Holocene environmental and climatic dynamics in the Dolomites (Eastern Italian Alps) reconstructed from pollen and geochemical analyses

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Outline

- About the project
- Study area
- Strategy
- Results
- Climate and human impact
- Conclusions and future perspectives

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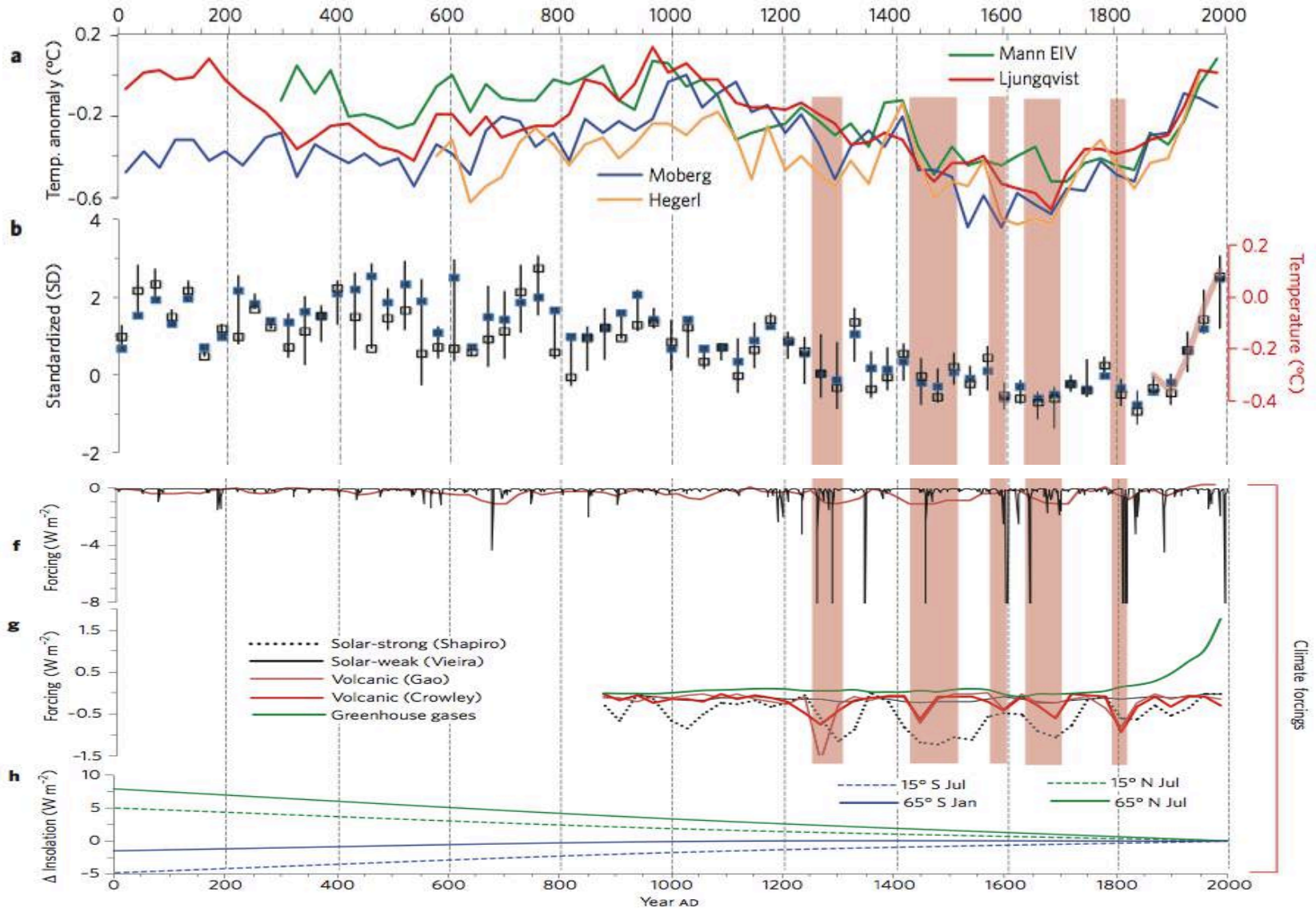
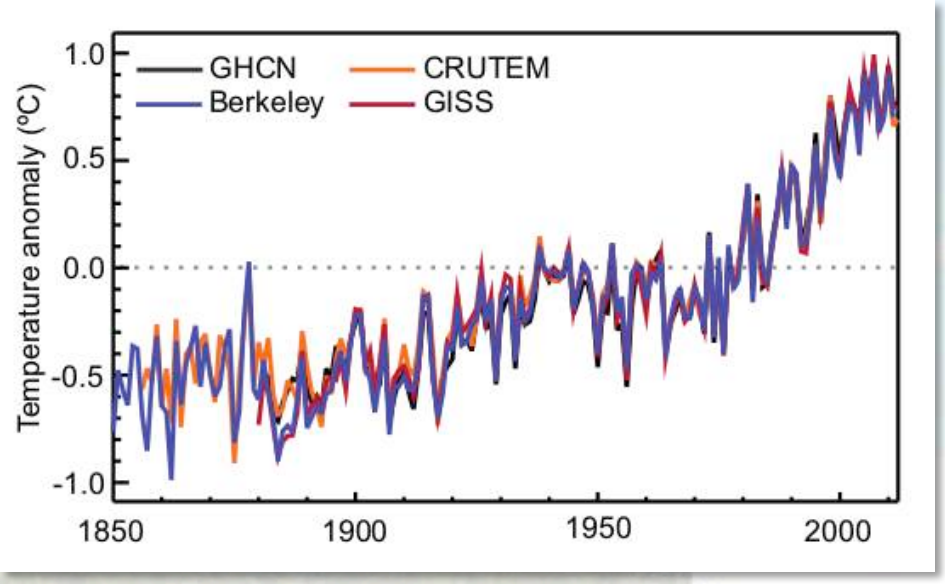


(Naturegeoscience, 2013)

ABOUT THE PROJECT



Global annual average land-surface air temperature anomalies relative to a 1961–1990 (**IPCC, 2013**)

Perimeter of Alps as described by the Alpine Convention (www.alpconv.org)

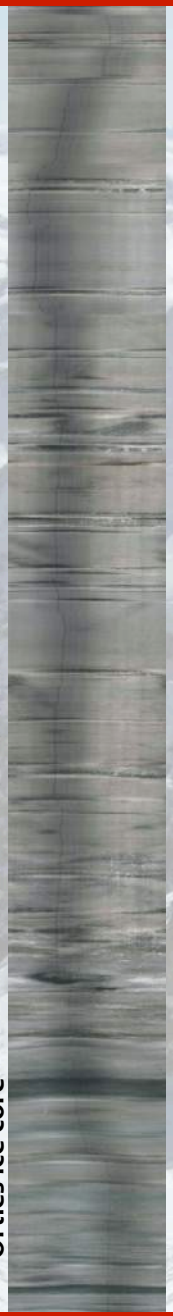
Reconstruction of past environmental and climatic conditions

→better understanding of **natural and anthropogenic forcings** implied in the regulation of the climate system

→ first step for the **understanding of the future climate changes** in this region

→ TERRESTRIAL AND GLACIAL ARCHIVES

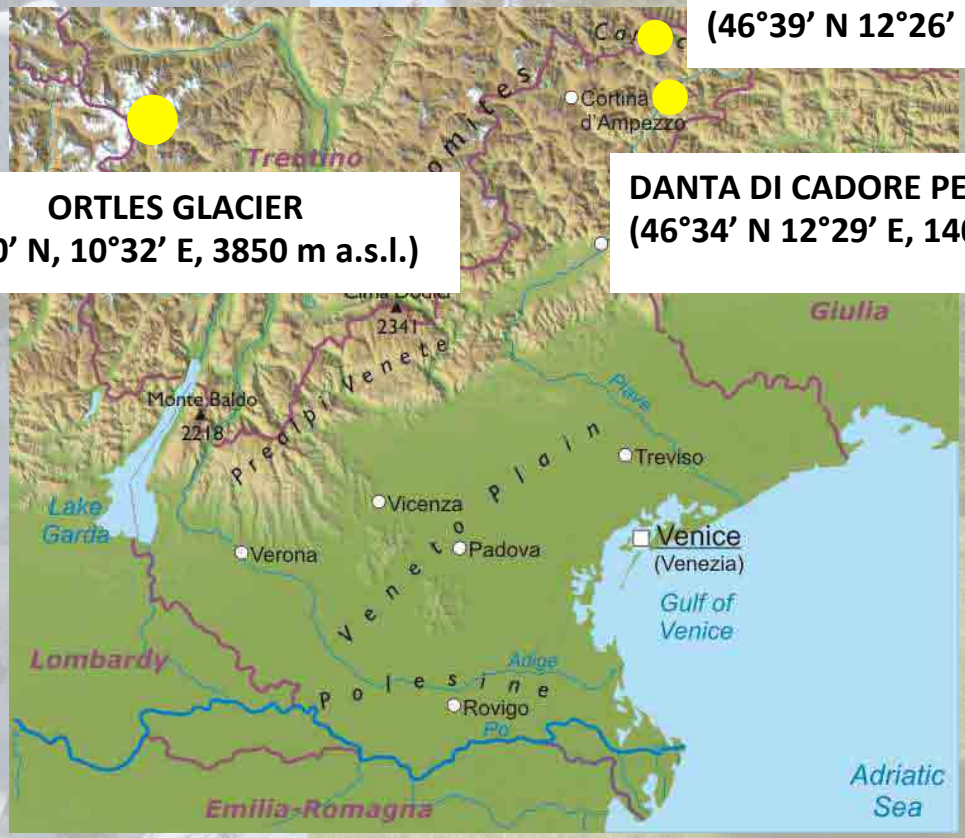
→ MULTI-PROXY APPROACH



COLTRONDO PEAT BOG
(46°39’ N 12°26’ E, 1800 m a.s.l.)

ORTLES GLACIER
(46°30’ N, 10°32’ E, 3850 m a.s.l.)

DANTA DI CADORE PEAT BOG
(46°34’ N 12°29’ E, 1400 m a.s.l.)



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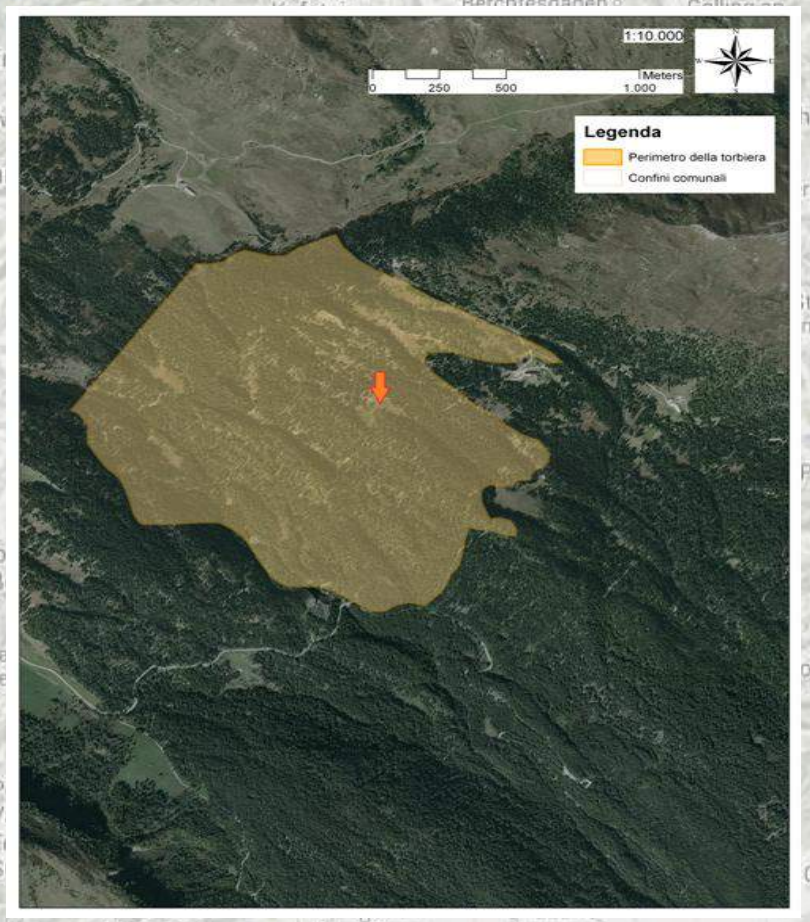
PEAT BOG ARCHIVES – Coltrondo

COLTRONDO PEAT BOG (46°39' N 12°26' E)



- Located at 1800 m a.s.l., in the upper sector of the Piave river basin
- 3.7 ha extent; part of a peatland system (14 ha)

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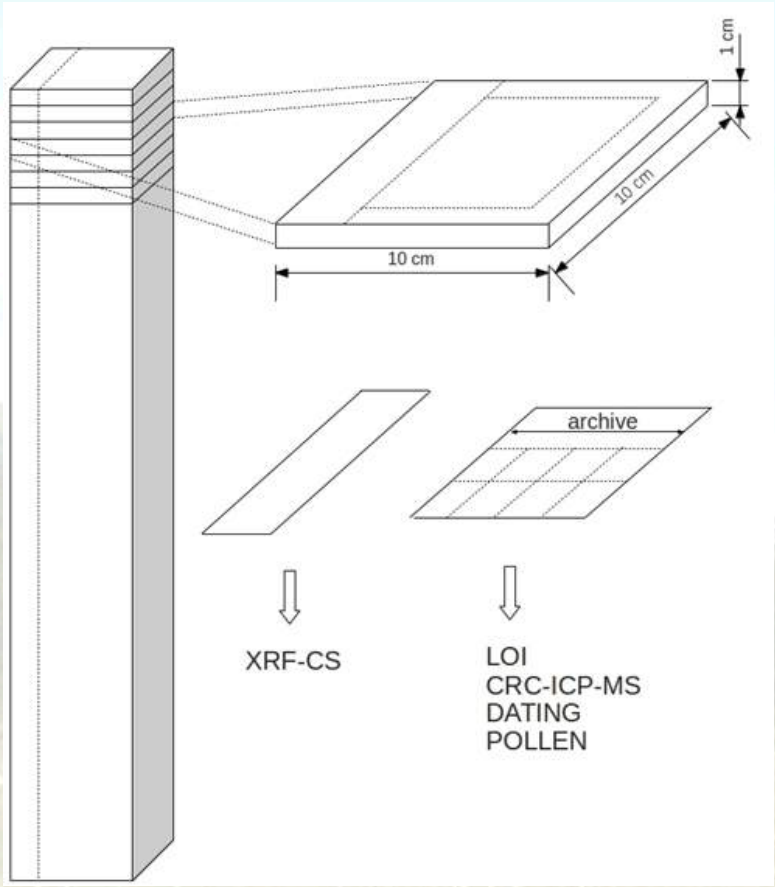
STRATEGY – Sampling and subsampling

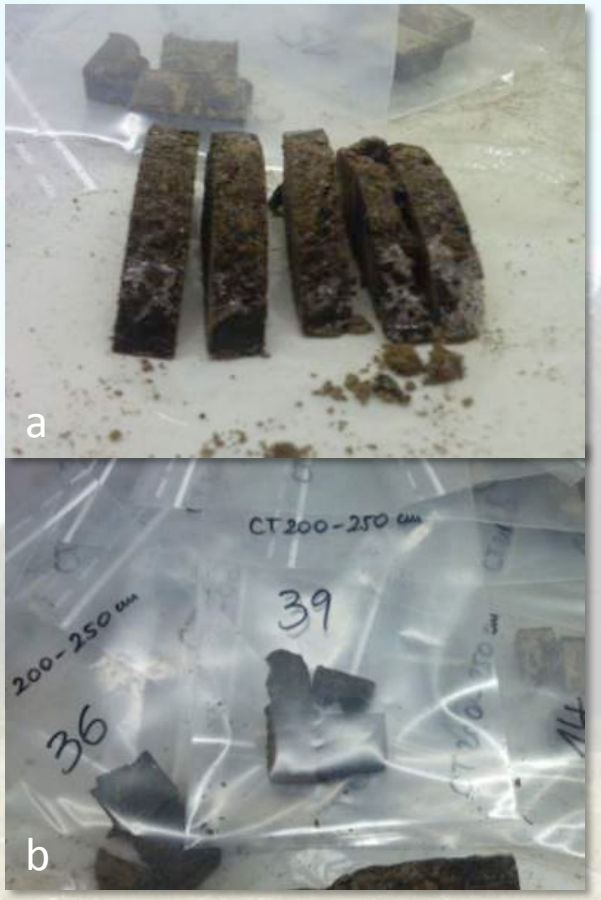
Peat core retrieved →
2.5 m depth

0 – 100 cm →
Wardenaar peat cutter

100 – 250 cm →
Titanium Belarus corer

STRATEGY – Sampling and subsampling

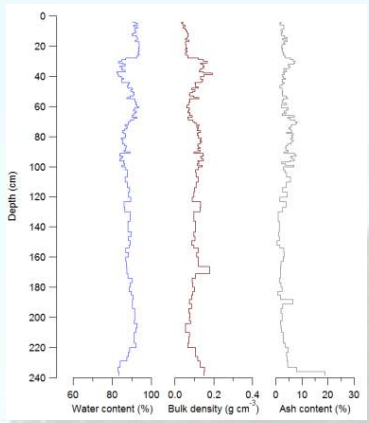




Subsampling in cold conditions (-18°C)

Chronology

^{14}C and ^{210}Pb dating

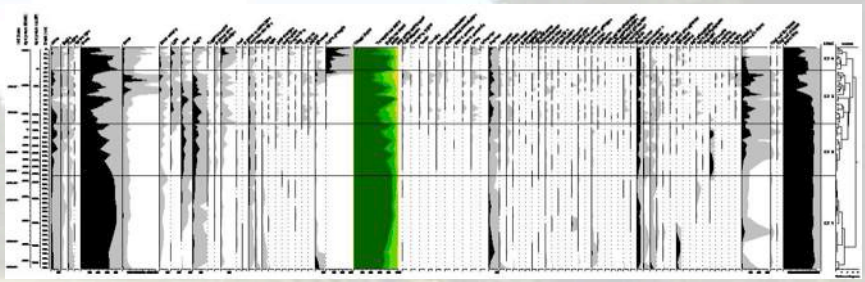


Physical analyses

LOI (loss on ignition):
bulk density, water content, ash

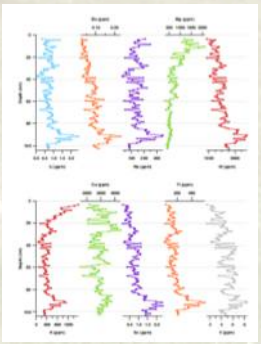
Biological analyses

Pollen, non pollen palynomorphs and microcharcoal analyses



Geochemical analyses

Major and trace elements, rare earth and lead isotopes



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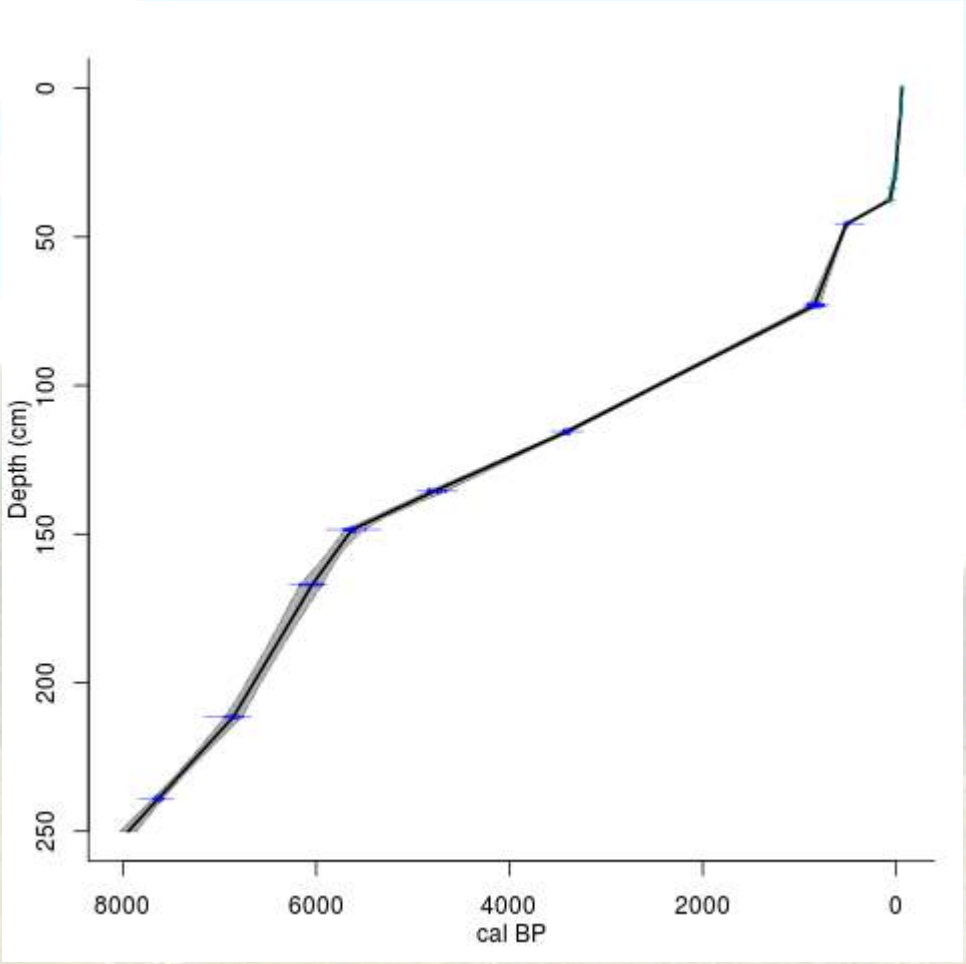
RESULTS - Chronology



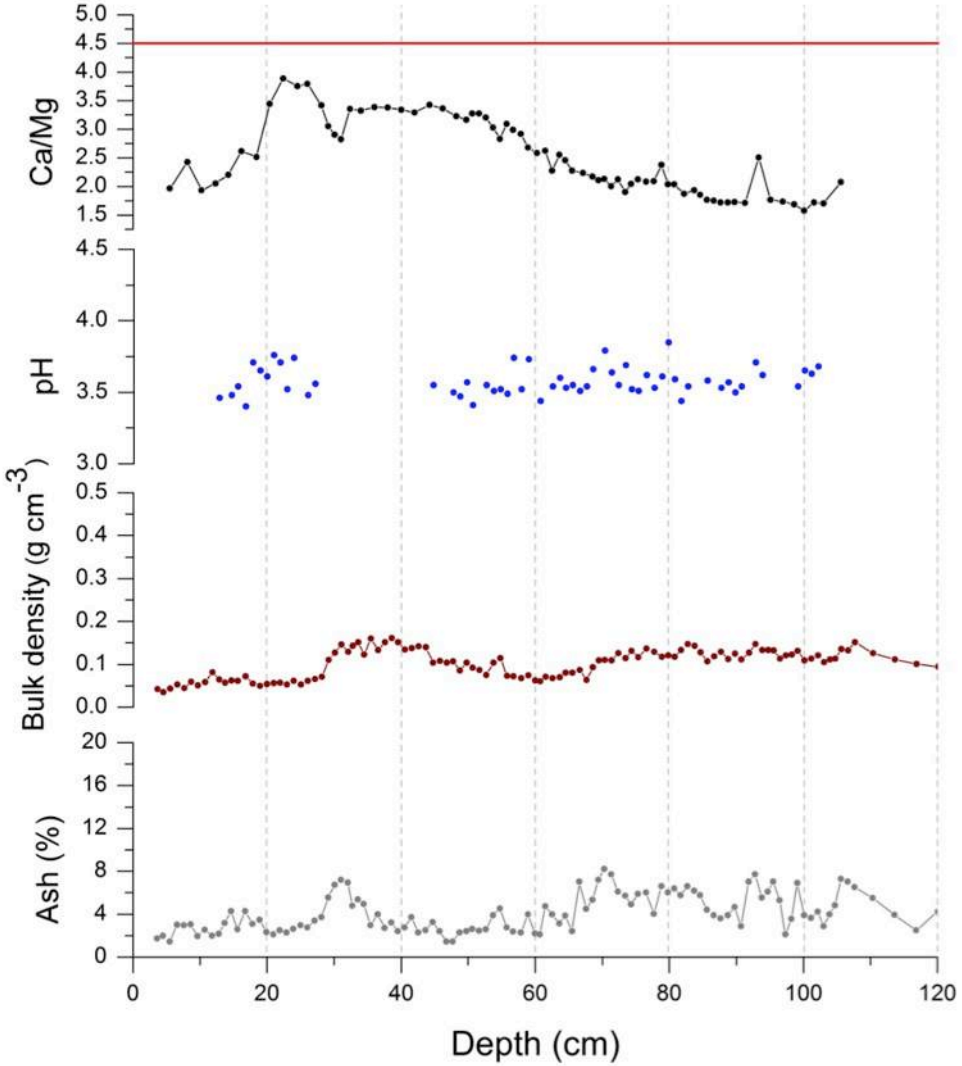
Clam age-depth model (Blaauw, 2010)

One of the most important factors for the successful use of any paleoclimate proxy is chronological control

^{14}C and ^{210}Pb dating of wood and peat bulk samples

~ 7900 years cal BP

RESULTS - Trophic status



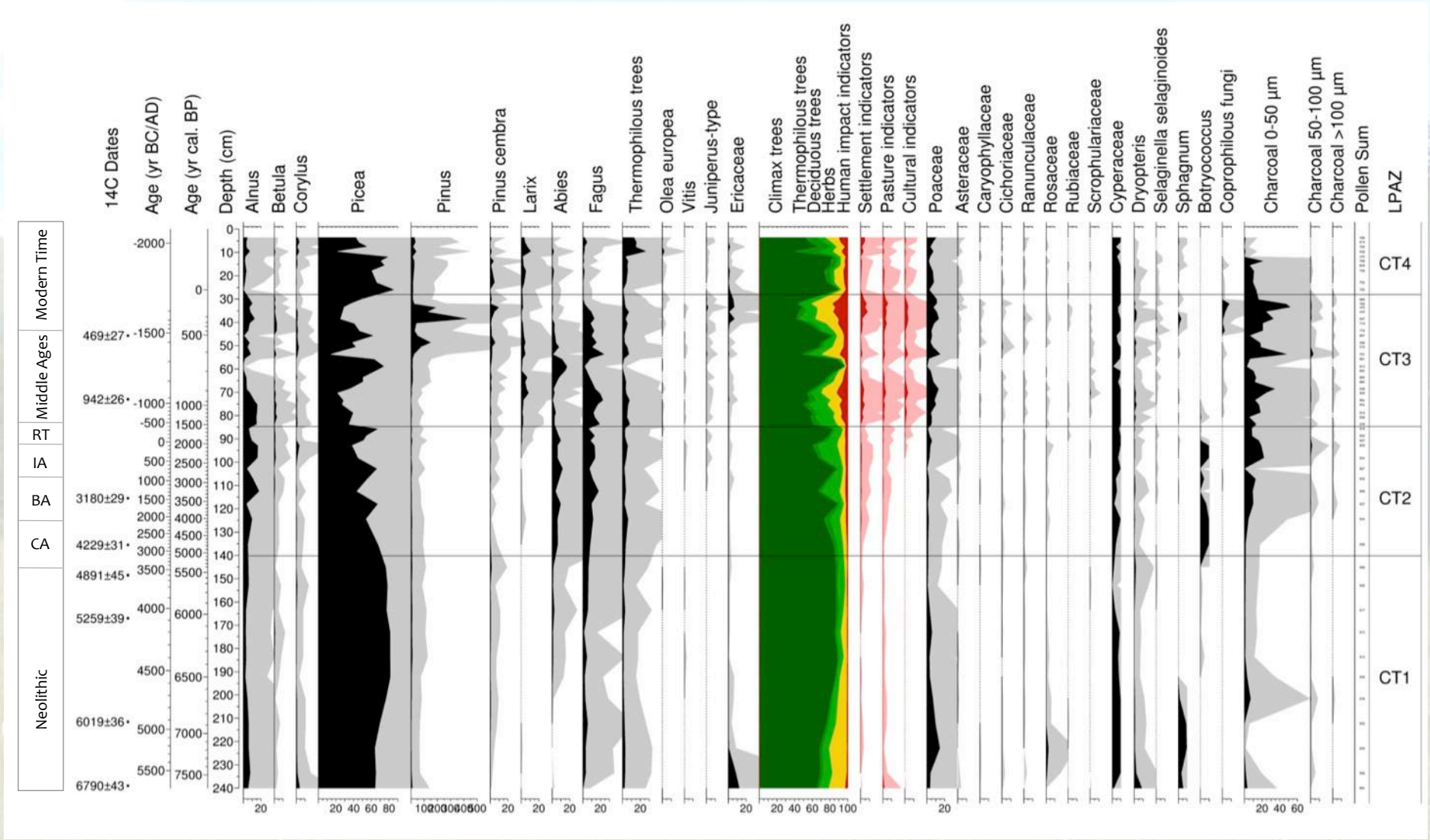
Pore water Ca/Mg < precipitation Ca/Mg

Acidic conditions, pH < 4

Low bulk density and ash content

Bog surface vegetation: *Sphagnum* spp.

Simplified pollen diagram showing percentage values of the main taxa found



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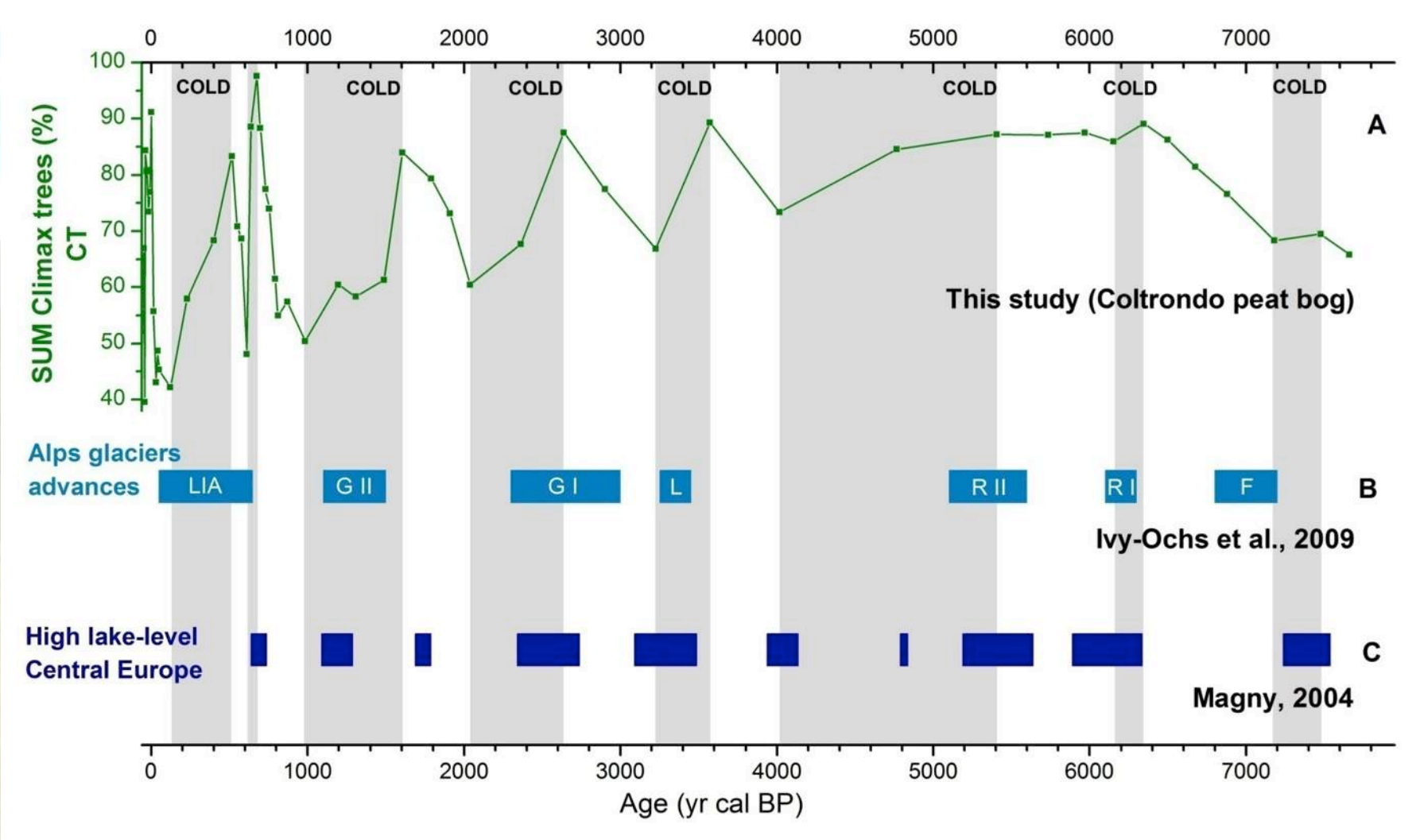
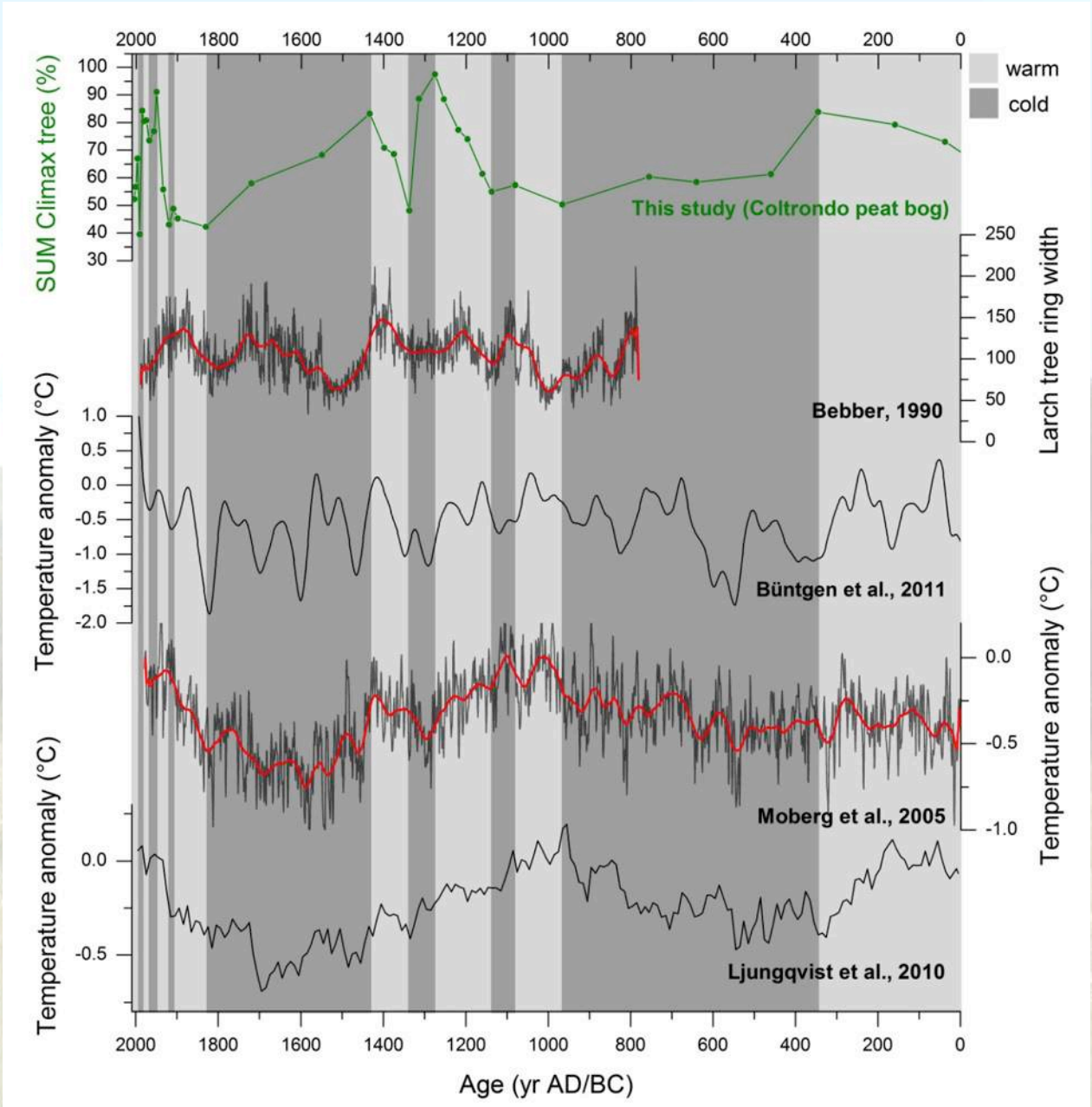
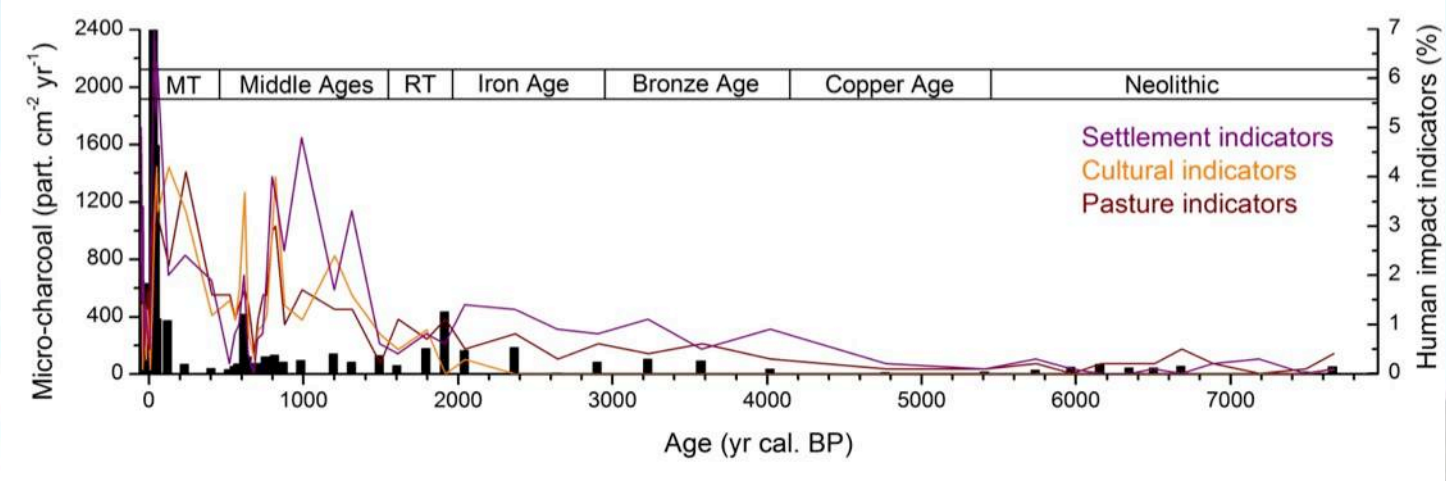
Climatic oscillations during the last 7800 years registered by the Coltrondo bog



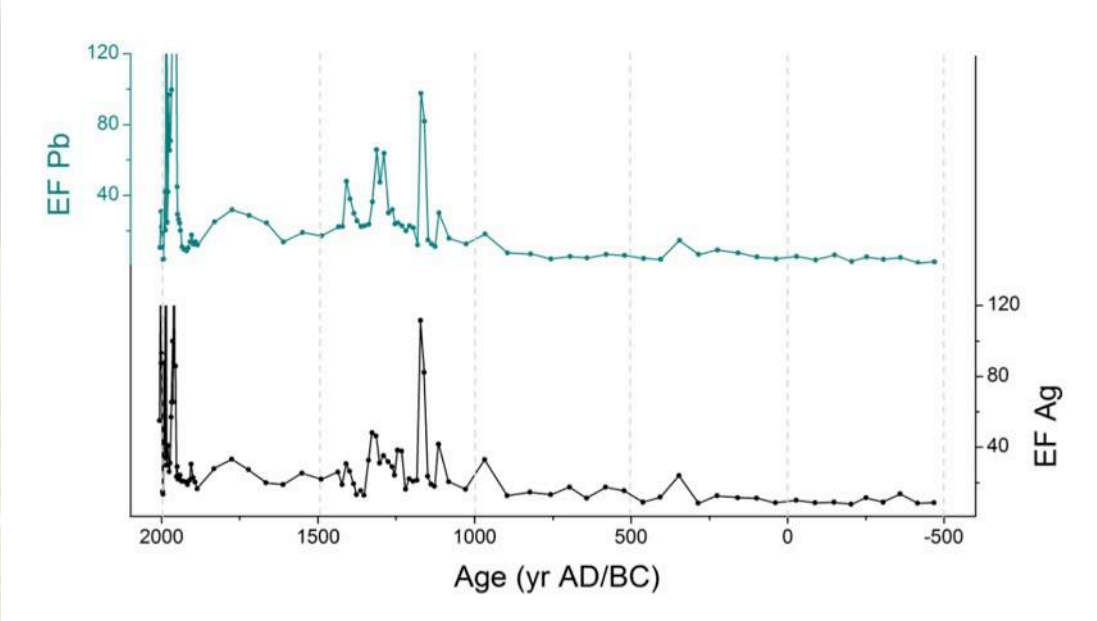
HOLOCENE CLIMATE – the last 2000 years



HUMAN IMPACT



Pasture, agriculture and mining activity registered by pollen and geochemical data



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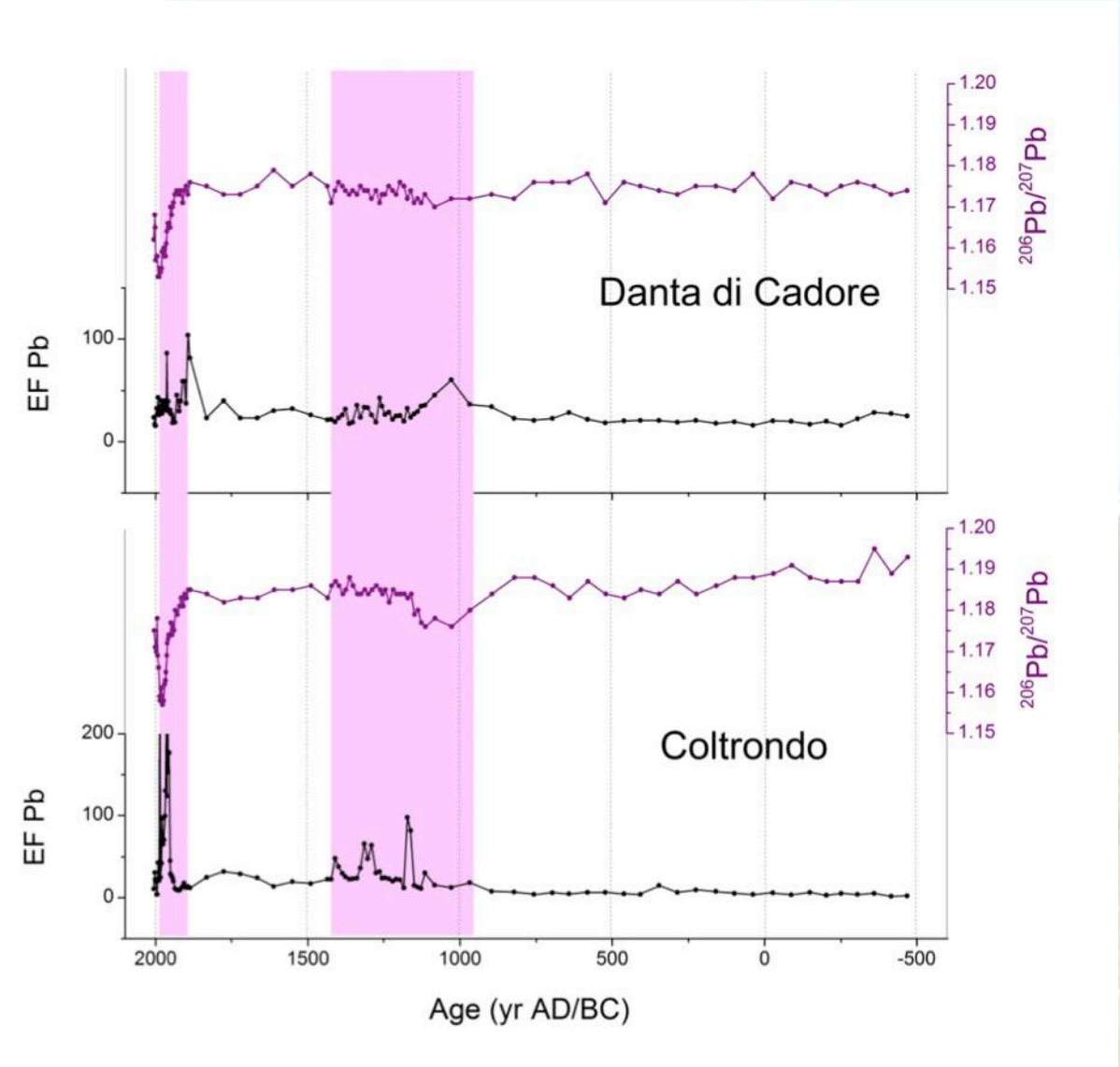

Middle Ages:
mining activities in the area

Modern Time:
- mining activities in the area (Salafossa and Argentiera mines)
- Industrial Revolution
- introduction of leaded gasoline

End of the 80s:
- inactivity of the mining sites
- banning of the leaded gasoline in Europe
- increasing attention to atmospheric pollution in Europe

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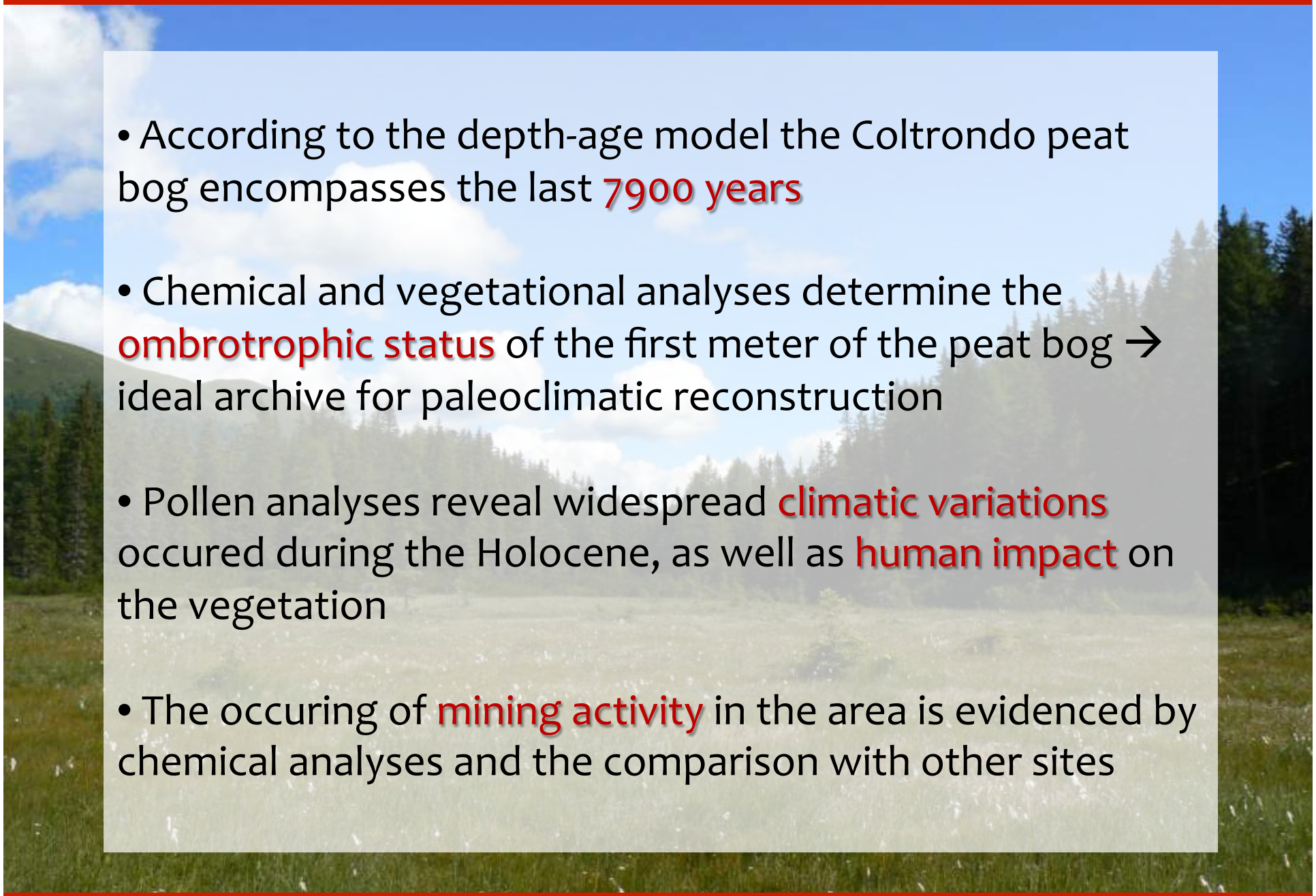
CONCLUSIONS



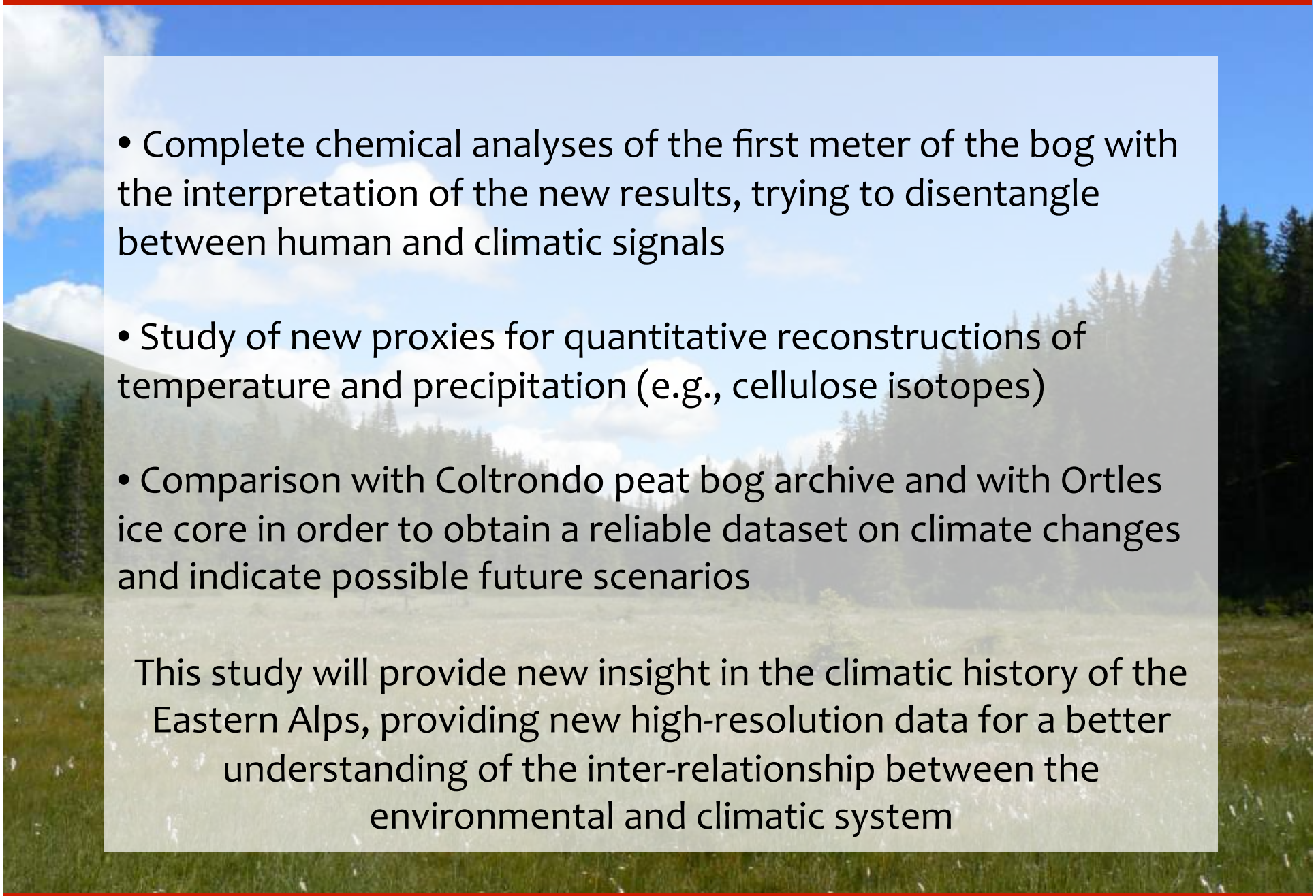
- According to the depth-age model the Coltrondo peat bog encompasses the last 7900 years

- Chemical and vegetational analyses determine the ombrotrophic status of the first meter of the peat bog → ideal archive for paleoclimatic reconstruction

- Pollen analyses reveal widespread climatic variations occured during the Holocene, as well as human impact on the vegetation

- The occuring of mining activity in the area is evidenced by chemical analyses and the comparison with other sites

FUTURE PERSPECTIVES



- Complete chemical analyses of the first meter of the bog with the interpretation of the new results, trying to disentangle between human and climatic signals

- Study of new proxies for quantitative reconstructions of temperature and precipitation (e.g., cellulose isotopes)

- Comparison with Coltrondo peat bog archive and with Ortles ice core in order to obtain a reliable dataset on climate changes and indicate possible future scenarios

This study will provide new insight in the climatic history of the Eastern Alps, providing new high-resolution data for a better understanding of the inter-relationship between the environmental and climatic system


Thanks for your attention!