Timing the Little Ice Age advance and fluctuations of a glacier in the Eastern Alps (Italy) with a multi-proxy lake sediment record

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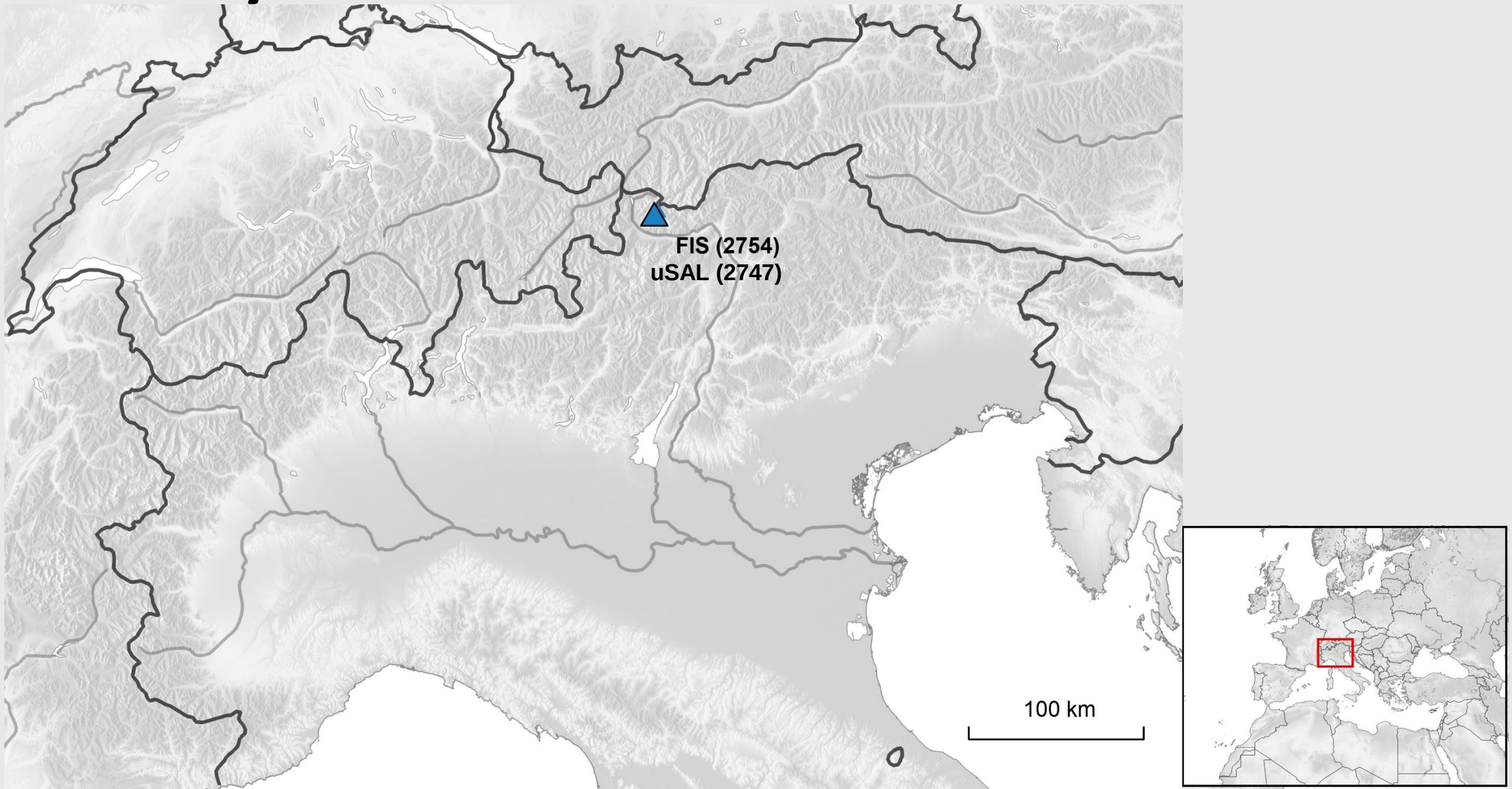
Austrian Core Facility
scientific core logging and scanning

Study sites



The lakes

R. Psenner,2016

1870/1873

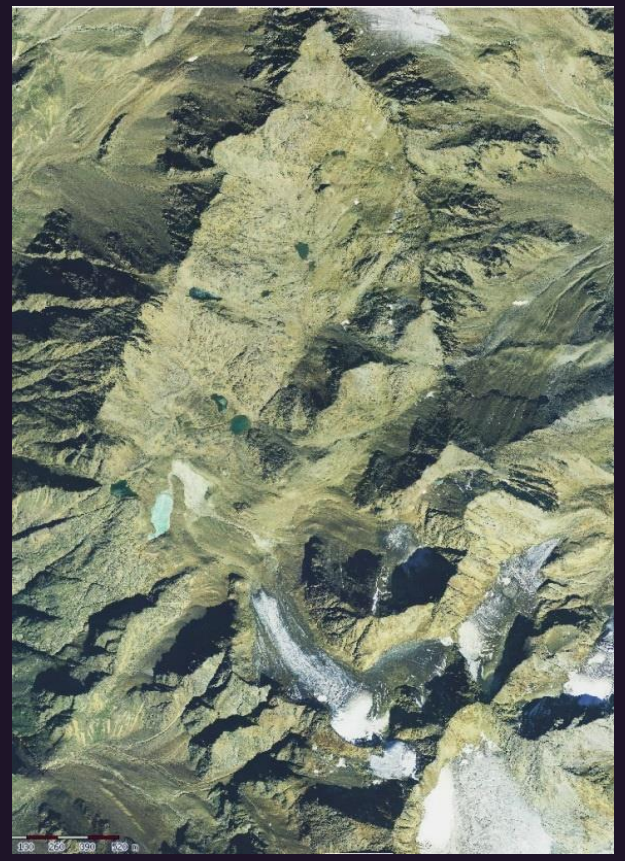
Tiris, 3. Landesaufnahme Tirol 1870/1887, Datenstand 1870/73

1875

Specialkarte der Ostalpen, Section Weißkugel
Zeits. Deutschen & Österreichischen Alpenvereins 1875 Band 6

1982/85

2006



2008

2014/15

Orthophotographs of Saldur Area and Fischer See, gis2.provinz.bz.it/geobrowser

The catchment: Recent changes in glaciation

1988

H. Klier 1988

2018

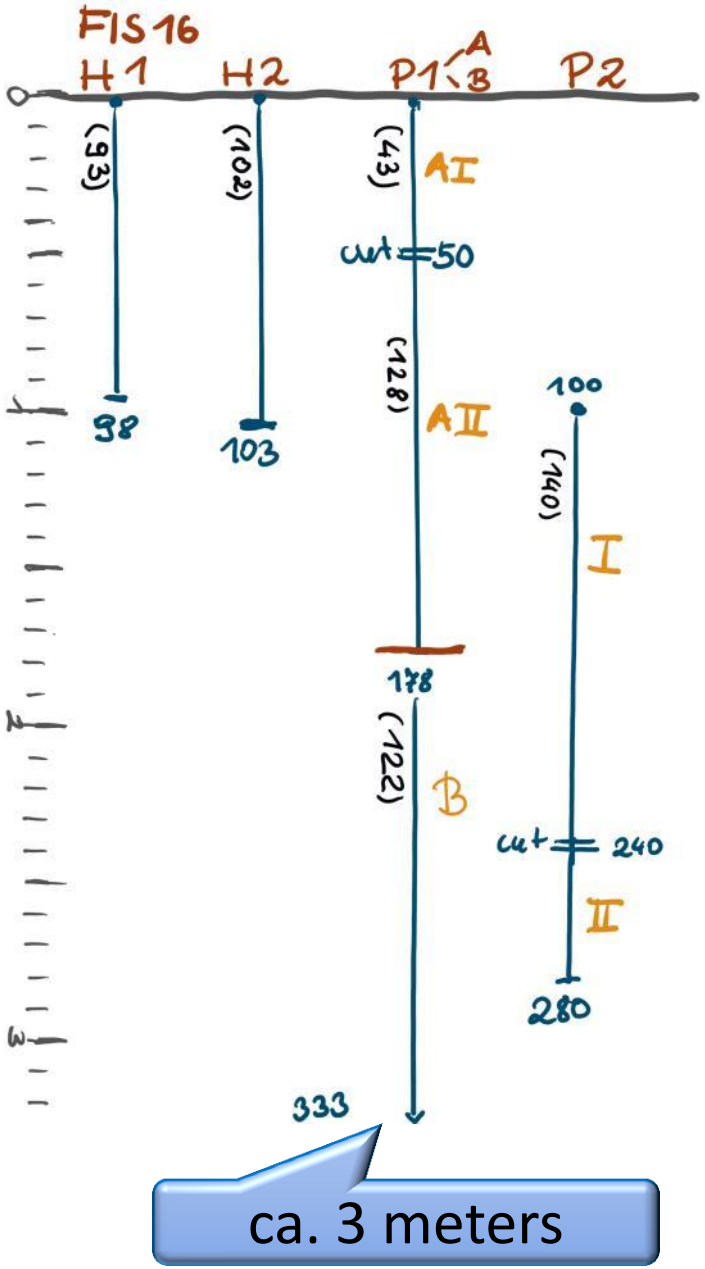
K. Koinig 2018/08

Fischer See

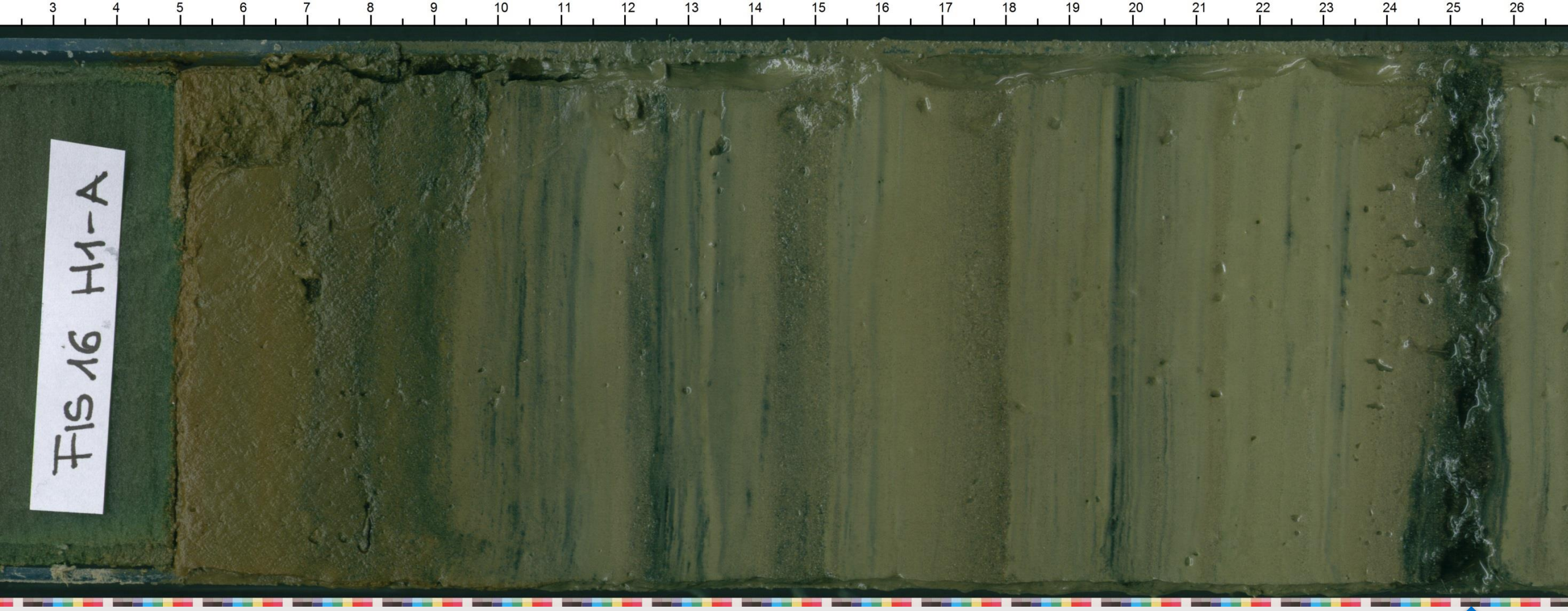
2018

current max. depth 8.5 ± 1 m

Fischer See: sediment cores (2016)



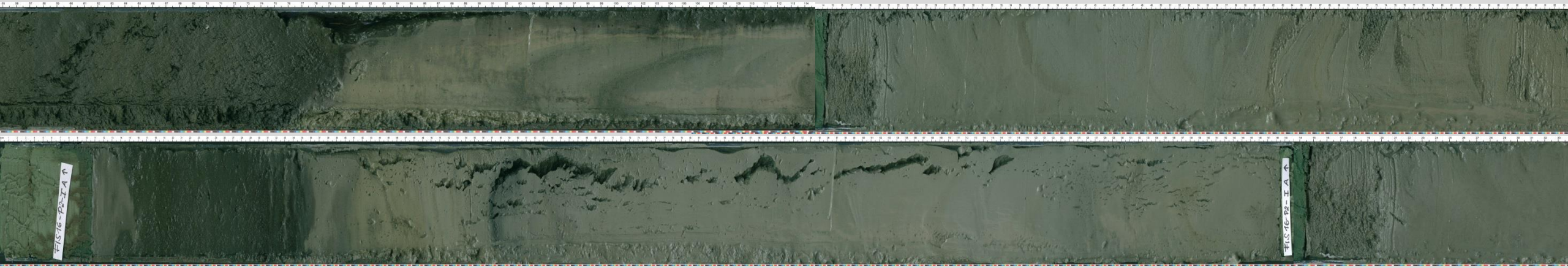
Fischer See: sediment cores



undisturbed & laminated

Fischer See: sediment cores

9500 ± 500 BP



organic…. onset of Gyttja

Fischer See: early-mid Holocene

9 500 ± 500 BP

relatively homogenous

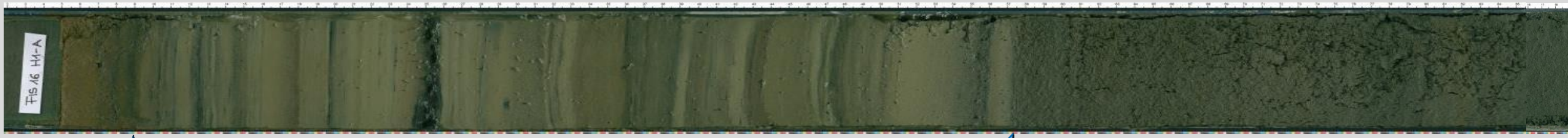
organic…. onset of Gyttja

Fischer See: late Holocene

1950 ± 7 AD

1880 ± 20 AD

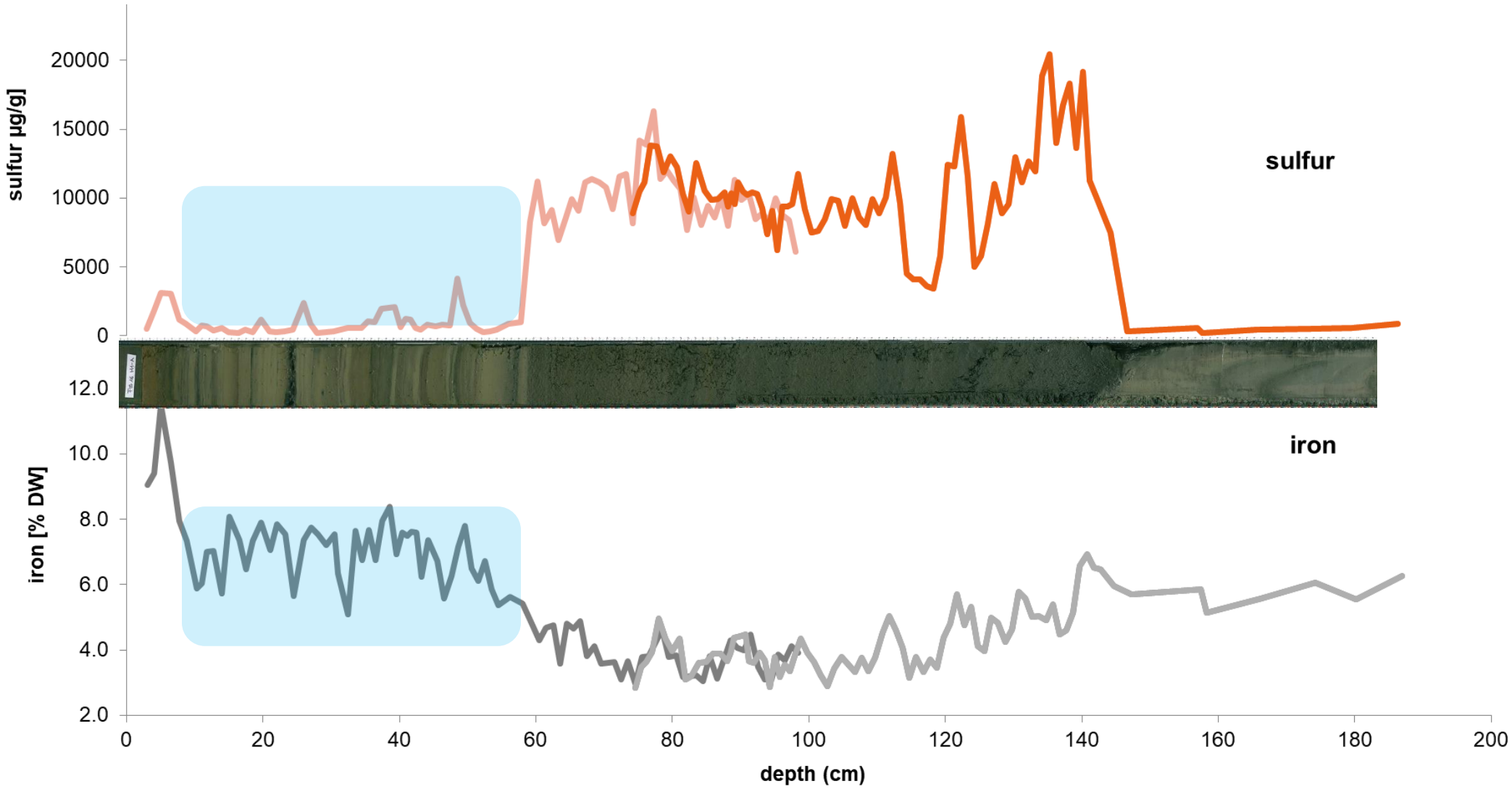
1100 ± 220 AD



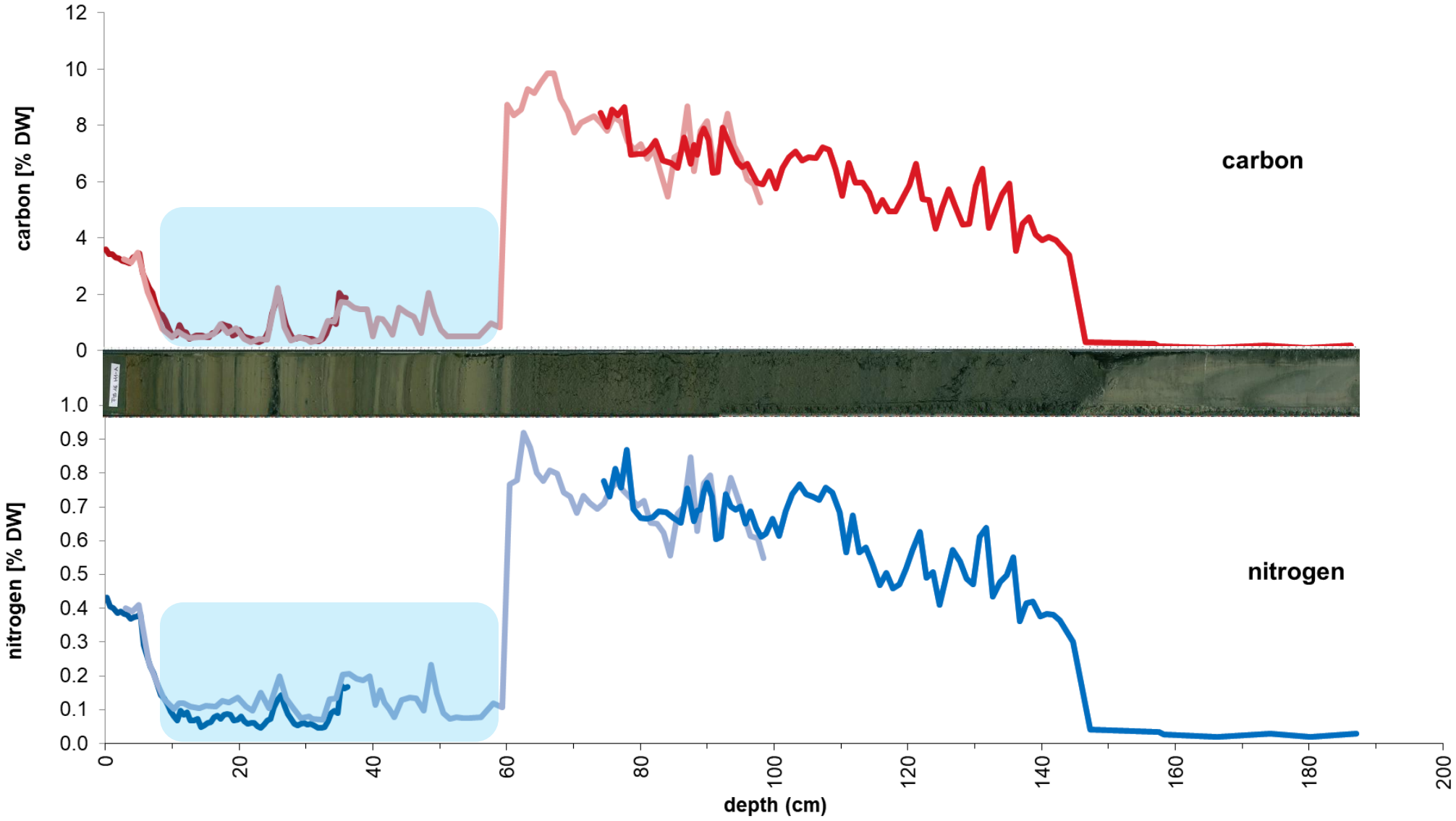
organic, homogeneous

onset of input of more glacial silt & clay

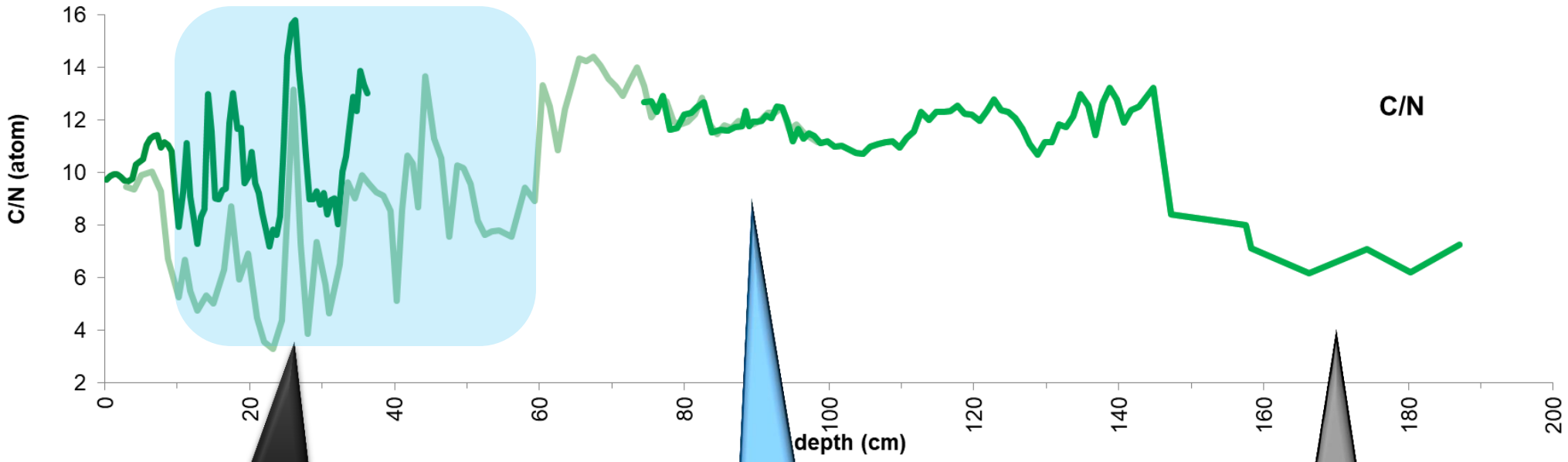
Inorganic parameters: sulfate and iron



Organic parameters: carbon and nitrogen



C/N as indicator for terrestrial input

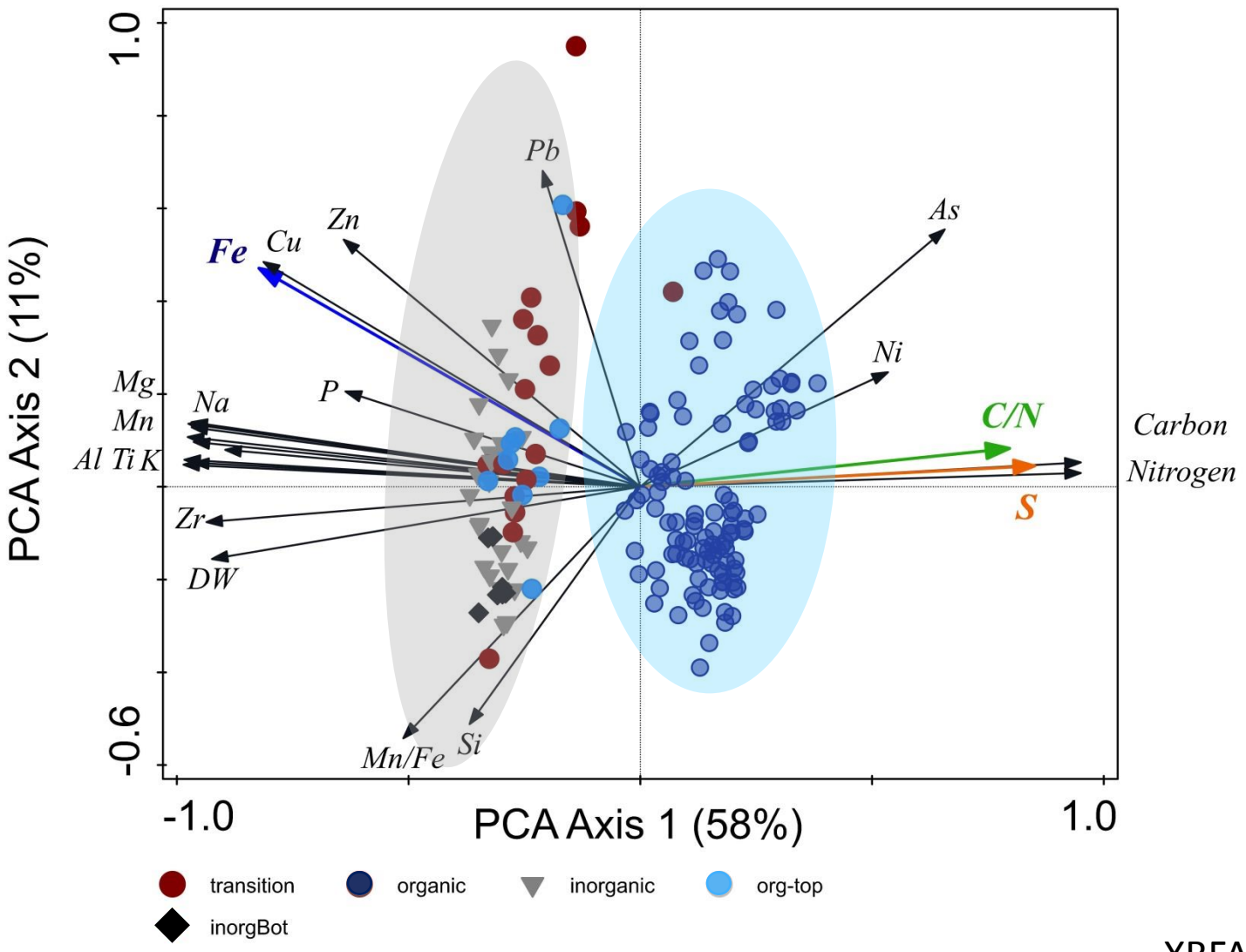


high variability
terrestrial/glacial/aquatic origin

typical in-lake
signal

glacial input
with very low C/N

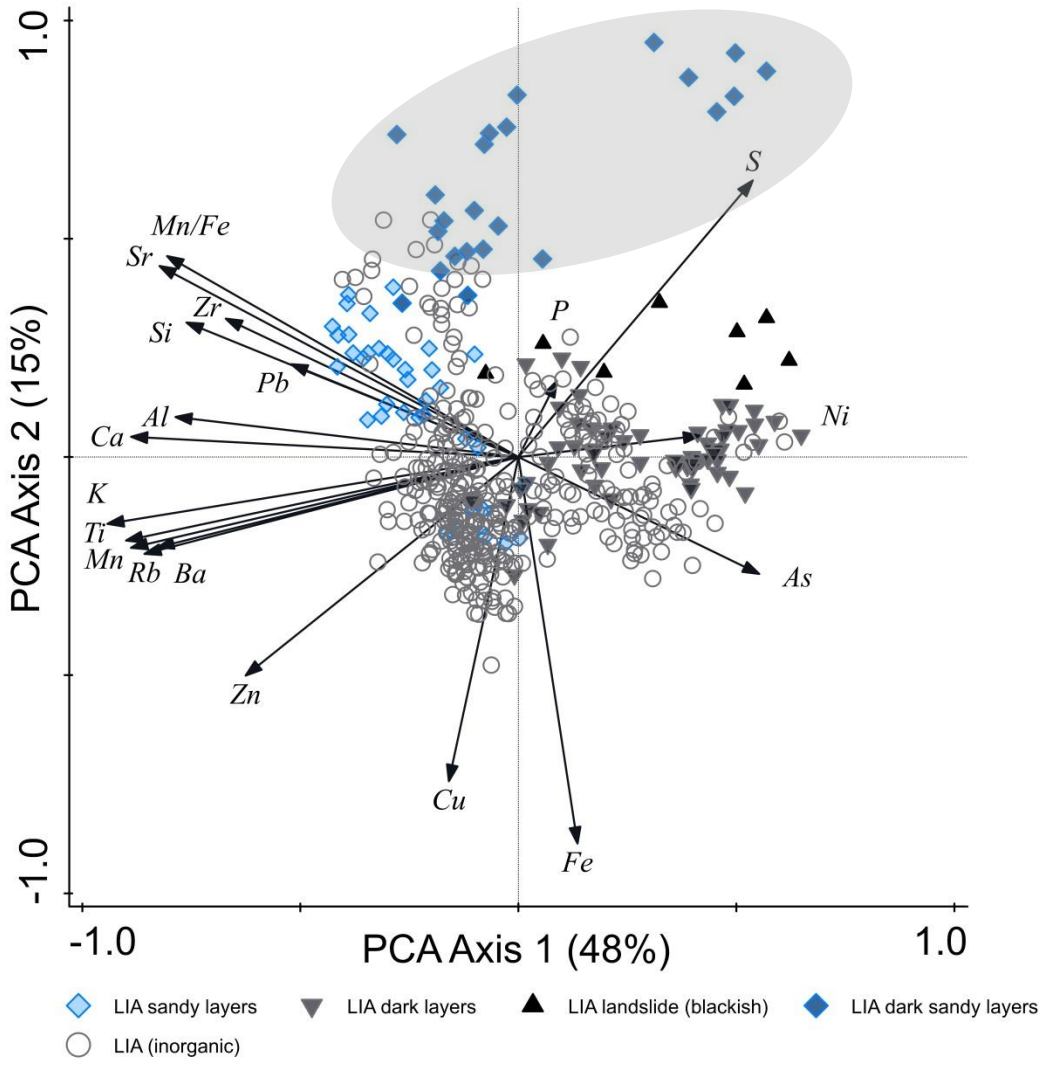
Holocene: different signature organic/inorganic part



XRFA on distinct samples every cm

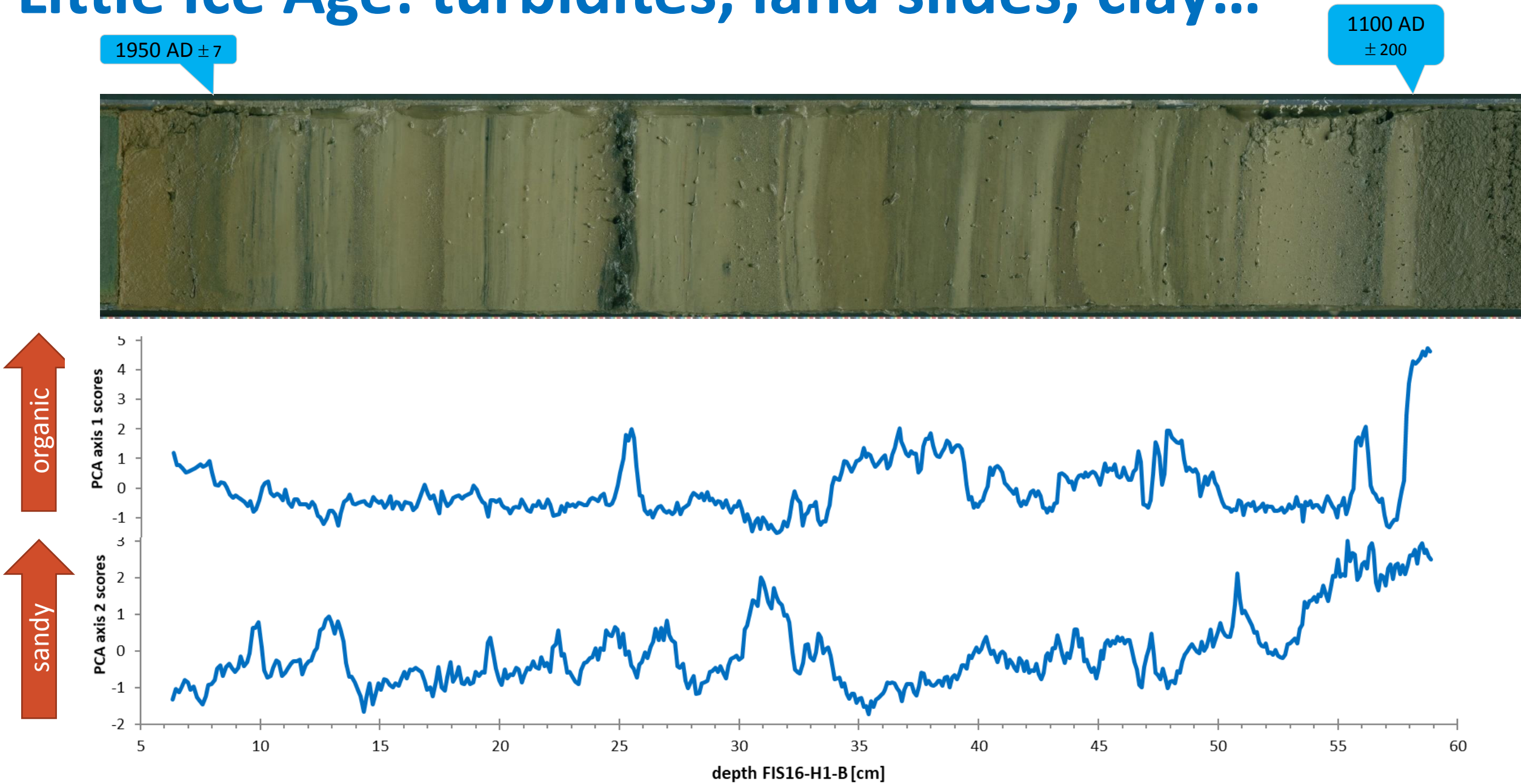
early Holocene 5 samples with high metal loading excluded

Little Ice Age: turbidites, land slides, clay…

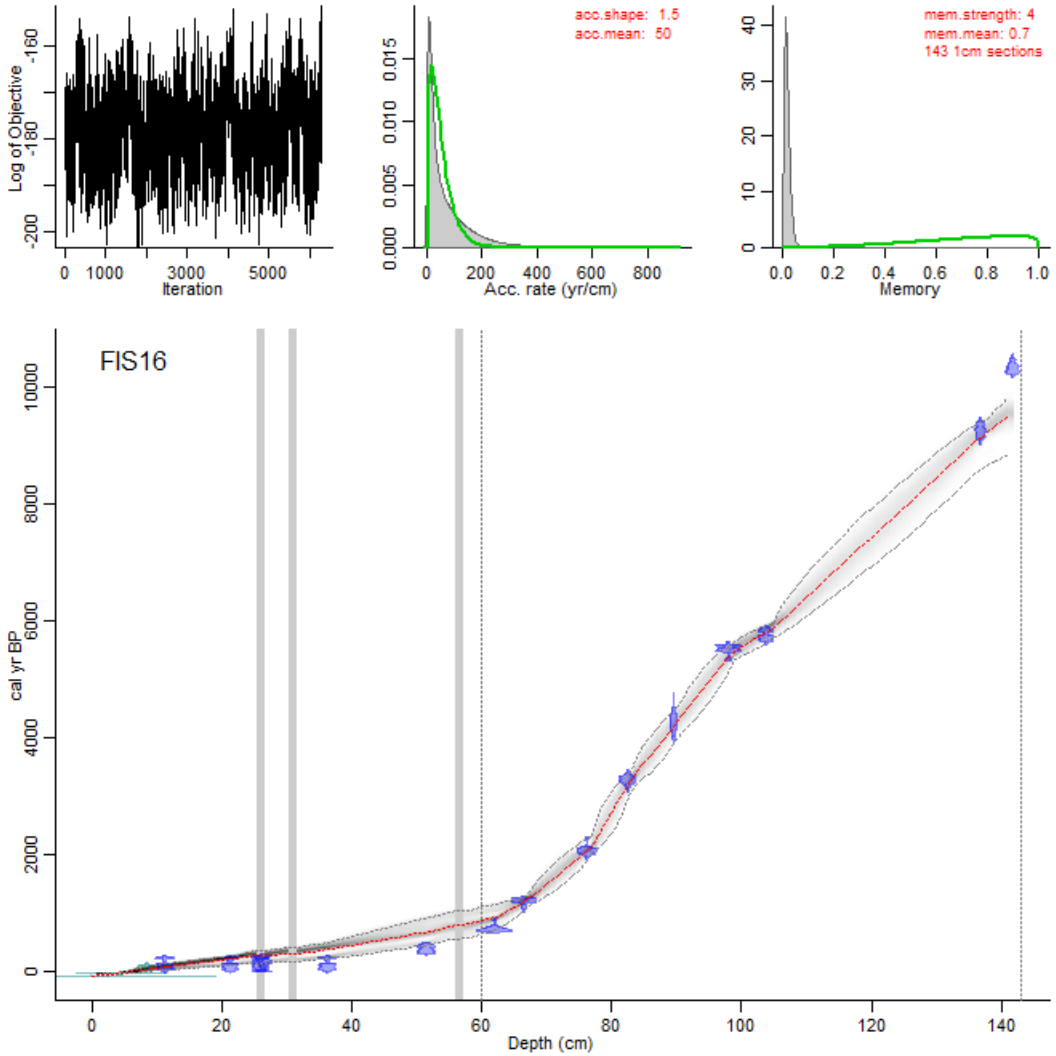


XRFA: ITRAX core scan every mm

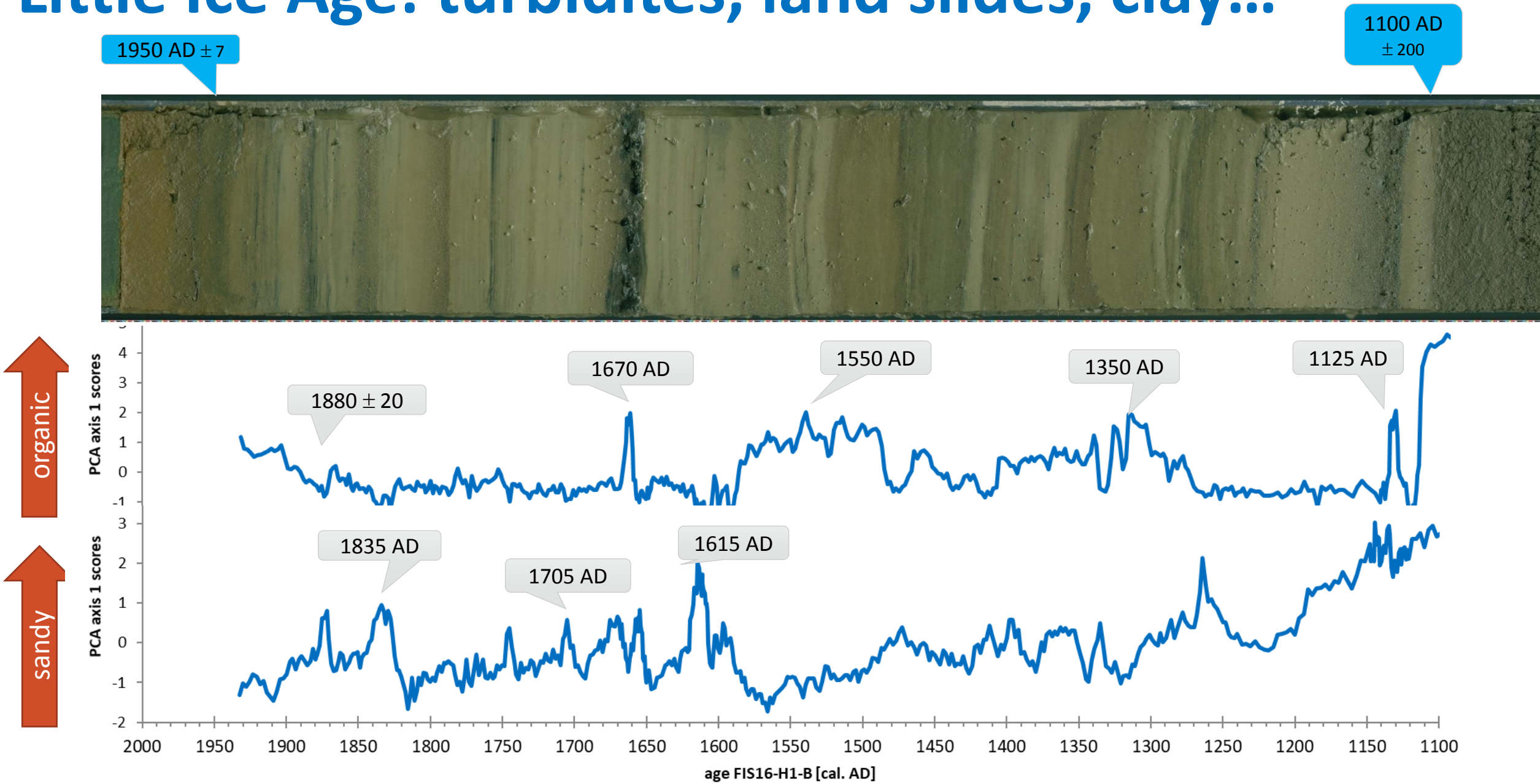
Little Ice Age: turbidites, land slides, clay…



age depth model (Bacon)



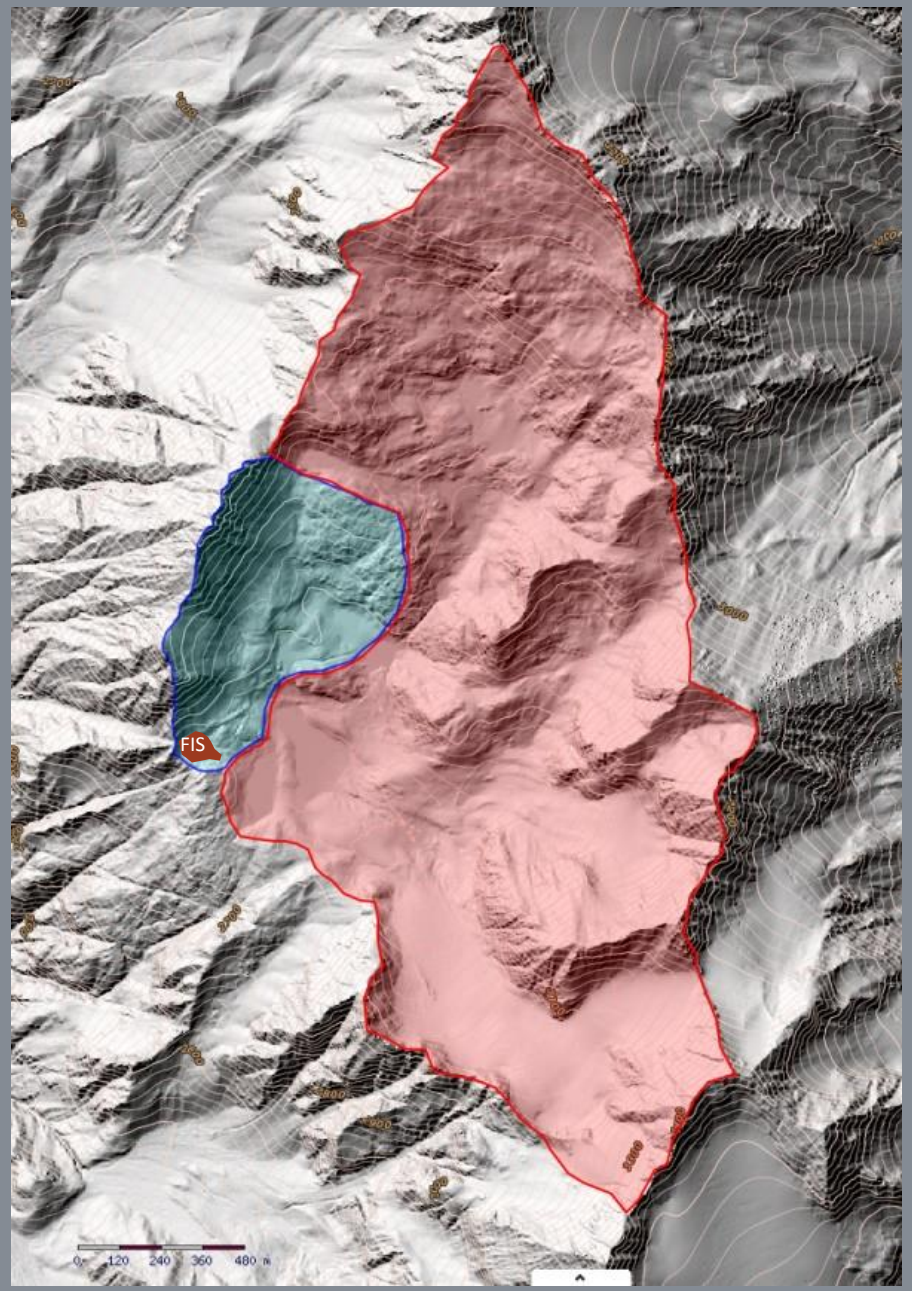
Little Ice Age: turbidites, land slides, clay…



Glacier fluctuations in catchment

K. Koinig, 2017/08

Change in size of hydrological catchment



Hydrological catchment

Blue: current situation (area 0.38 km²).

Red: situation during Holocene glacier high stands (area 3.12 km²).

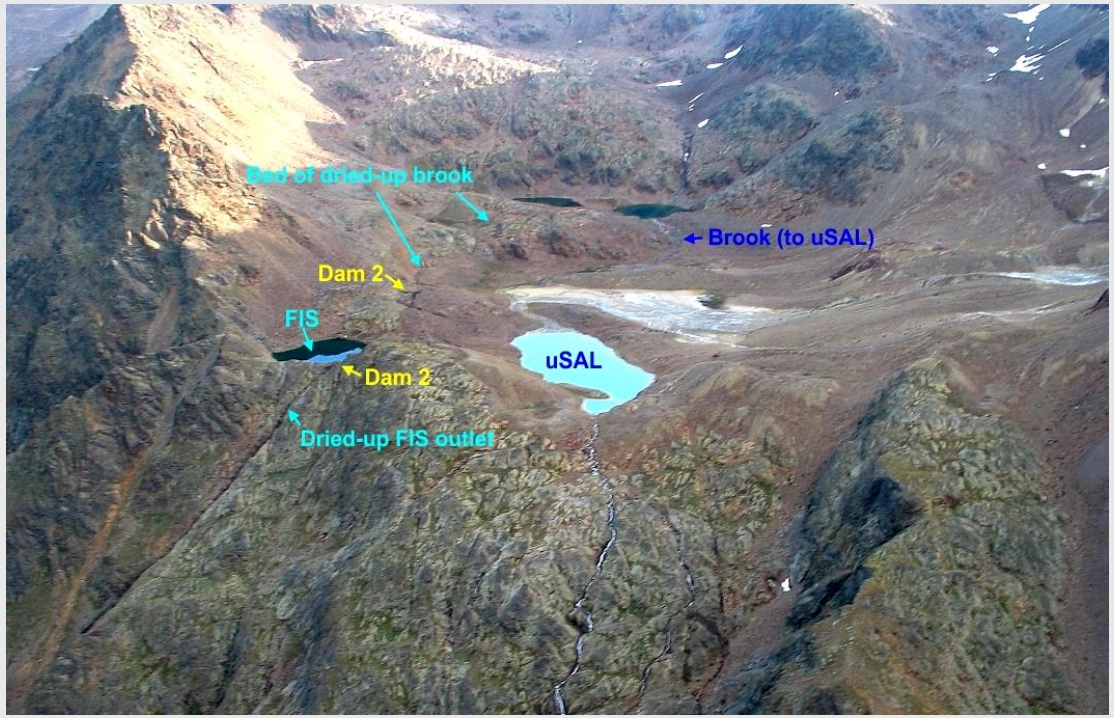
Glacier position:

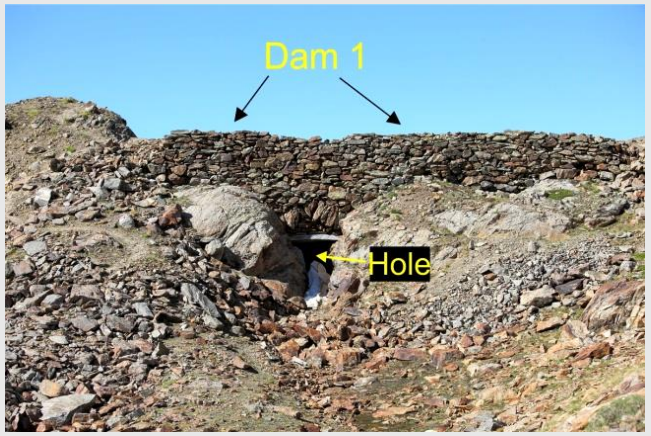
red line marks Holocene glacier high stand (during Little Ice Age).

Bright blue shaded glaciers recorded in the glacier inventory 2006

based on Geobrowser

Landscape changes in the Fischersee catchment (ca. 1870 AD)

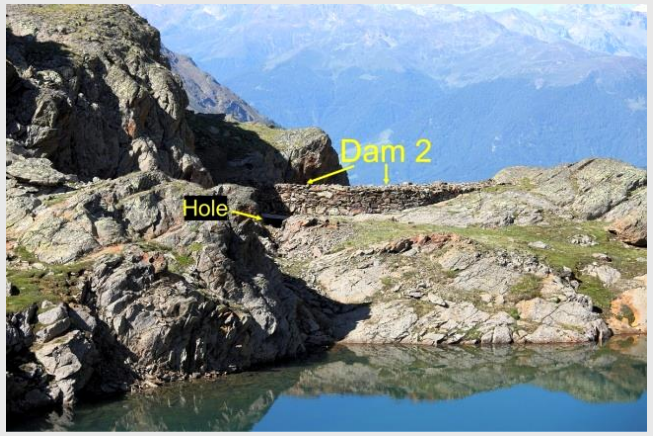




9 recorded lake outbursts/landslides: **1603-1866**

chronicle: The dams were built in **1866 & 1868**

final wood age: **1872** (K. Nicolussi, 2017)



Summary - Major changes

ca. **10500 cal. yr. BP**	**disconnected** from glacier
9500-850 cal. yr BP	**homogeneous organic** sediment
after **850 cal yr. BP** 1100 AD ± 200	re-advance of glacier Connection to glacier: **continuous** but **variable**
1603-1866	9 **land slides/floodings** result in (chronicles)
1868/70	**man made structures** to avert floodings
Since 1950 ± 7	**disconnected** from glacier (clear water lake)

Thanks for your attention