The mesolithic site Ullafelsen in the Fotsch Valley (Tyrol, Austria) – a biomarker perspective

M Lerch, M Bliedtner, C Geitner, D Schäfer, JN Haas, S Szidat, R Zech, B Glaser
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Michael Zech

Heisenberg-Professorship
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With the finding of „Ötzi“ in 1991, high mountain (geo-)archaeology received high attention.

Our motivation/aim:
to contribute to a better understanding of human-climate-environment interaction

‚Ötzi“ – the Iceman

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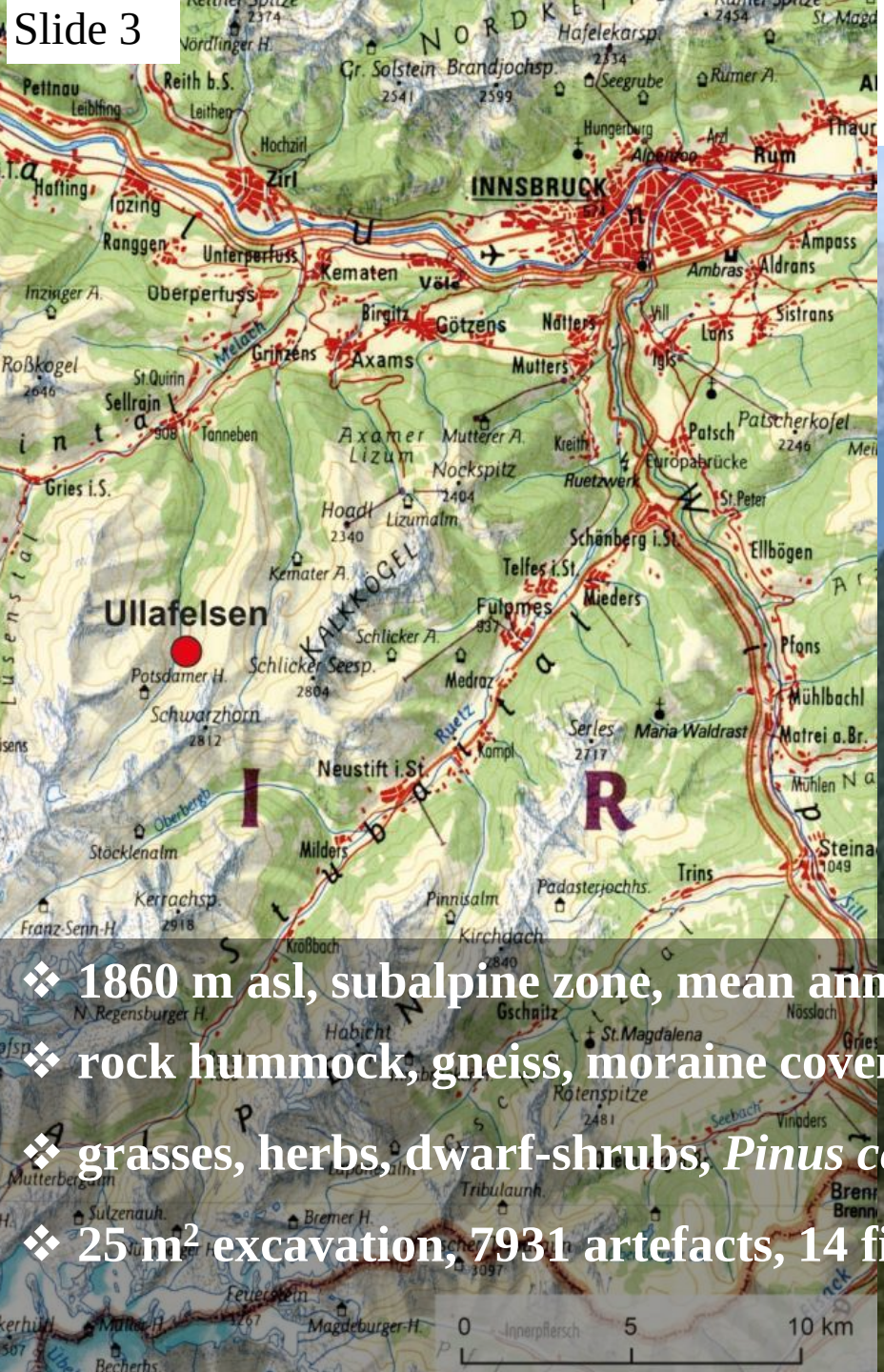
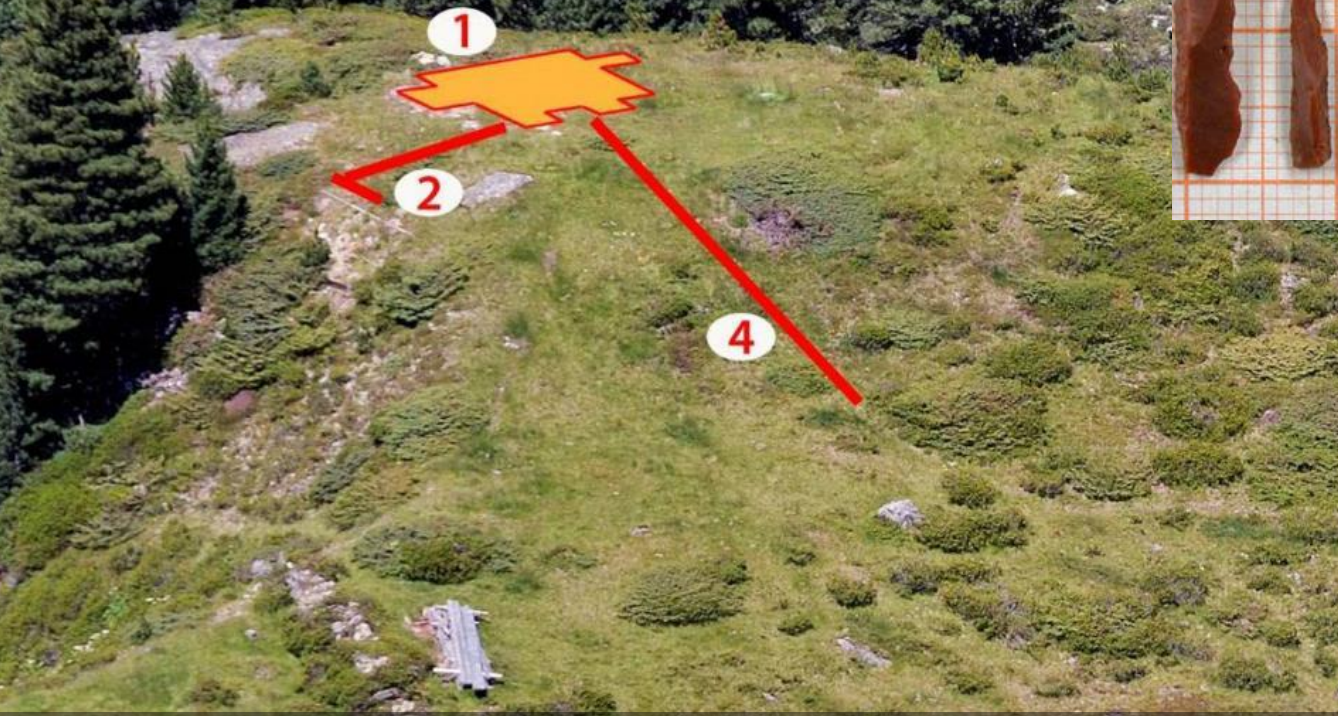
Slide 3



- 1860 m asl, subalpine zone, mean annual precipitation of about 1500 mm
- rock hummock, gneiss, moraine cover
- grasses, herbs, dwarf-shrubs, *Pinus cembra*
- 25 m^2 excavation, 7931 artefacts, 14 fire places

Slide 4

Source: http://tirol.orf.at/news/stories/2519305
(Last download: 13 January 2018)



Ressources:
- wood
- water
- stone tools
- hunting area
- cf. Kaseralmschrofen

- 1860 m asl, subalpine zone, mean annual precipitation of about 1500 mm
- rock hummock, gneiss, moraine cover
- grasses, herbs, dwarf-shrubs, *Pinus cembra*
- 25 m^2 excavation, 7931 artefacts, 14 fire places
- 20 AMS ^{14}C-data (9,6-11,2 cal ka BP)

1

LL: contains 62% of the artefacts → living floor

One of the open questions:

B_h-horizon due to podzolization or buried former topsoil (fA_h)?

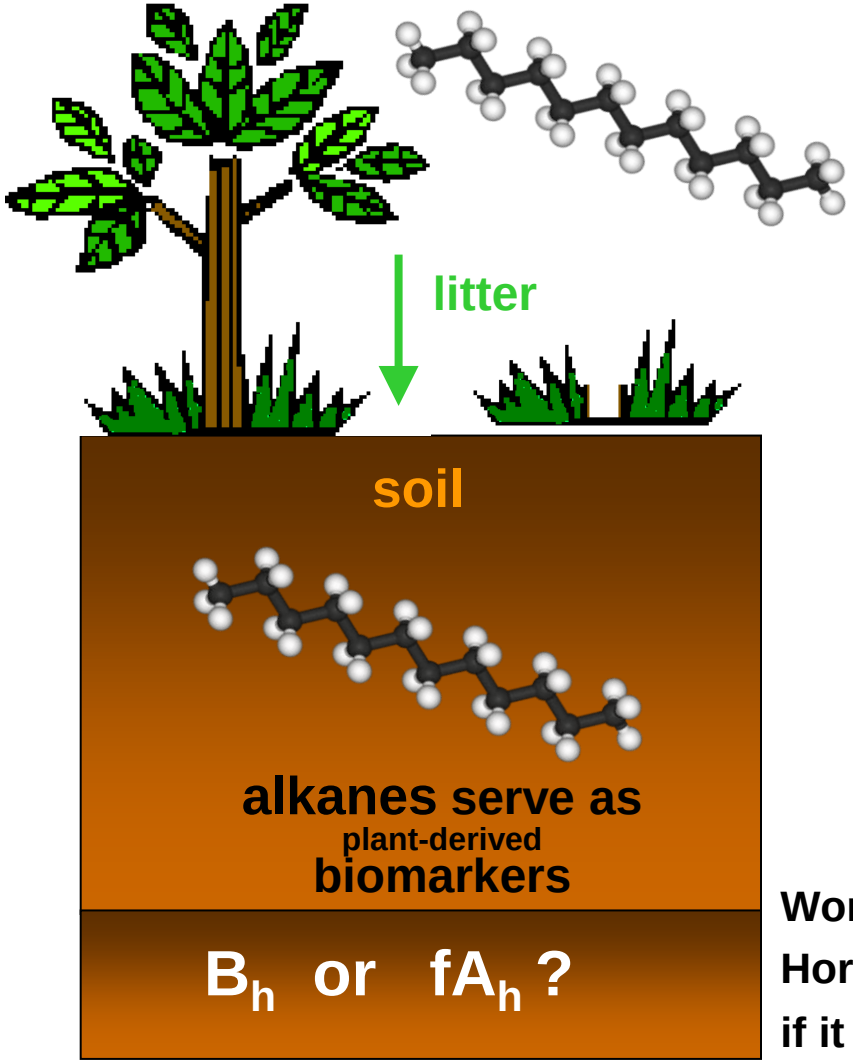
	pH ($CaCl_2$)	C%
A_h	3.7	16.4
LL	3.7	1.8
B_h/ fA_h	4.1	10.7

Thin section analyses / ^{13}C-NMR etc. provided no clear answer, hitherto.

What are alkane biomarkers and why do we interrogate them?

alkanes are hydrocarbons

and important constituents of leaf waxes



Working hypothesis:

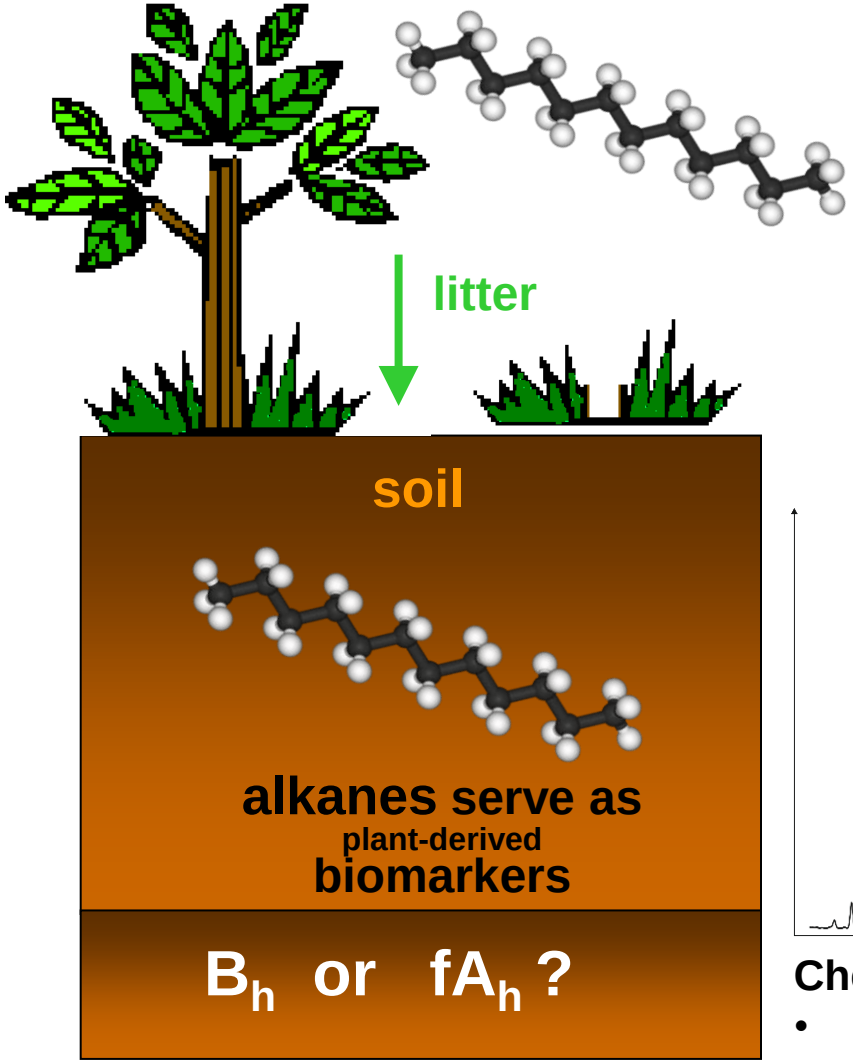
Horizon contains alkanes → former topsoil fA_h;

if it doesn't contain alkanes → B_h podzol horizon

What are alkane biomarkers and why do we interrogate them?

alkanes are hydrocarbons

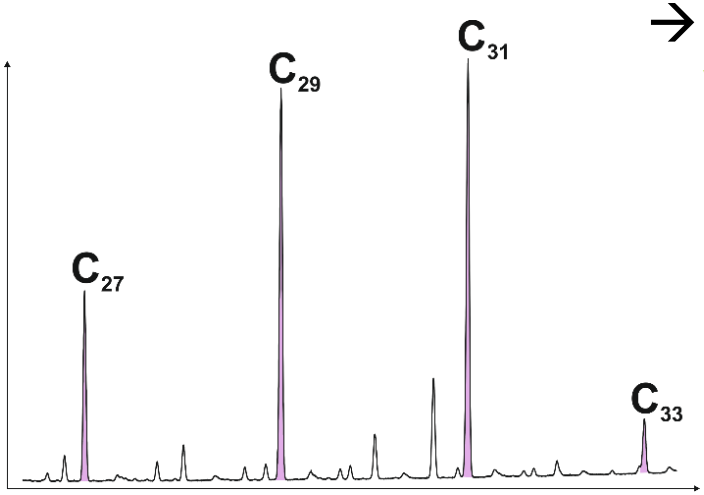
and important constituents of leaf waxes



Moreover:

C_{31}/C_{27}

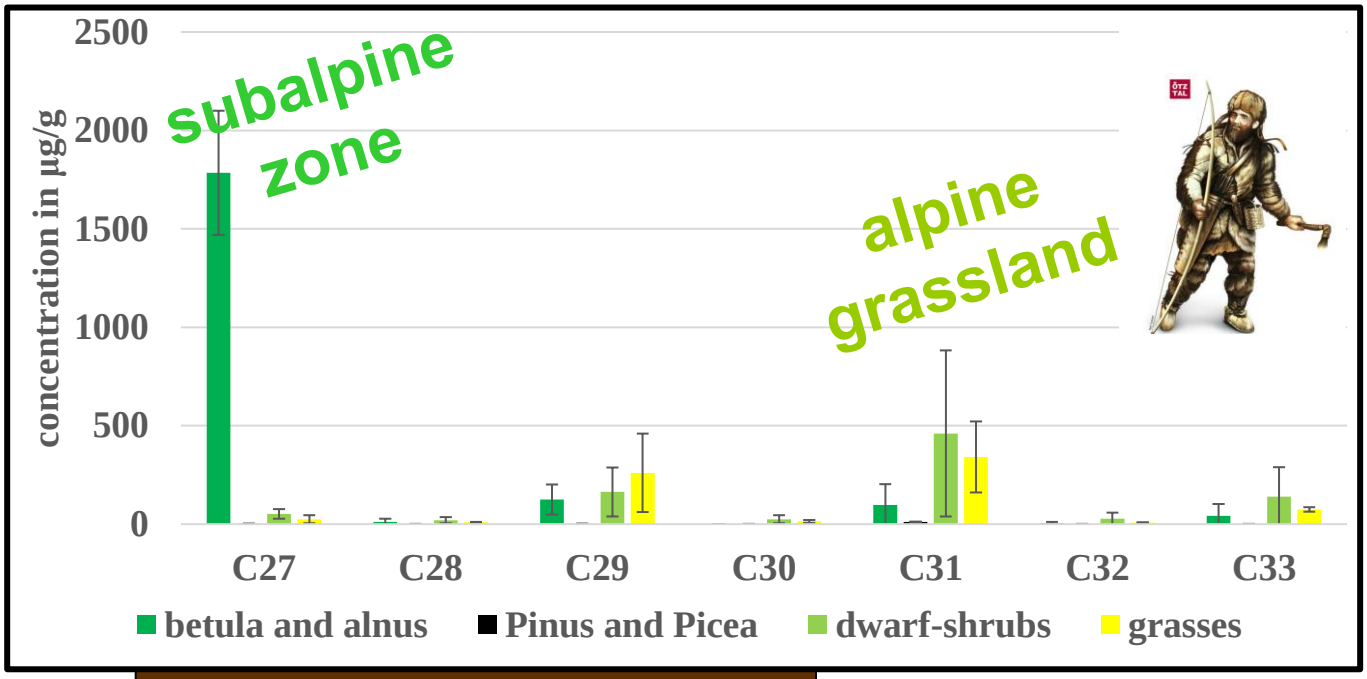
→ **proxy for**
vegetation changes



Chemotaxonomy based on number of C-atoms (Lit):

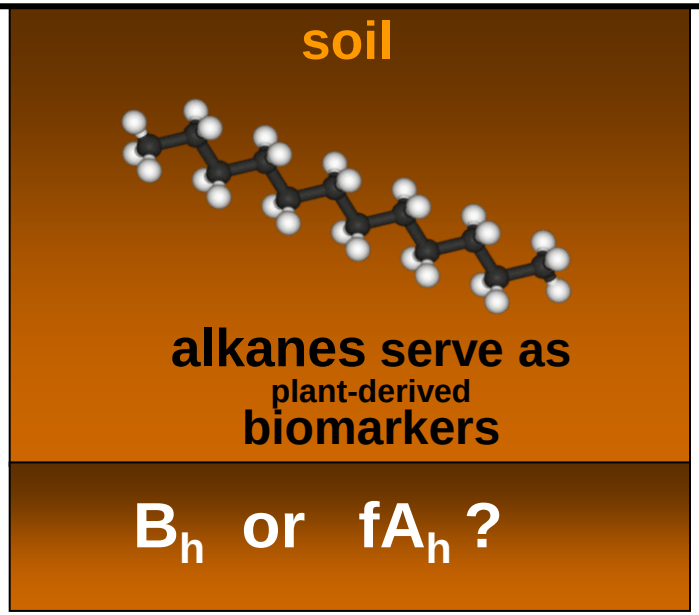
- C_{27} & C_{29}: trees
- C_{31} & C_{33}: grasses and herbs

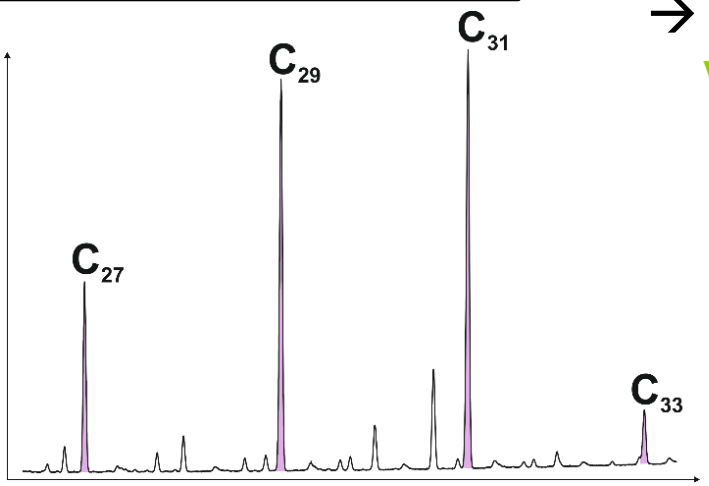
Result I: Chemotaxonomic differentiation of dominant vegetation



C_{31}/C_{27}

→ **proxy** for vegetation changes





Chemotaxonomy based on number of C-atoms (Lit):

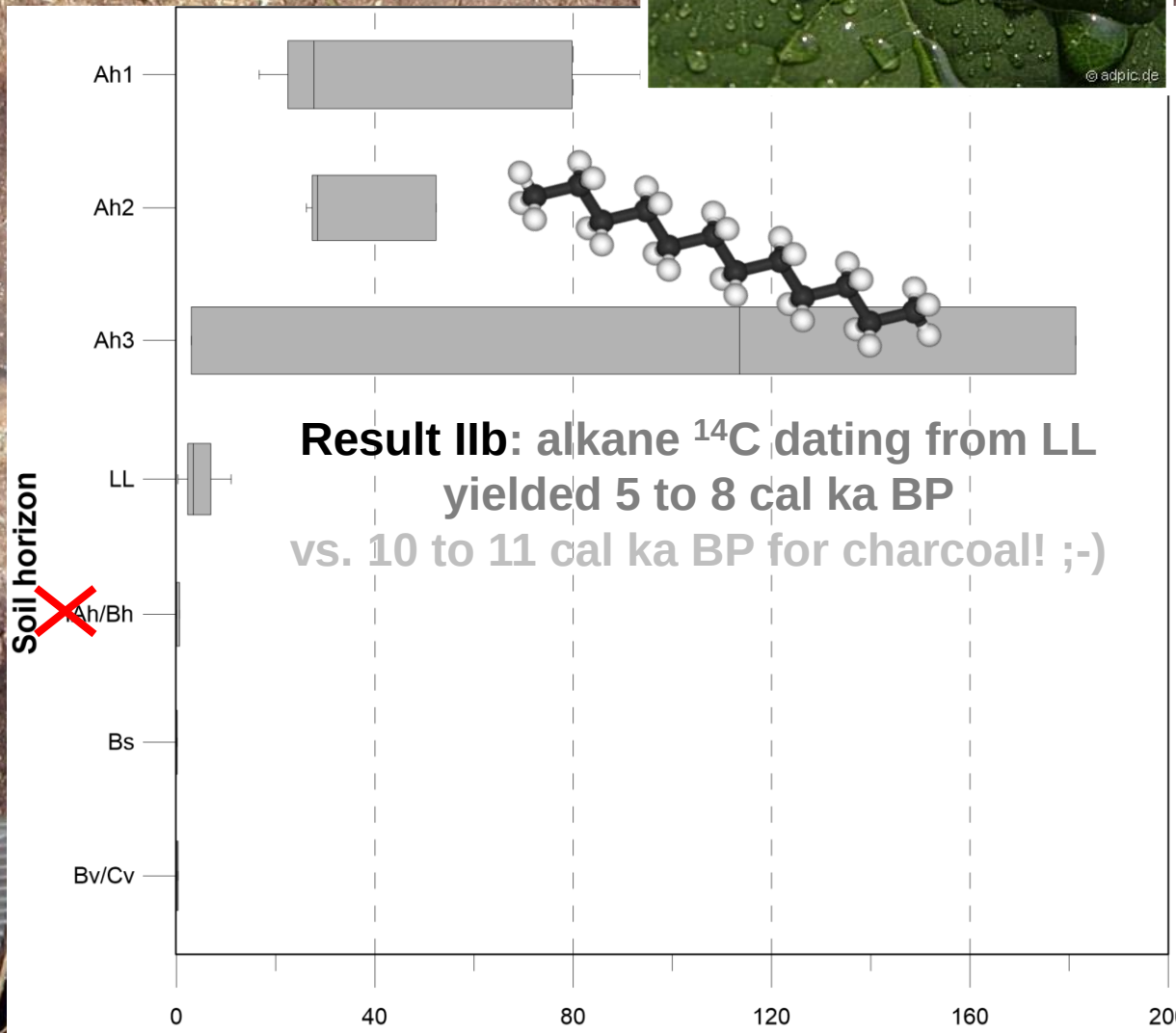
- C_{27} & C_{29}: trees
- C_{31} & C_{33}: grasses and herbs

Result IIa: B_h/fA_h-horizon contains no alkanes → no fA_h!

A_h

LL

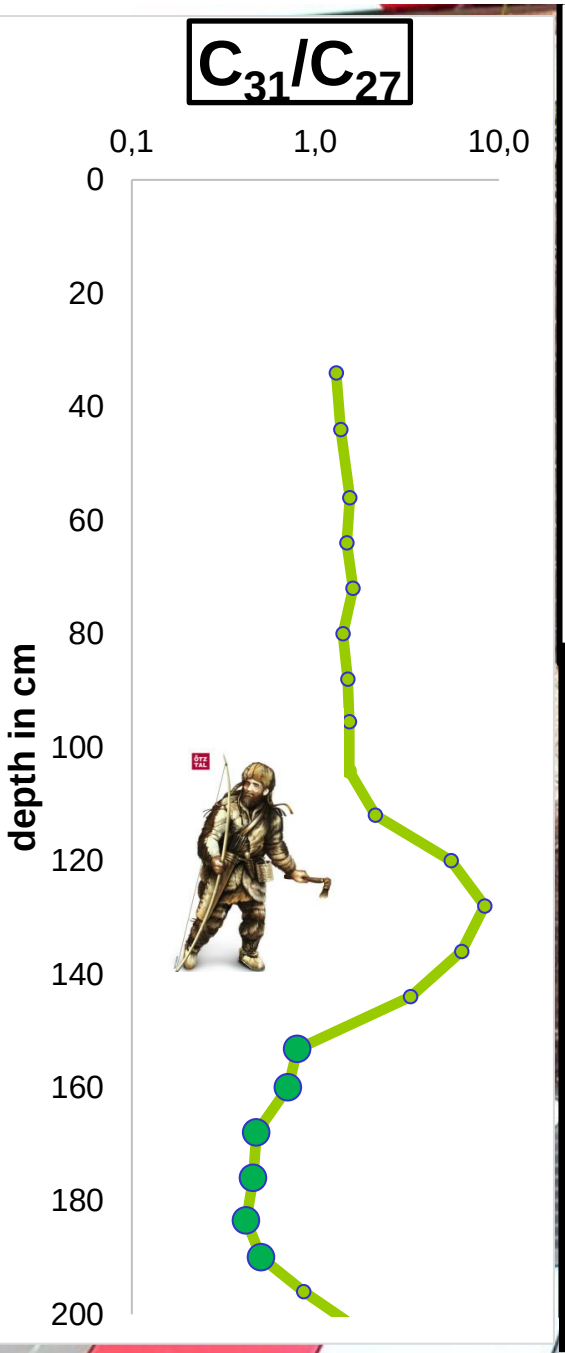
B_h/ ~~fA_h~~

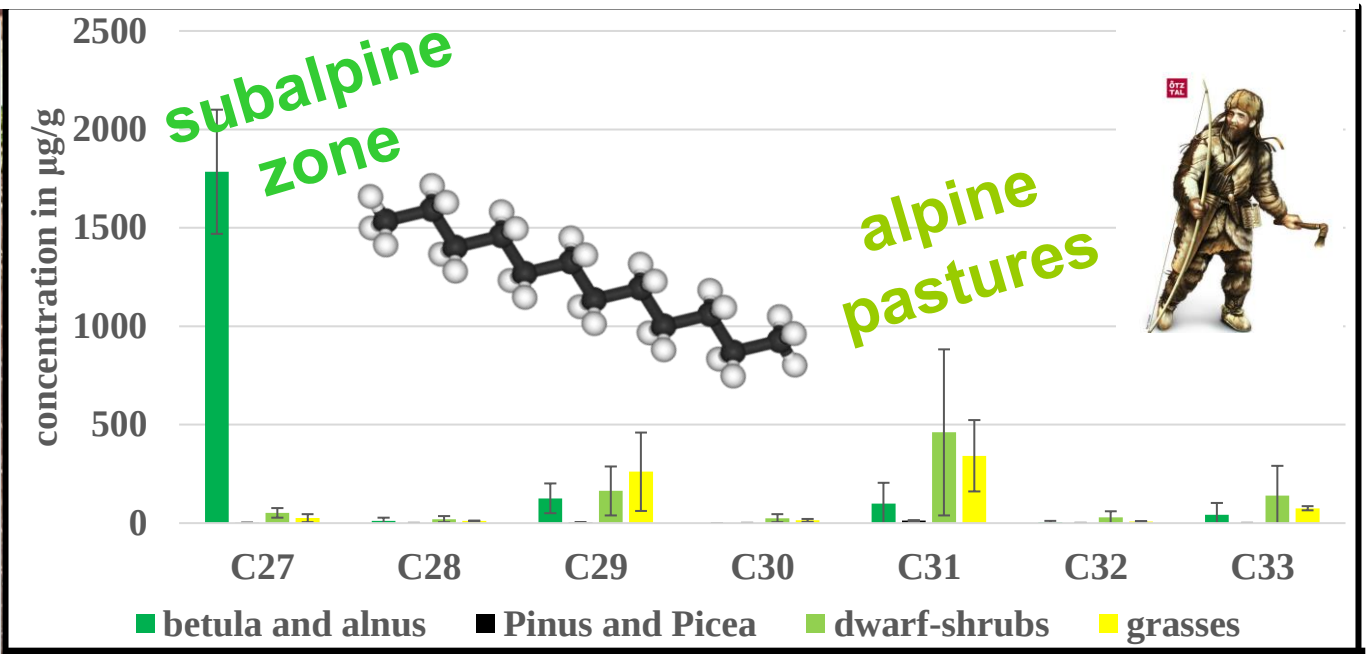


Result IIb: alkane ^{14}C dating from LL yielded 5 to 8 cal ka BP

vs. 10 to 11 cal ka BP for charcoal! ;-)

Result III: Clear indication of vegetation change in alpine peats





→ 2 m and 9 cal ka BP environmental and climate archive

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Thanks

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