Two thousand years of atmospheric metal depositions recorded by the ombrotrophic peat bog of Danta di Cadore (North-Eastern Italy)

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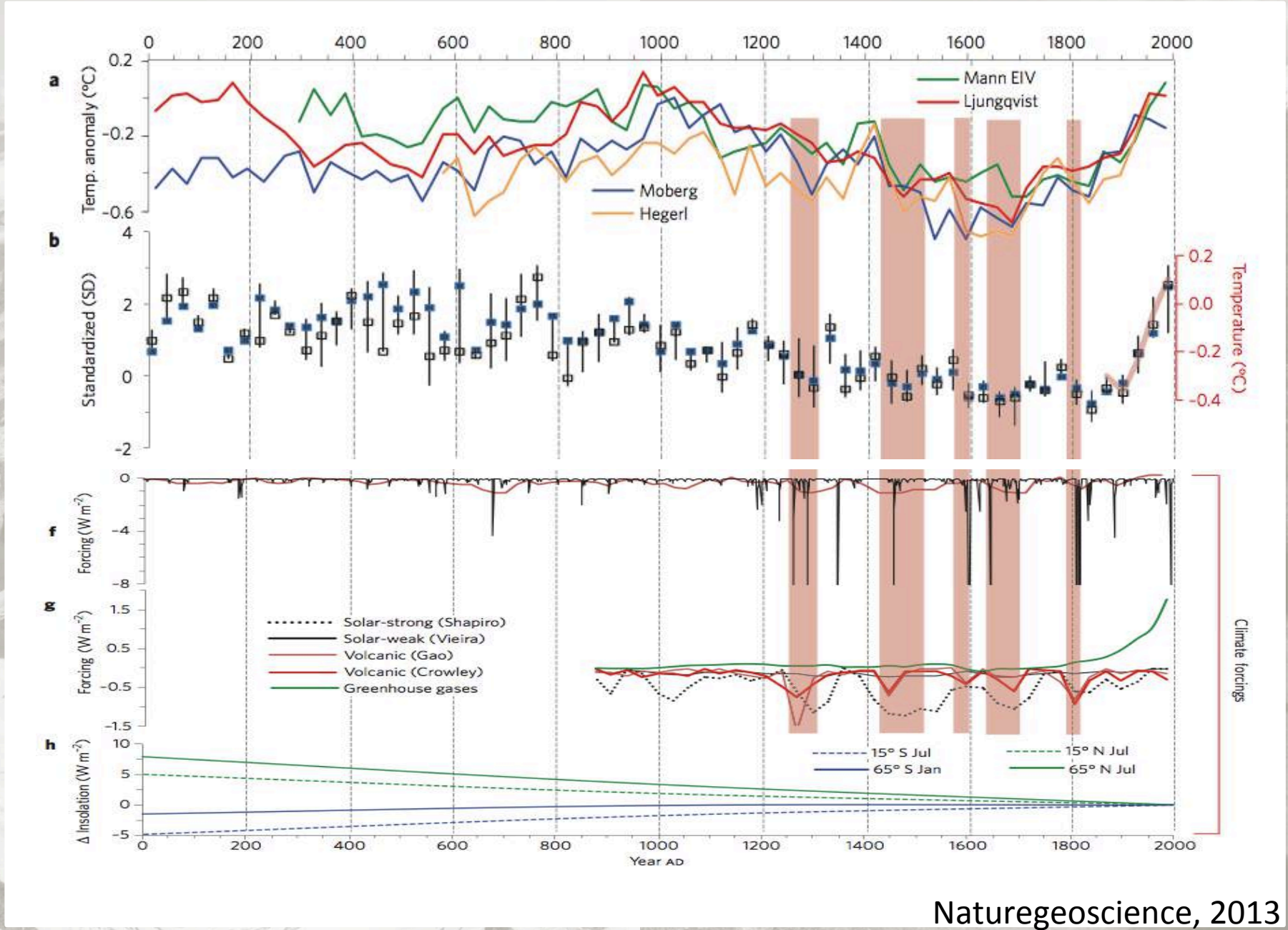


Naturegeoscience, 2013

ABOUT THE PROJECT

Fig. 1 – Perimeter of Alps as described by the Alpine Convention (www.alpconv.org)

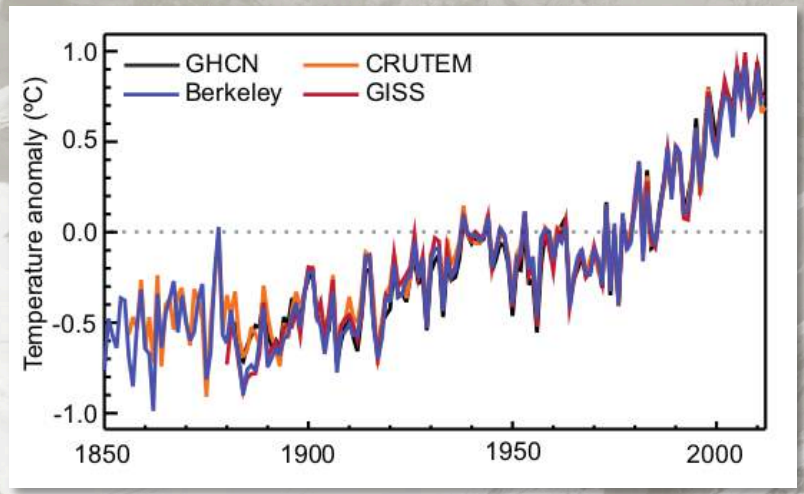


Fig. 2 - Global annual average land-surface air temperature anomalies relative to a 1961–1990 (IPCC, 2013)

The Earth is currently facing a rapid climate change with an unequivocal **global warming** of the climate system (IPCC, 2013)

Alps → ~ + 2°C increase in the last 150 years

Scarcity of high-resolution studies on the environmental and climatic evolution of the **Eastern Italian Alps**

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

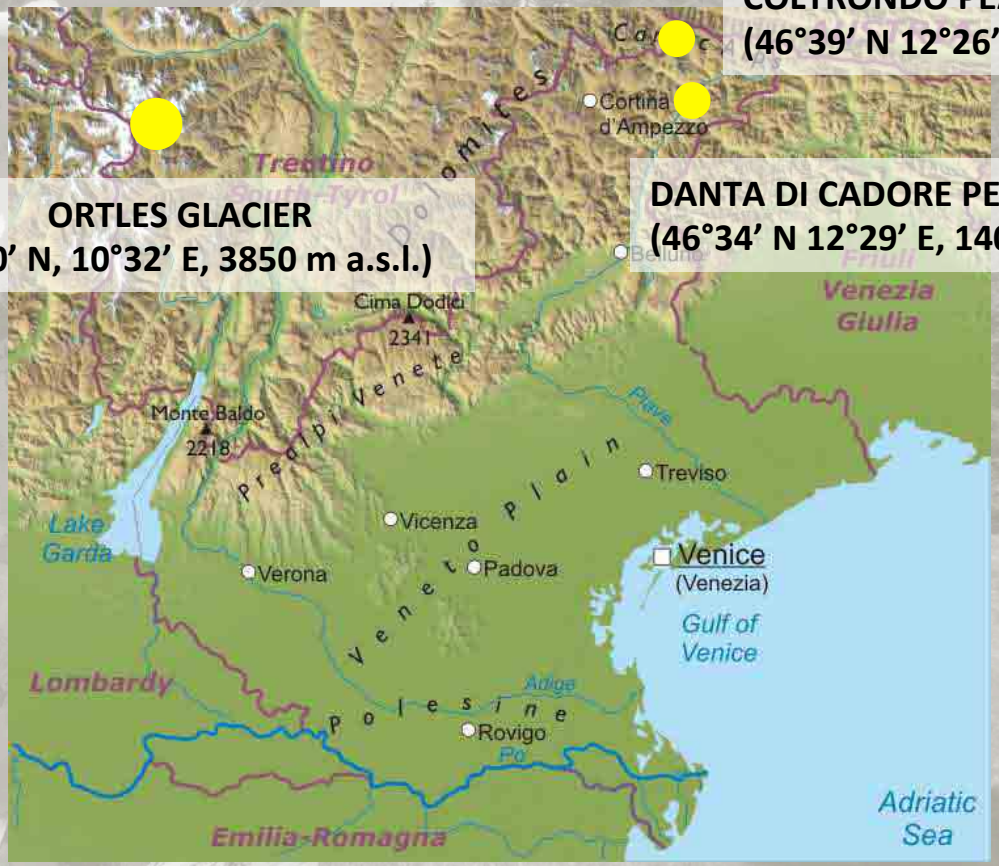
Reconstruct Holocene climatic and environmental variability in the Eastern Italian Alps using

TERRESTRIAL AND GLACIAL ARCHIVES

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

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

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

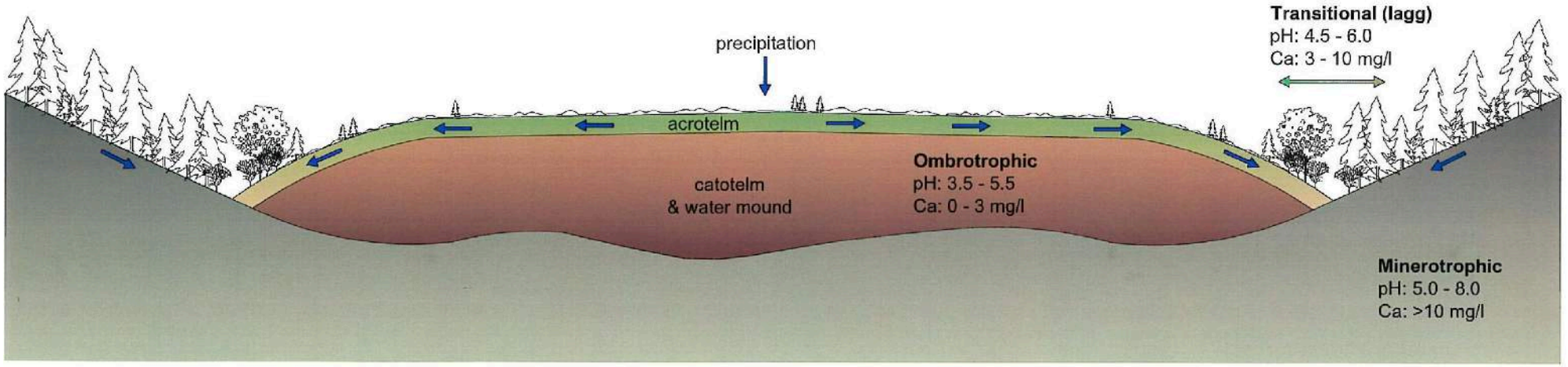


OMBROTROPHIC PEAT BOG

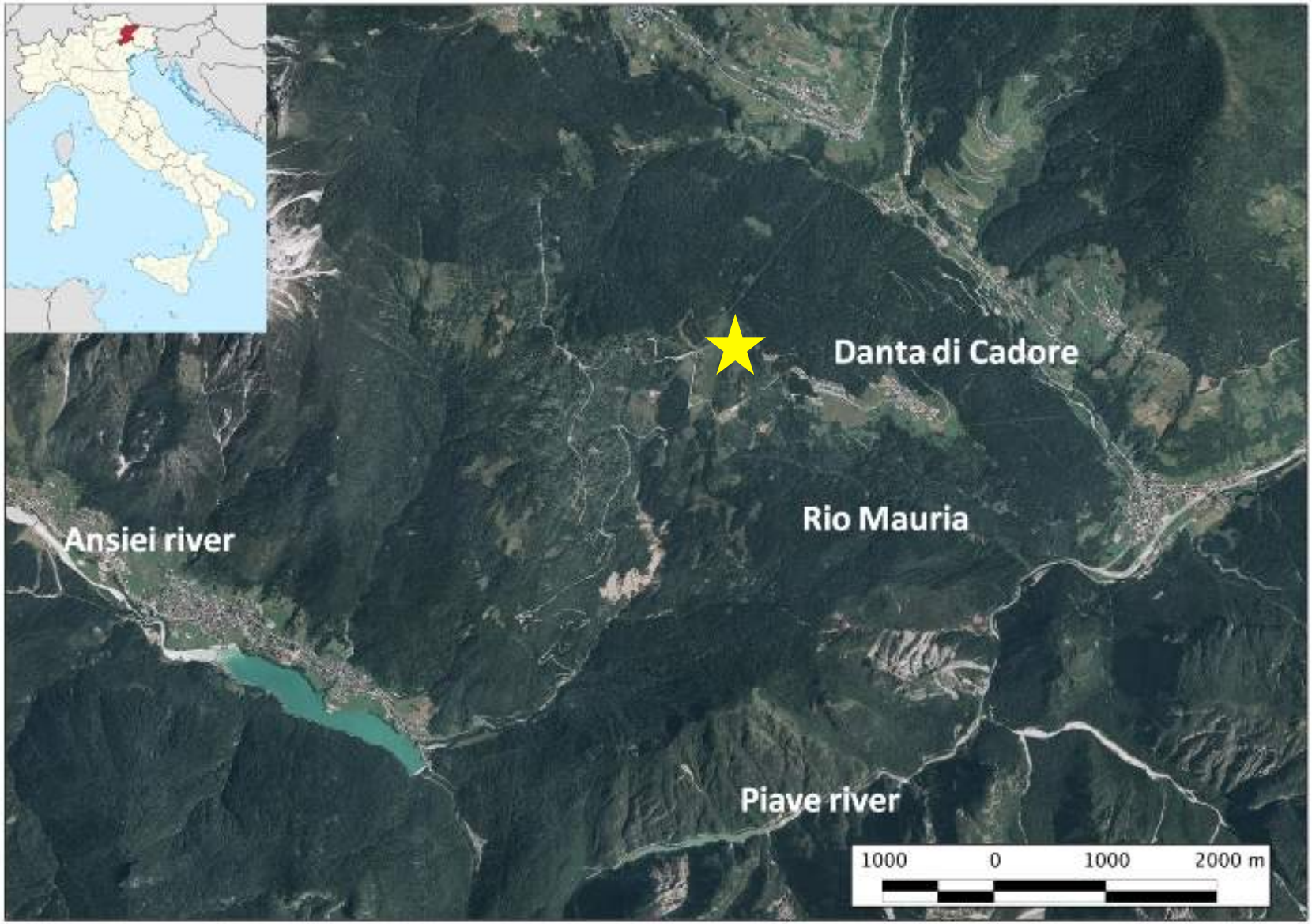
- Global distribution
- high acidic conditions
- high accumulation rate and reduced organic matter decomposition
- receive water only form atmospheric depositions (wet and dry)

Sphagnum spp.

"ombros" = rain
"trophé" = nourishment

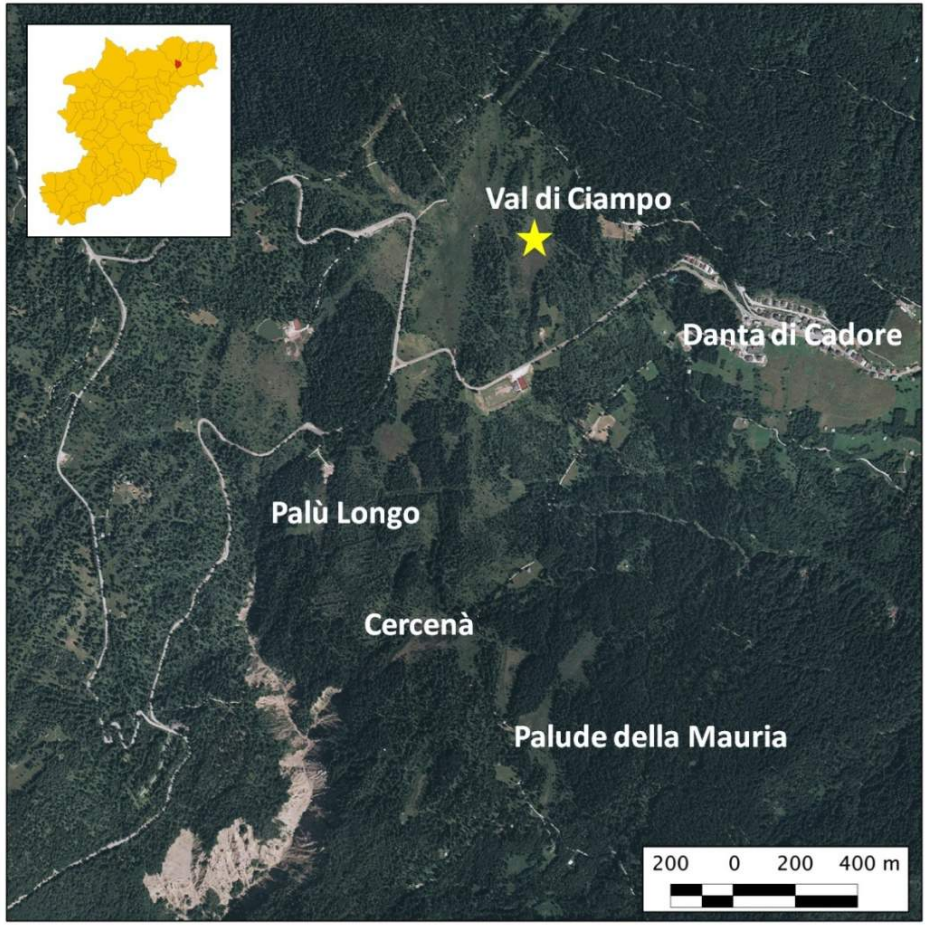


PEAT BOG ARCHIVES – Danta di Cadore



(46°34’ N 12°29’ E, 1400 m a.s.l.)

STRATEGY – Sampling and subsampling

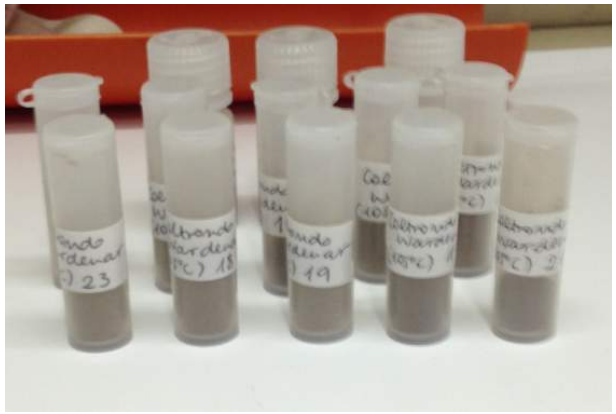


7.0 m core

STRATEGY – Sampling and subsampling

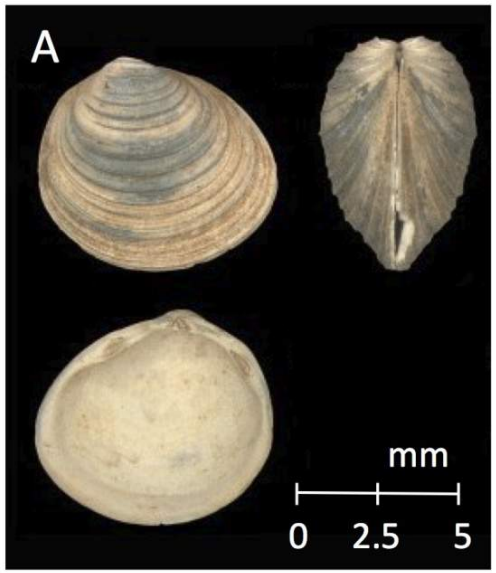
Peat sub-samples cut in coldroom

- Fresh peat
  - **Macrofossil ^{14}C dating**
- Pore water
  - **pH**
  - **EC**
- Bulk 105°C
  - **LOI**
    - **Water content**
    - **Organic matter content**
    - **Ash**
- Bulk 105°C
  - **^{210}Pb dating**
- Bulk 105°C
  - **Delta^{+}**
    - **C tot**
    - **N tot**
    - **δ^{13}C, δ^{15}N**
- Bulk 105°C
  - **ICP-MS previous microwave digestion HNO_3 + HF**
    - **TE**
    - **REE**
    - **Pb isotopes**
- Fresh peat
  - **Acid digestion**
    - **pollen**



Dried peat sub-samples

^{210}Pb **^{137}Cs**



Pisidium shells

Wood macrofossils

^{14}C

X-Ray
Fluorescence core scanner

ICP-MS

29
elements

54
elements


Drosera rotundifolia


Tritus alpestris


Andromeda polifolia


Rana temporaria

RESULTS


Menegazzia terebrat


Eriophorum vaginatum


Parmotrema arnoldii


Sphagum magellanicum

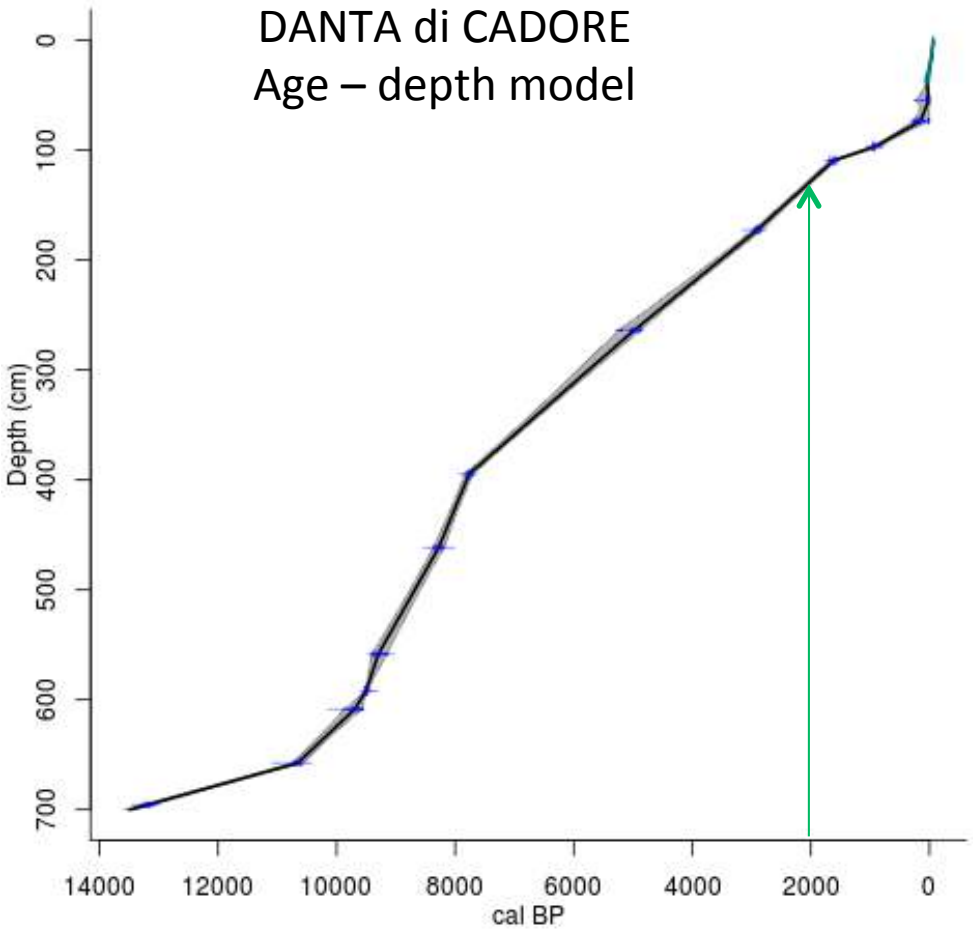


Fig. 1 – *Clam* age-depth model.

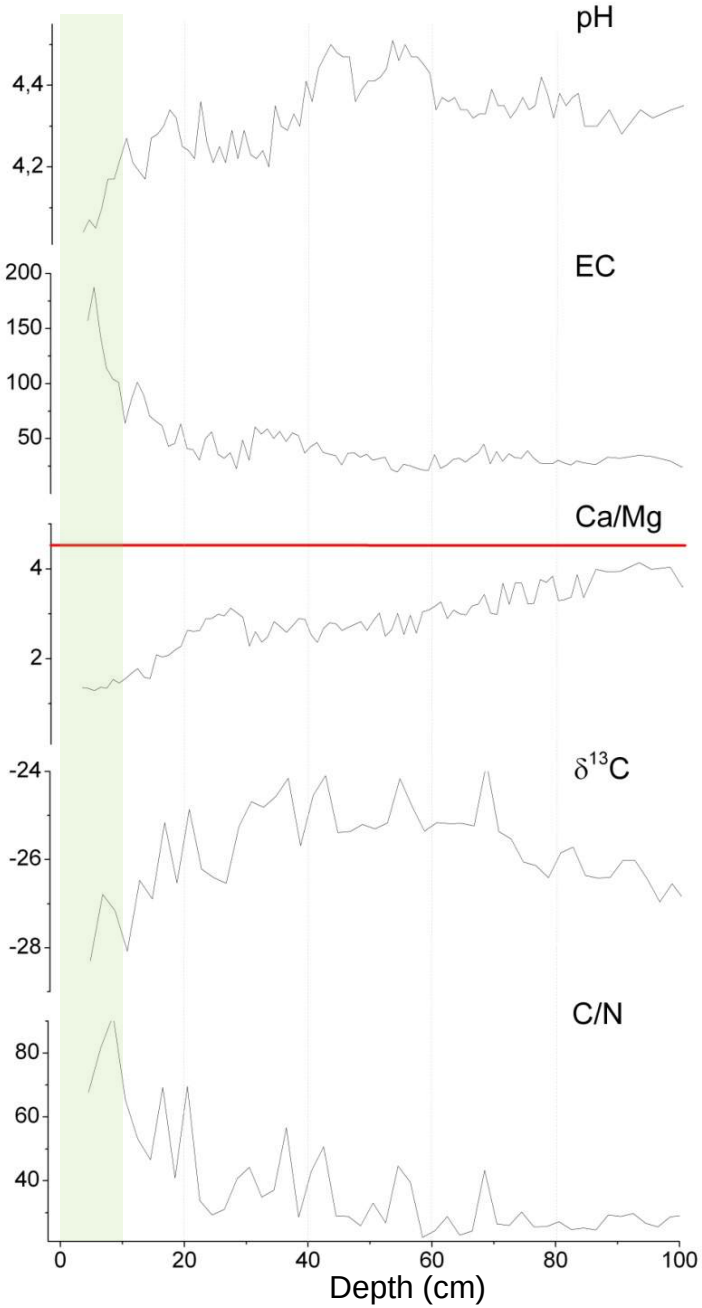
One of the most important factors for the successful use of any palaeoclimate proxy is chronological control

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

Calibration as calendar years before present (cal BP) and creation of a ***Clam*** age-depth (Fig. 1) (Blaauw, 2010)

Blaauw, M., 2010. Methods and code for "classical" age modelling of radiocarbon sequences. *Quater*, 5: 512-518.

RESULTS - TROPHIC STATUS



Acidic conditions, pH < 4.5

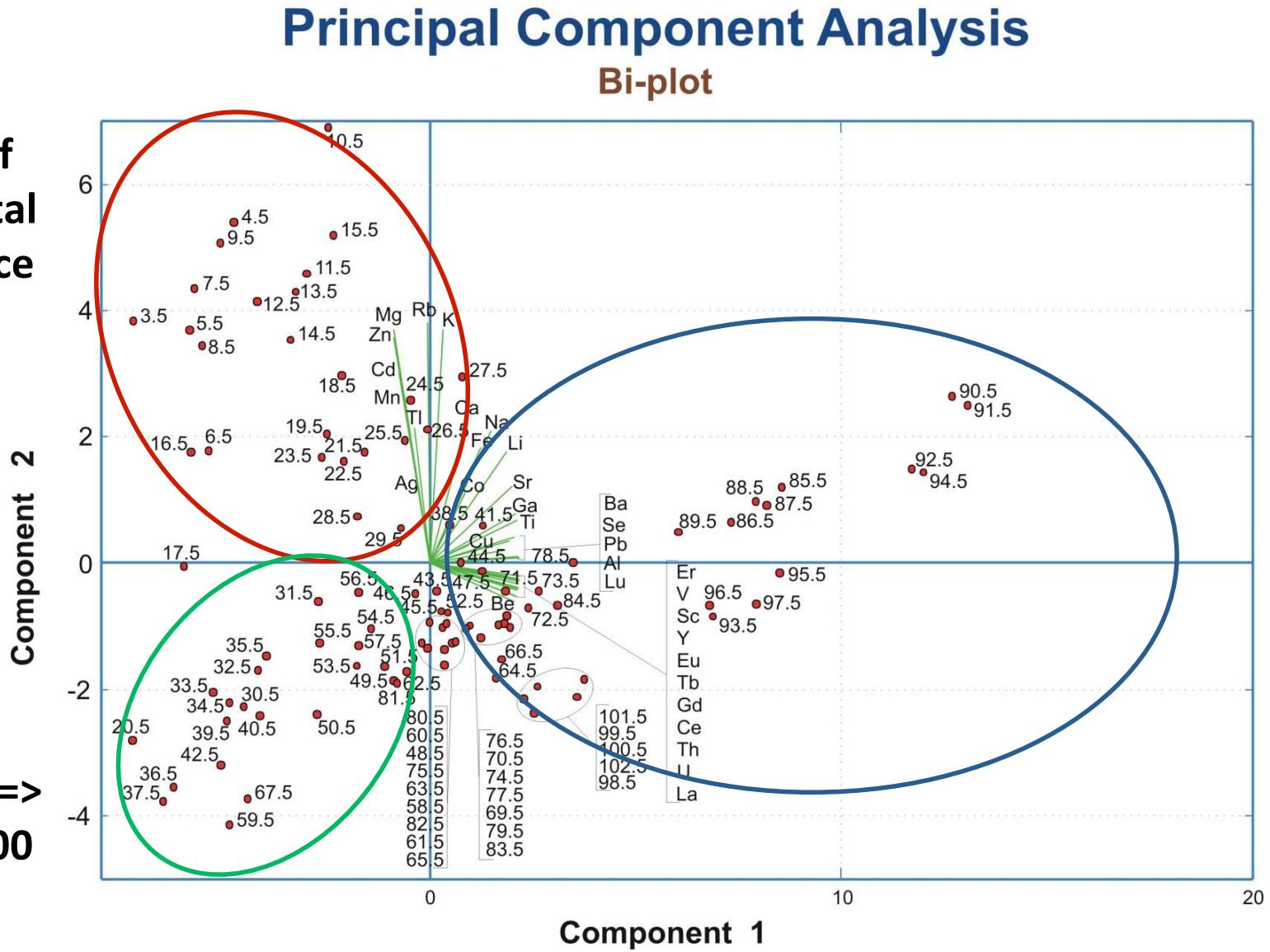
Electrical Conductivity very low

Pore water Ca/Mg < precipitation Ca/Mg

Very low correlation between $\delta^{13}C$ and C/N
$\delta^{13}C$ record is not altered by digenetic processes

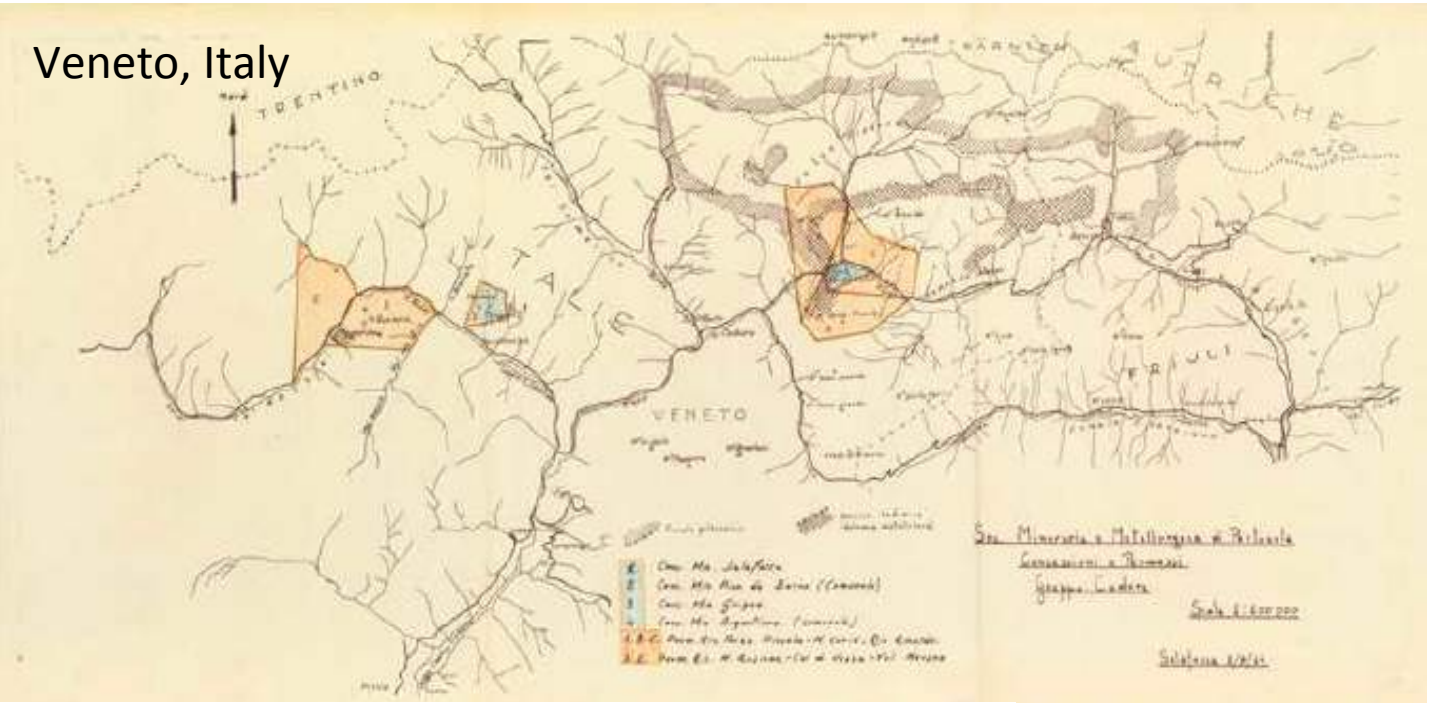
OMBROTROPHY!

78% of the total variance



60 cm => AD 1300

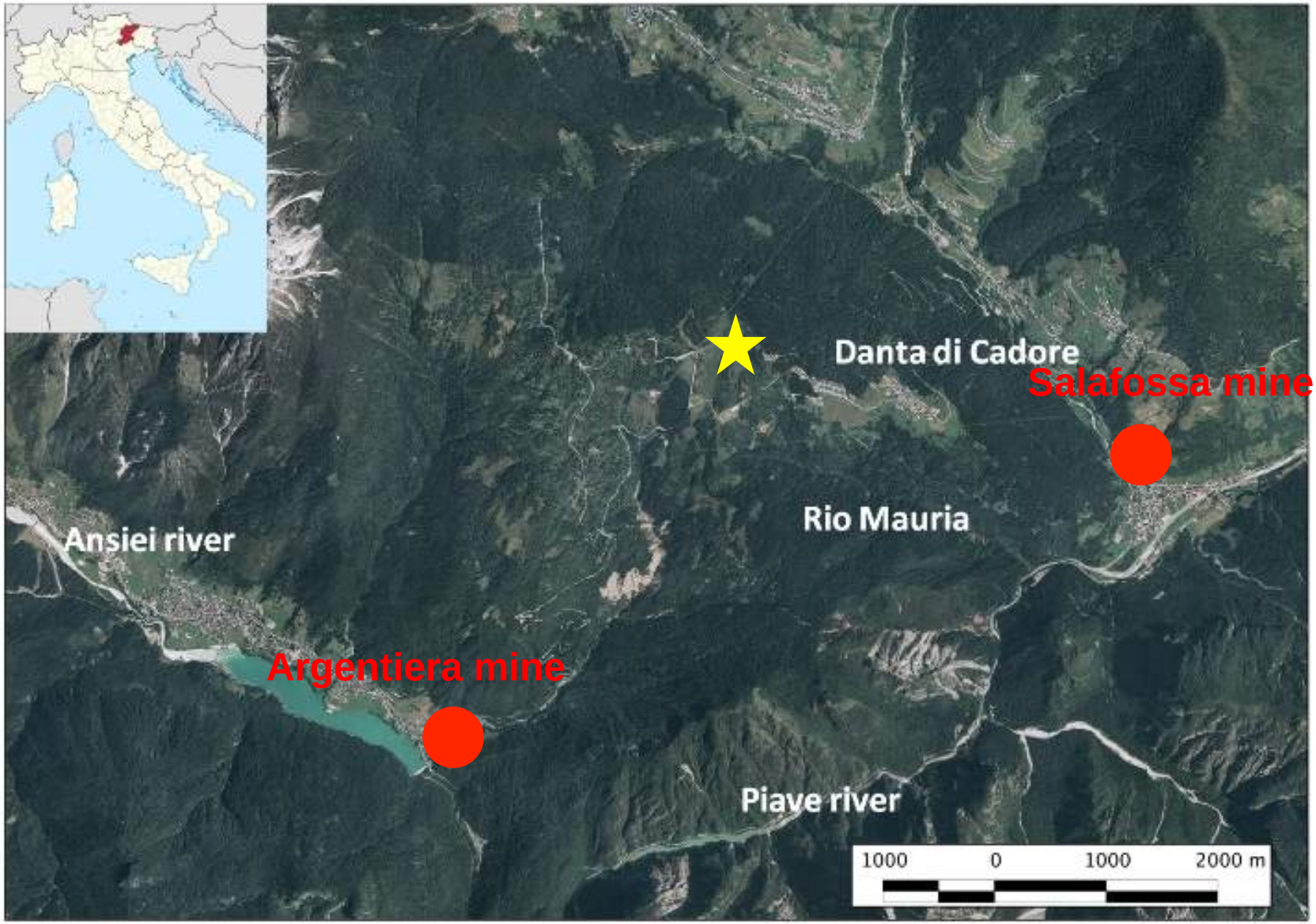
RESULTS – 2000 years of human impact



Pb from argentiferous-lead ores -> Silver

Argentiera and **Salafossa**
mining site
near Auronzo
under german workforces
(Cecchi, 1988; De Vecchi, 1990)

RESULTS – 2000 years of human impact



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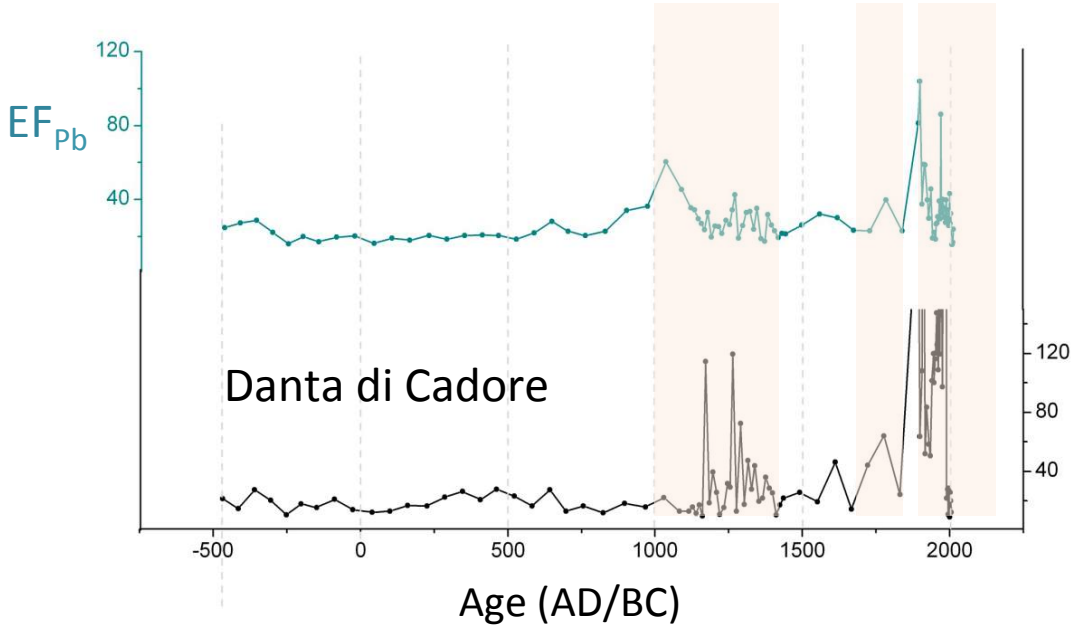

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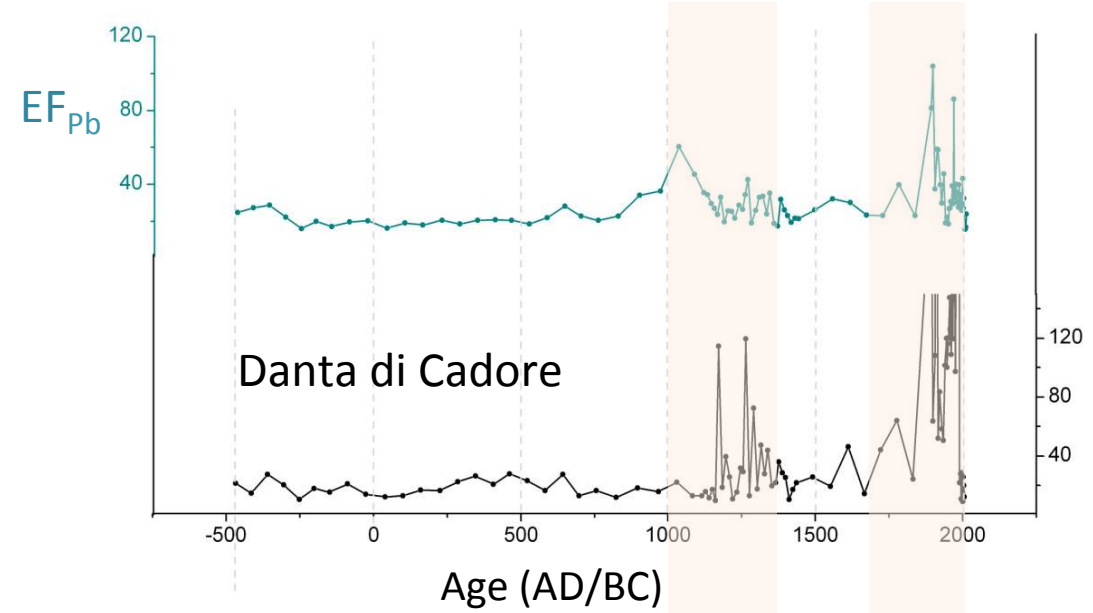
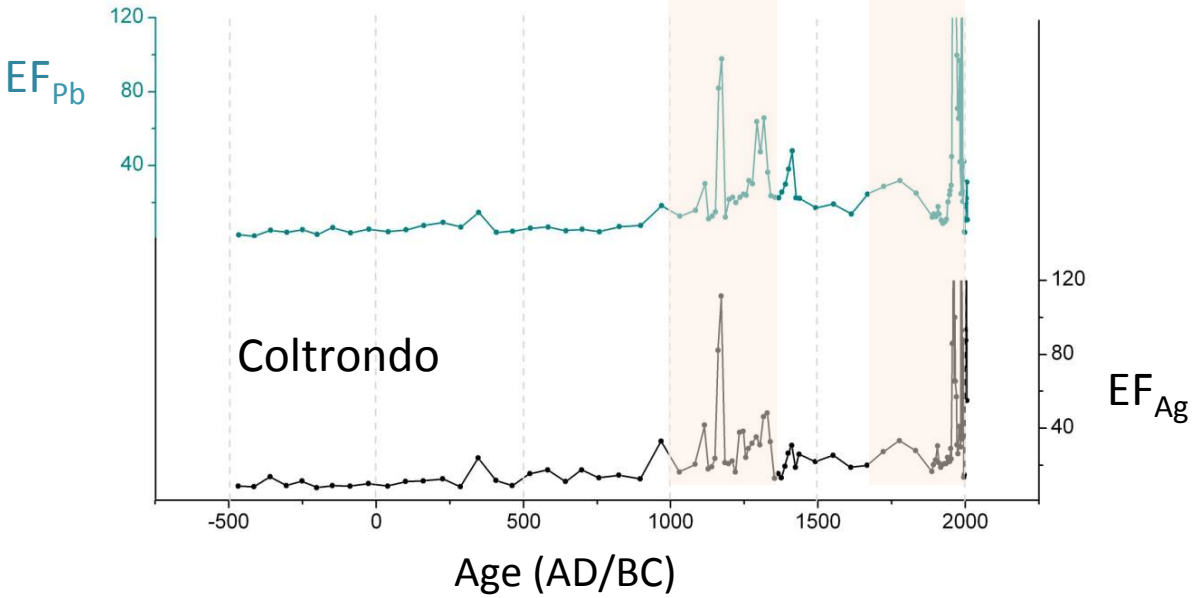
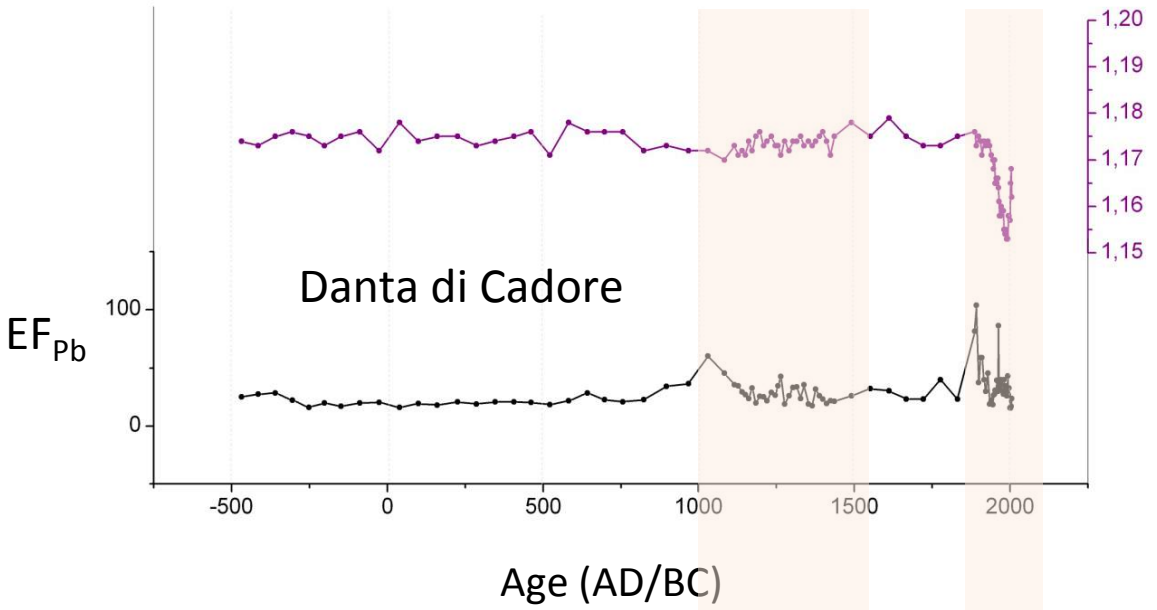




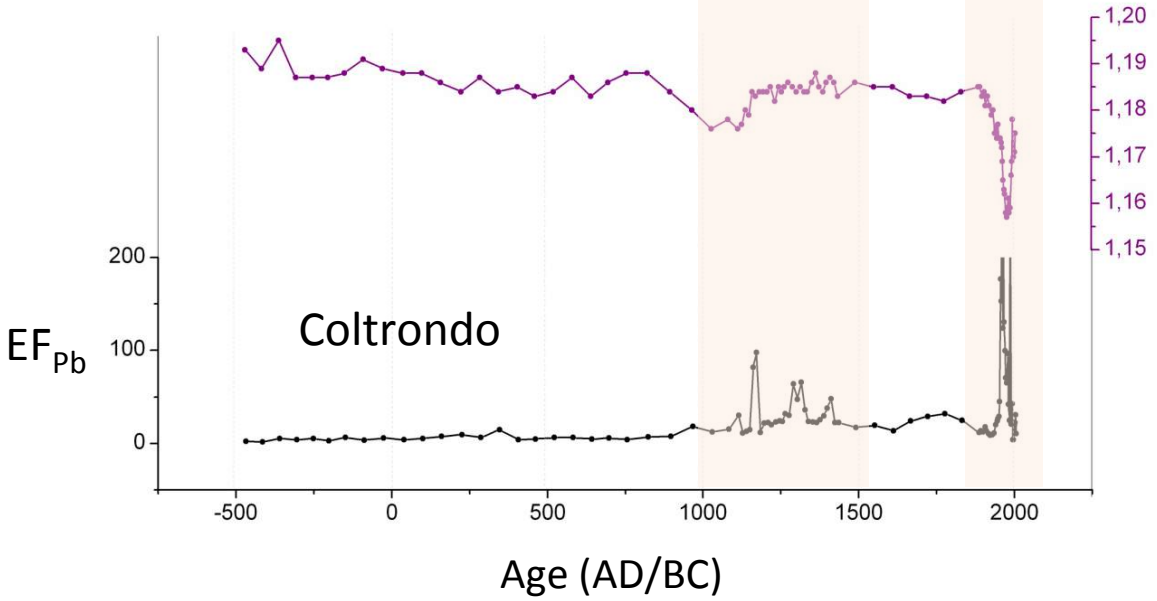
COLTRONDO PEAT BOG
(46°39’ N 12°26’ E, 1800 m a.s.l.)

RESULTS – 2000 years of human impact



$^{206}Pb/^{207}Pb$

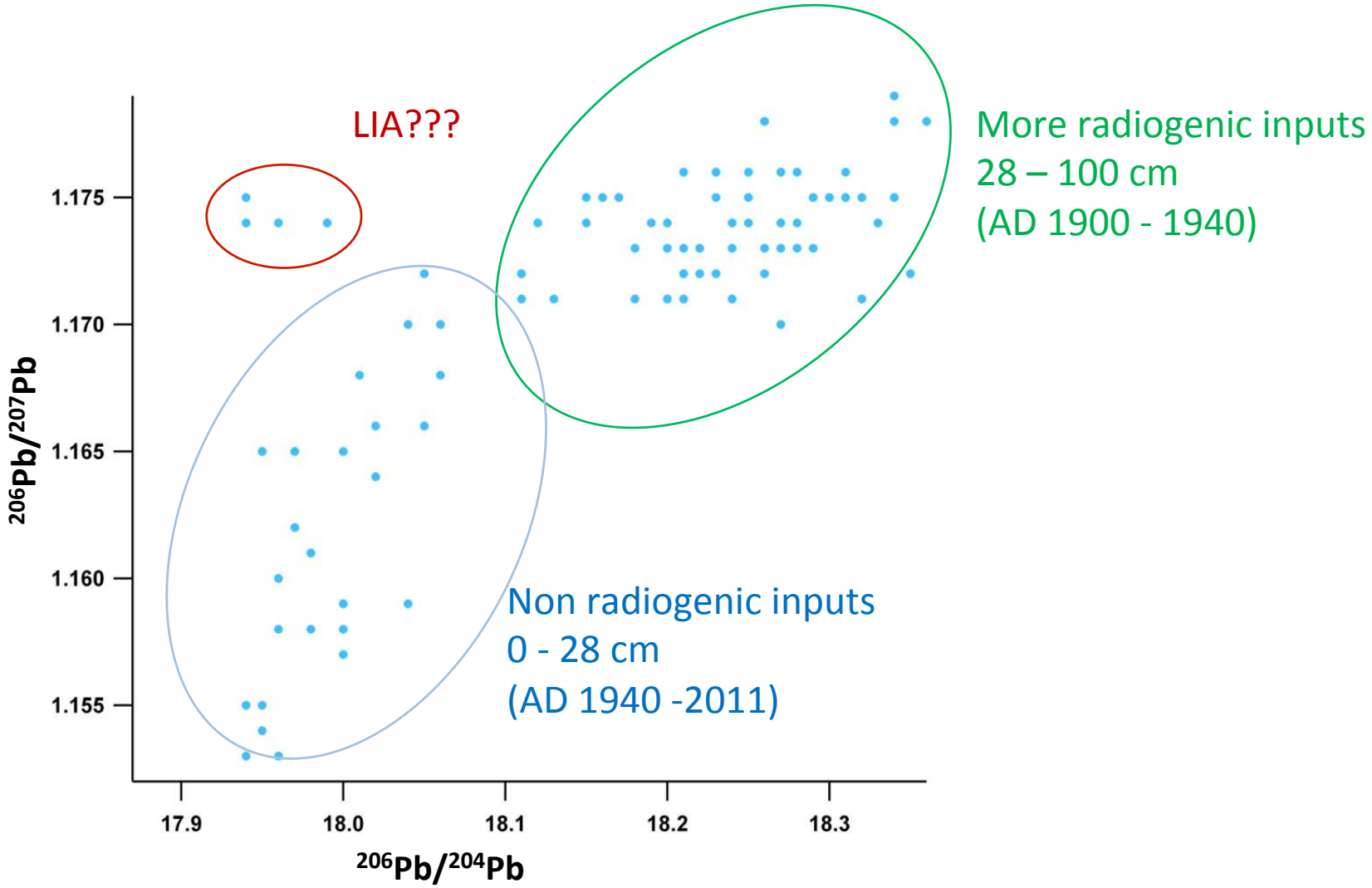
leaded gasoline → 1940s



$^{206}Pb/^{207}Pb$

un-leaded gasoline → 1990s

RESULTS – 2000 years of human impact



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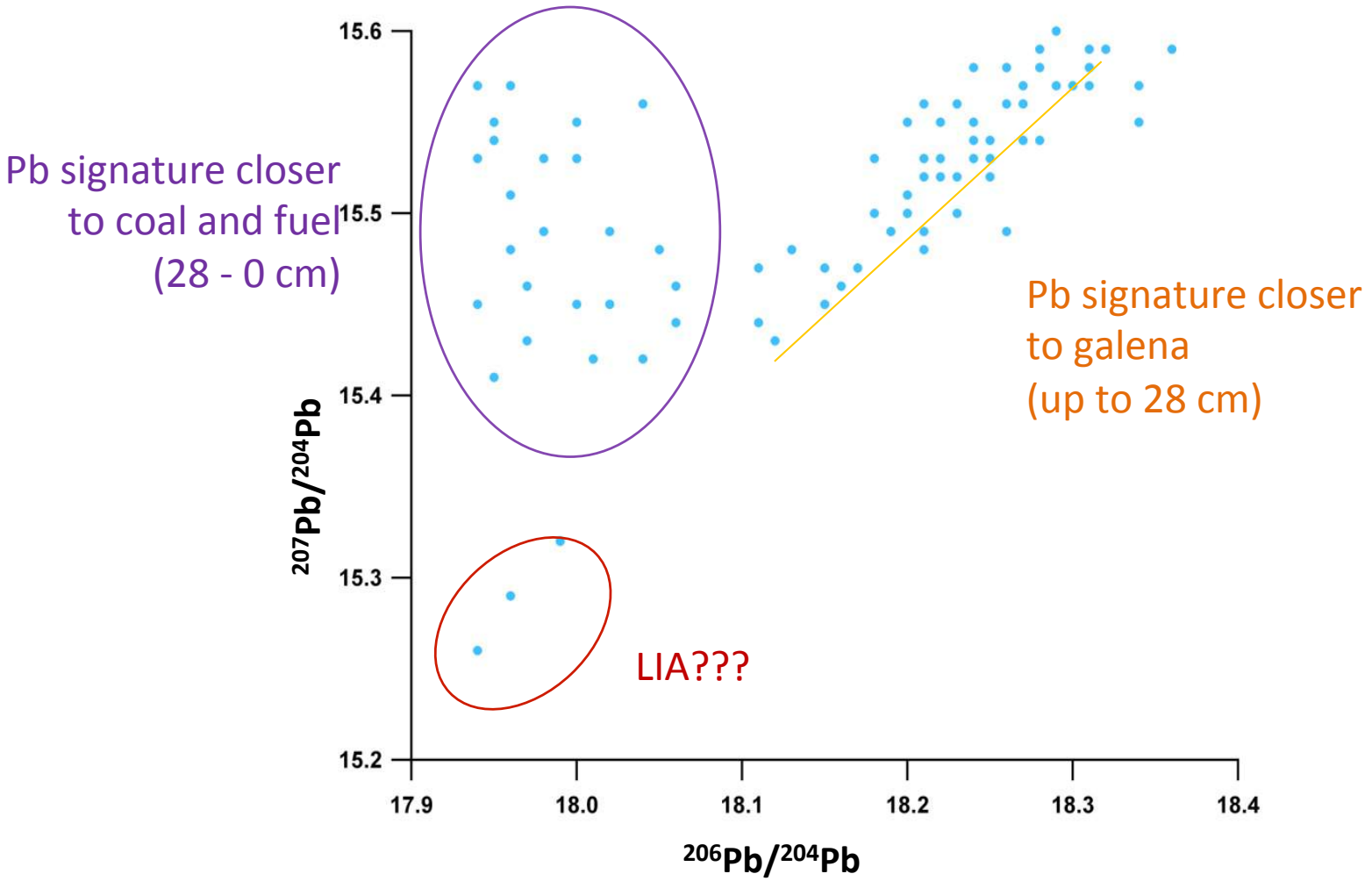
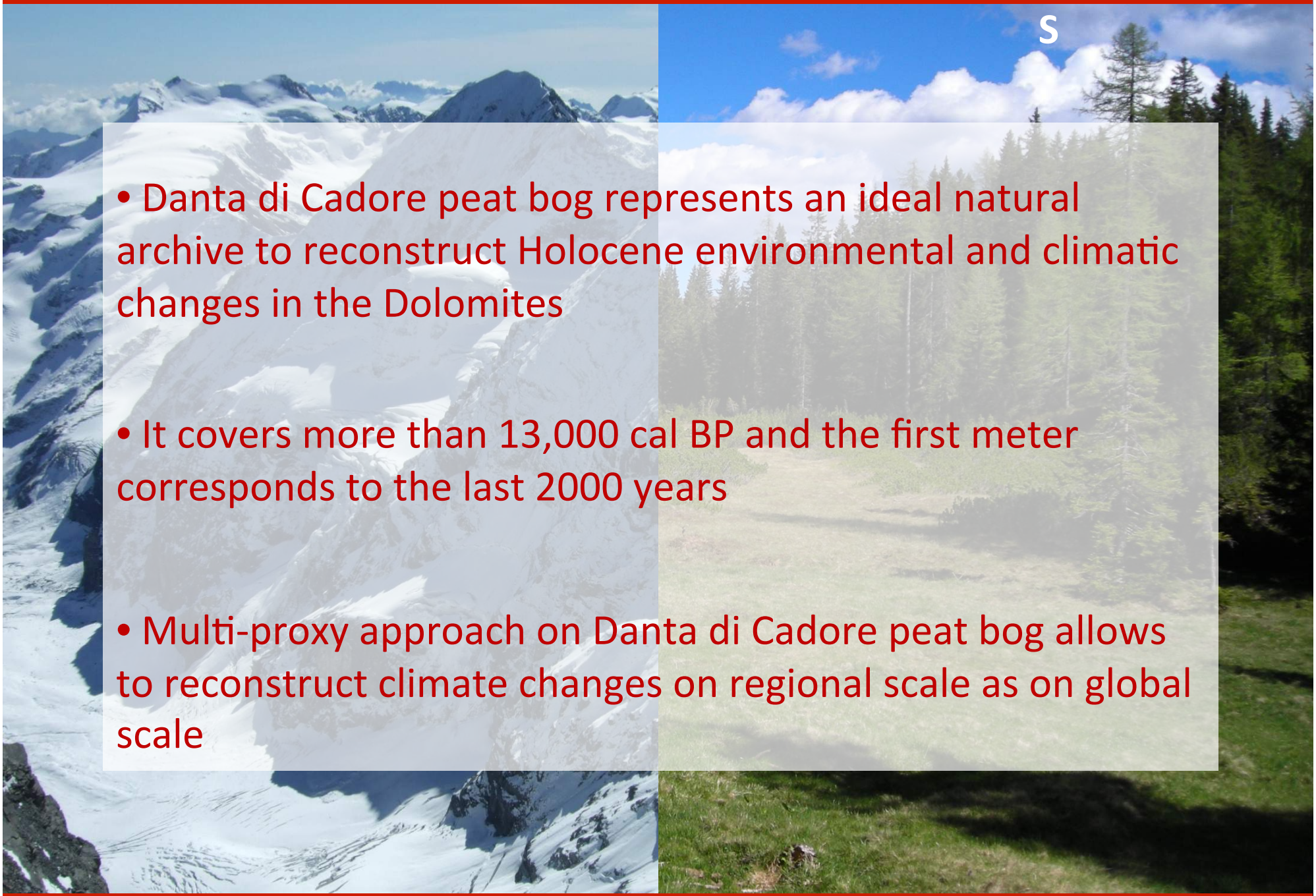


CONCLUSIONS

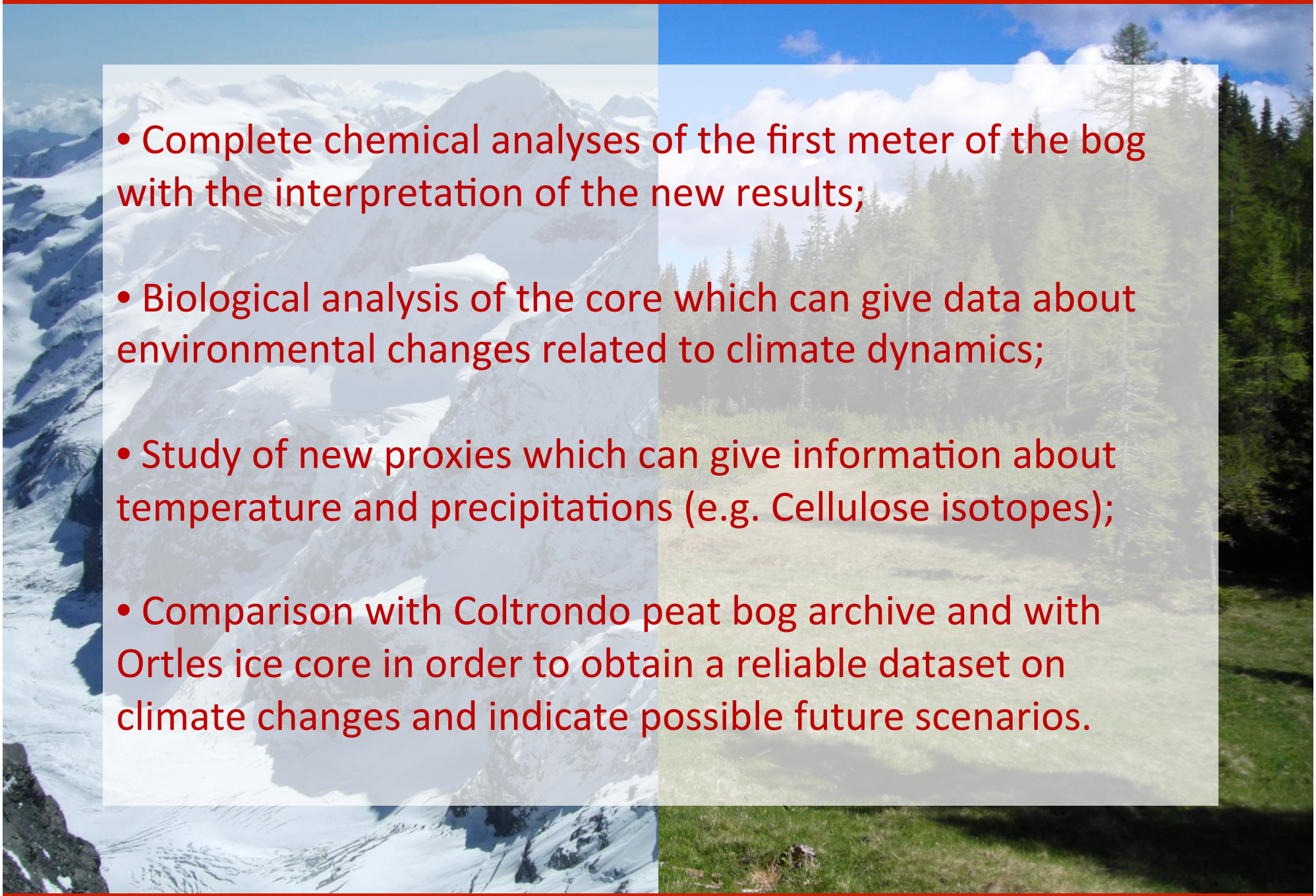


- Danta di Cadore peat bog represents an ideal natural archive to reconstruct Holocene environmental and climatic changes in the Dolomites

- It covers more than 13,000 cal BP and the first meter corresponds to the last 2000 years

- Multi-proxy approach on Danta di Cadore peat bog allows to reconstruct climate changes on regional scale as on global scale

PERSPECTIVES



- Complete chemical analyses of the first meter of the bog with the interpretation of the new results;

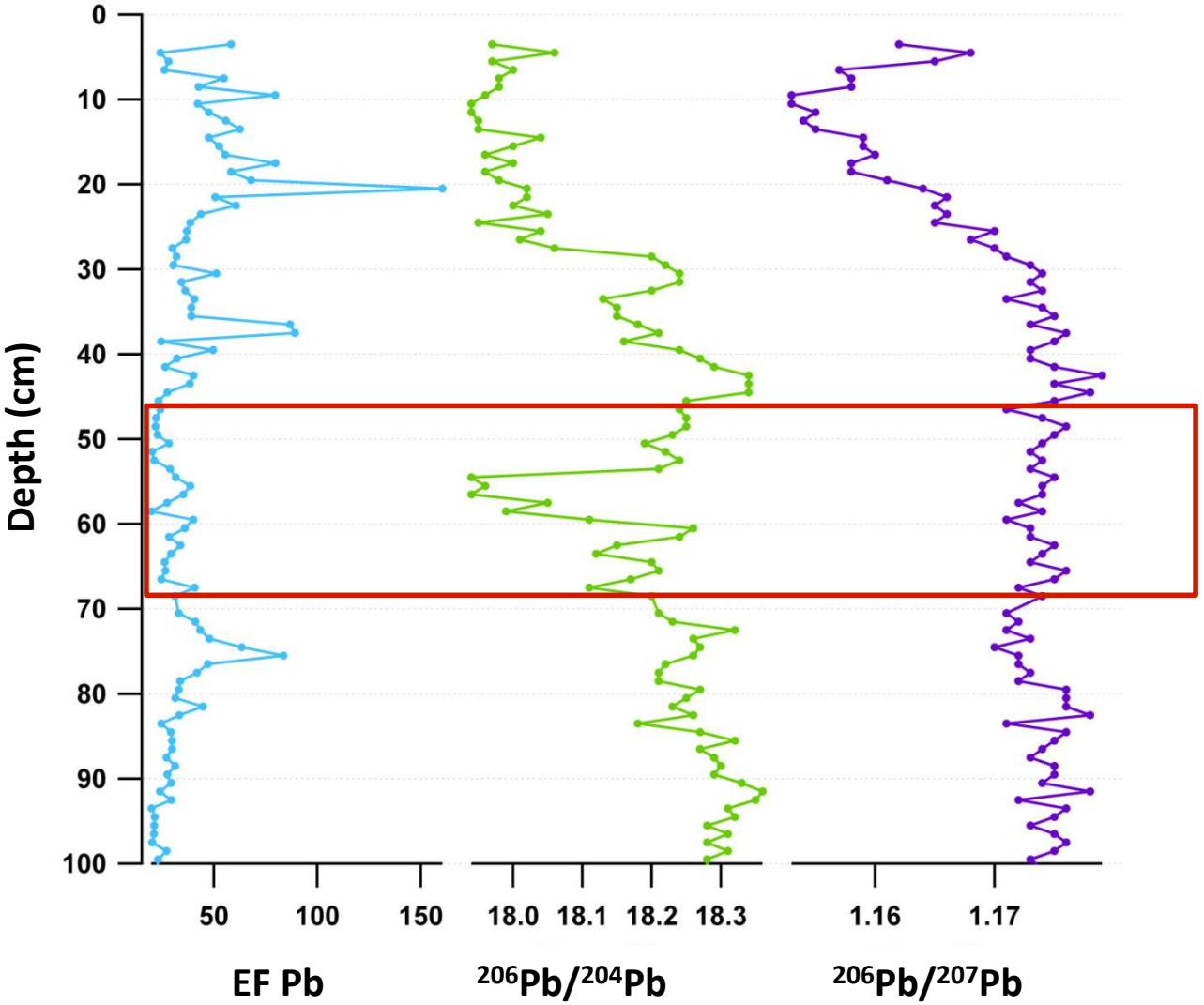
- Biological analysis of the core which can give data about environmental changes related to climate dynamics;

- Study of new proxies which can give information about temperature and precipitations (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.

THANKS FOR YOUR ATTENTION!!

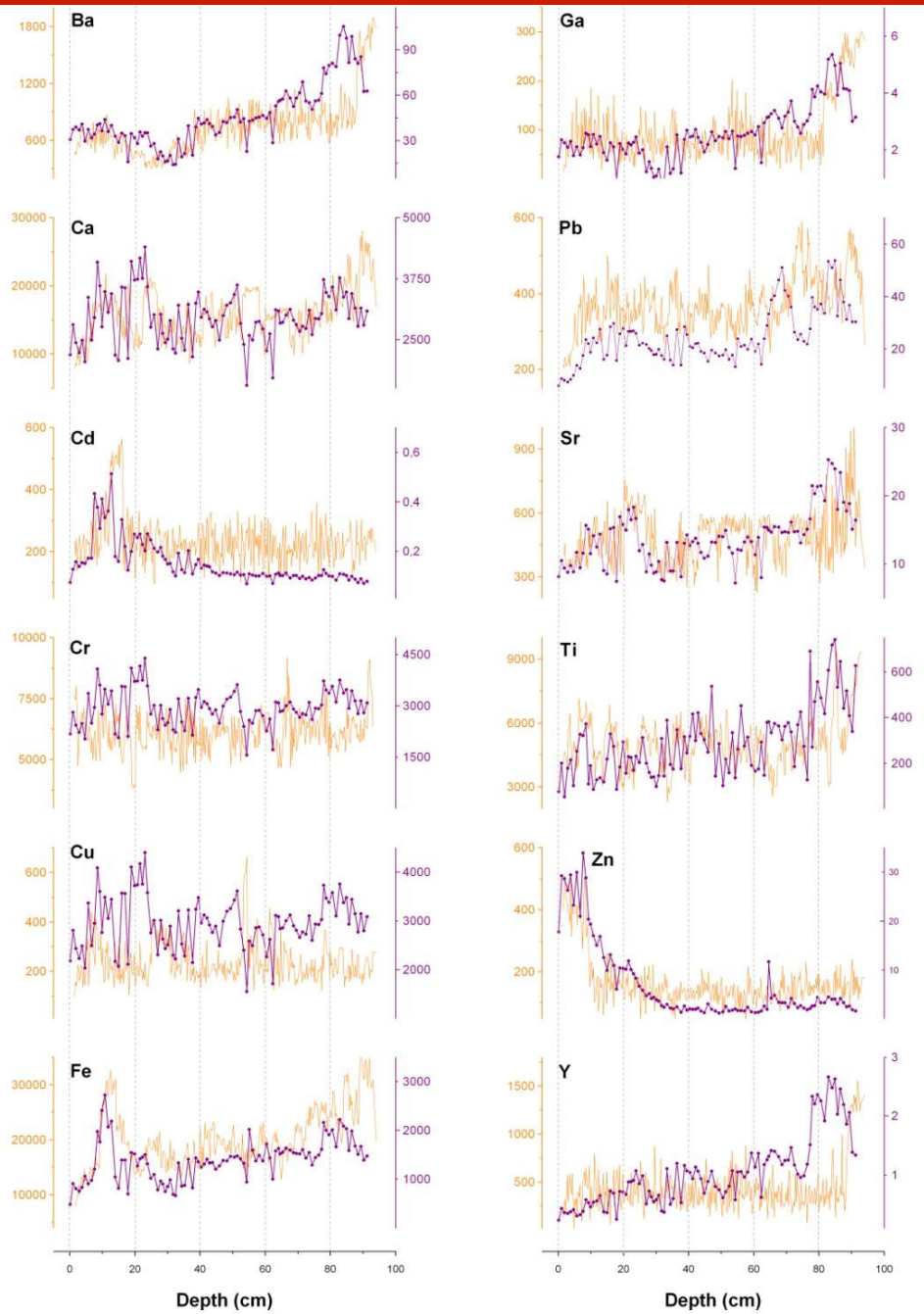
The last 2000 years – The anthropic impact



AD 1300 - 1400

Little Ice Age????

XRF-CS



ICP-MS