY SITE

THE HIGH RESOLUTION MONTICCHIO (MON) SEDIMENT RECORD

❖ A key archive for reconstructing climate and environmental changes in the Mediterranean for the last glacial-interglacial cycle. Several cores extracted in the past decades (left).

- Mainly annually laminated
- Key marker tephra layers
- Macrefugia for modern European biota

❖ MON16: five new cores (A-E) extracted in 2016.

- Micro-facies analyses, XRF
- DNA analyses

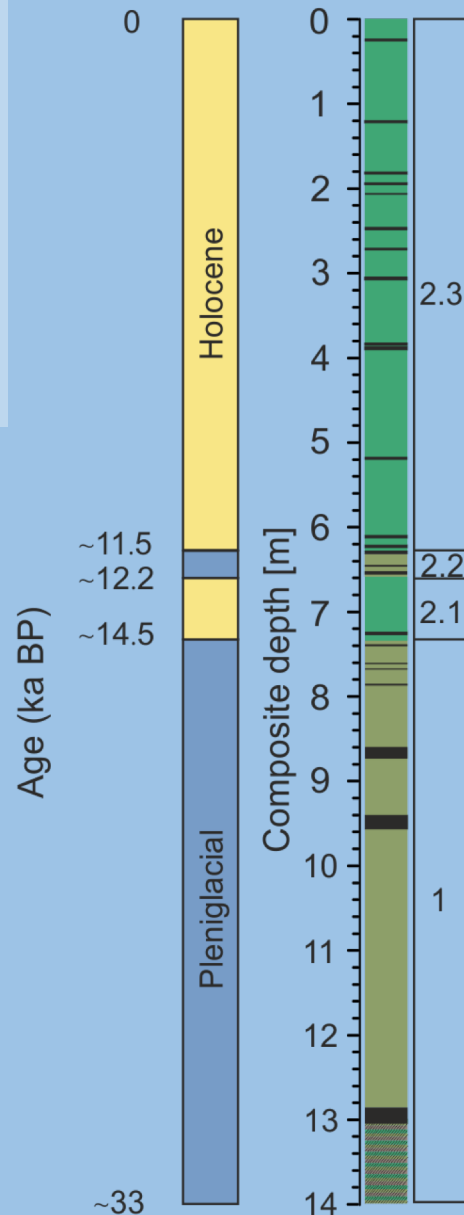
- Maar lake, located within 100-140 km of the Campanian volcanoes documenting major explosive events.
- Lies far enough south to have escaped direct effect of the Weichselian glaciation.
- One of the major glacial microrefugia for European biota.
- Mediterranean climate with distinguished seasonal changes.

MACRO-LITHOLOGY

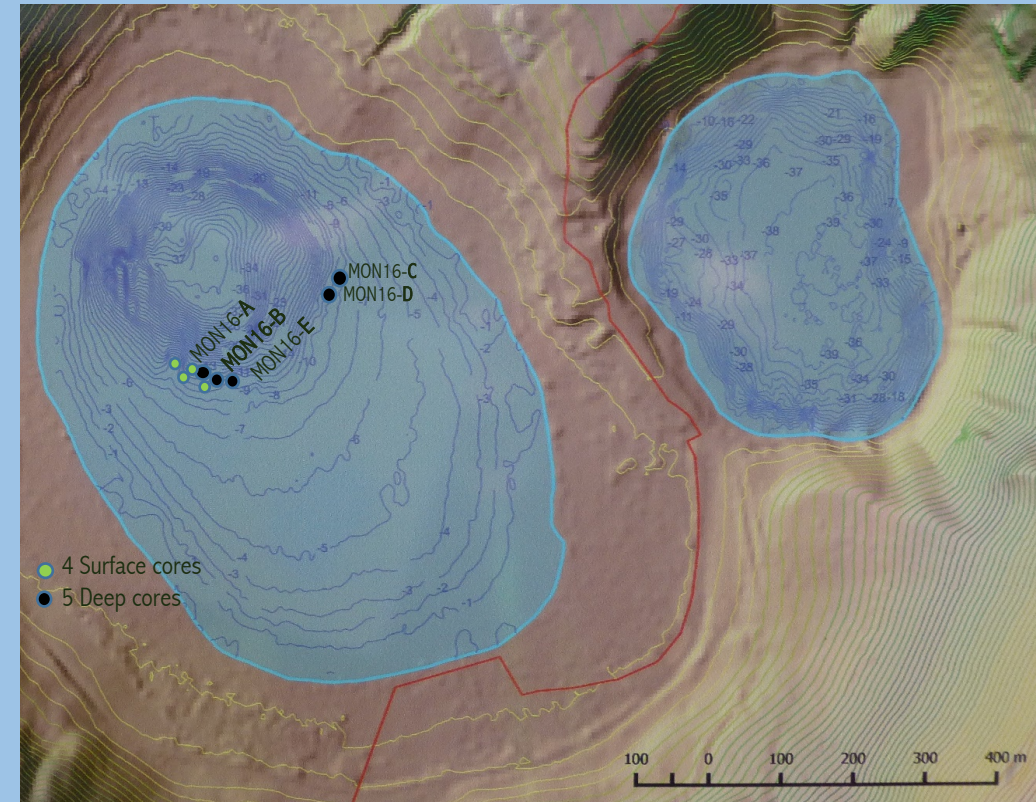
- Unit 1: olive grey organic-minerogenic mud, non-slightly laminations, bottom disturbed.
- Unit 2.1: reddish brown organic material, clear lamination.
- Unit 2.2: ca. 5 cm thick pale greyish sandy homogenous intervals, slightly lamination.
- Unit 2.3: brownish organic mud, good lamination.
- Tephra layers.

DATING (0-33 kyr BP)*

- Varve chronology, anchored at tephra Agnano Pomici Principali (11999 ± 52 a BP).
- Tephrochronology.
- Radiocarbon dating, on terrestrial fragments.



We used **MON16-B** (0-14000 cm) for DNA analysis on >120 samples



MON16 fully covers the lastglacial/interglacial transition (33-0 kyr).
So far, no study has applied molecular DNA methods to this sedimentary record unique among European terrestrial records.

AIMS

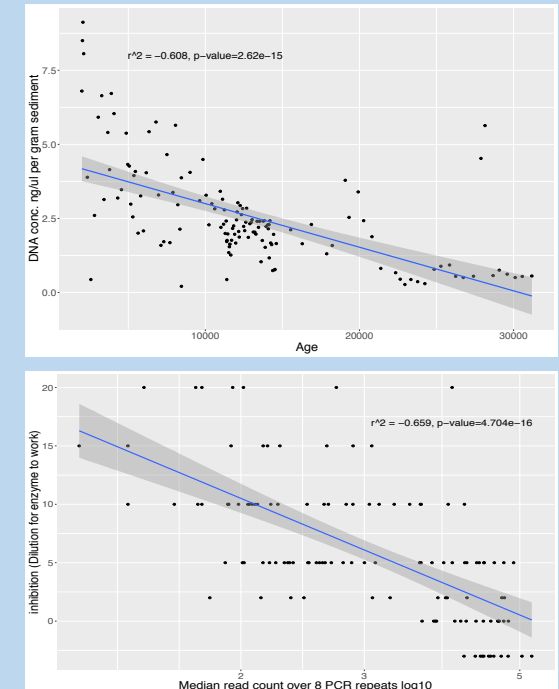
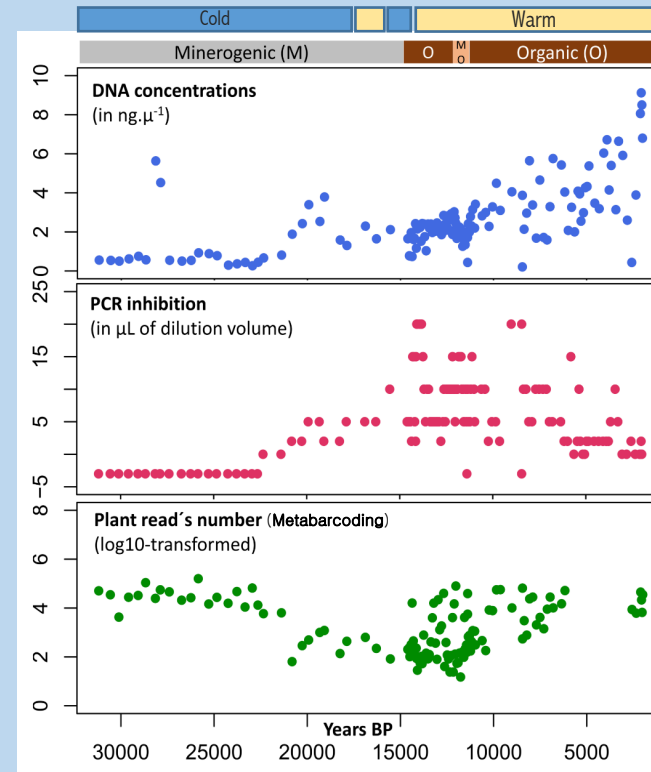
- Reconstruct late Pleniglacial-Holocene vegetation at high taxonomic resolution in southern Europe.
- Link plant community to climate change.
- Compare metabarcoding and shotgun DNA sequencing approaches for vegetation reconstruction.

METHODS

- Metabarcoding of plants (*trnL* g/h).^{*}
 - Curated plant database containing *trnL* sequences.
- Shotgun sequencing & capture enrichment (on-going).
 - DNA enrichment to target *rbcL* & *matK* genes of major orders of plants (3684 species).
 - Bait set designed using ancestral plant sequence reconstruction.
 - We are currently testing probes designed on the four major orders: Fagales, Pinales, Asterales and Poales.

- Sørensen et al. (2010) Mol Ecol Res 10:1009-1018
- ** Co-extracted plant secondary metabolites

DNA QUALITY & QUANTITY (120 samples)



- Nr DNA sequences amplified/sequenced strongly negatively correlated to PCR inhibition.**
- DNA concentration negatively correlated to age.
- No correlation between DNA concentration and PCR inhibition.

RESULTS

METABARCODING (37/120 SAMPLES)*

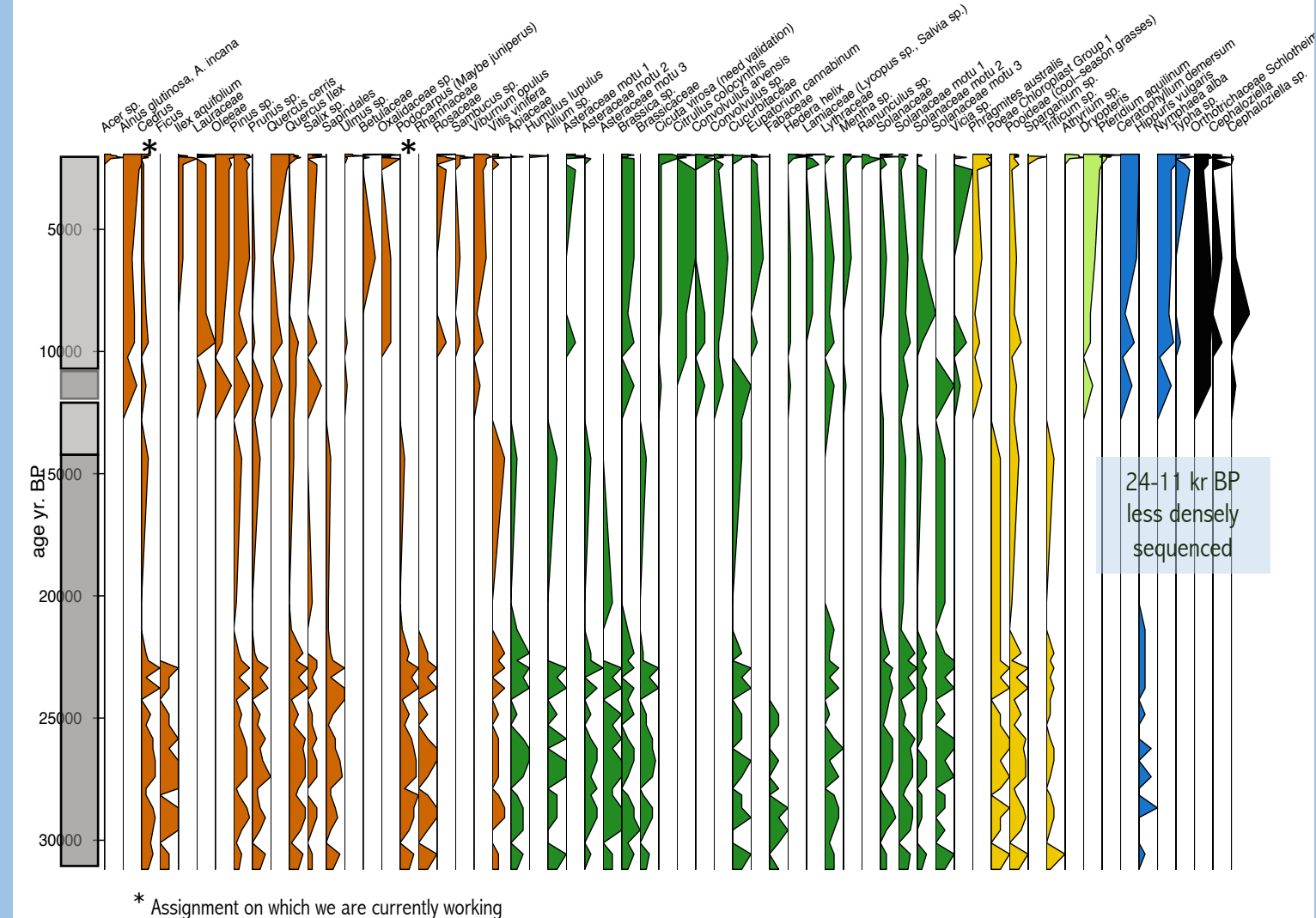
- 0-33 KYR BP: 62 TAXA (27 extended to the Pleniglacial; 10 only Pleniglacial):

- 22 trees/shrubs
- 25 herbs
- 5 grasses
- 3 ferns
- 4 aquatics
- 3 liverworts

Very restrictive assignment: 100% match, only abundant taxa shown and present in > 2 samples. Less densely sequenced in the middle part of the core due to inhibition.

- 0-15 KYR BP: 58 TAXA **
- More taxa can be found: PCR inhibition negative effect removed 2/3 of our samples!

SHOTGUN SEQUENCING & CAPTURE ENRICHMENT: ONGOING STUDY
Preliminary results not shown.



* Due to PCR inhibition and low read count

** 40 taxa detected with pollen in Allen *et al.* 2002 (0-15 KYR BP)

NEXT:

METABARCODING: Increase the number of samples, increase resolution, map climatic transitions better and include low-abundant and rare taxa.

SHOTGUN SEQUENCING & CAPTURE ENRICHMENT: We are currently testing the new bait set designed based on ancestral plant sequences from Fagales, Pinales, Asterales and Poales.

WANT TO KNOW MORE?

laura.parducci@uniroma1.it
<https://laurap.it/index.html>

SEE ALSO OUR RESEARCH ON GLACIAL SURVIVAL OF SPRUCE IN SCANDINAVIA

https://presentations.copernicus.org/EGU2020/EGU2020-21385_presentation.pdf

THIS SESSION 16:38-16:41; D633 | EGU2020-21385

THANKS TO:

- The Swedish Research Council
- The Swedish Phytogeographical Society
- Carl Trygger's Foundation
- Formas Research Council

LAGO GRANDE DI MONTICCHIO



quaternary

Quaternary (ISSN 2571-550X, ESCI Indexed) is an international academic #OpenAccess journal covering all aspects of #Quaternary Science
<https://www.mdpi.com/journal/quaternary>