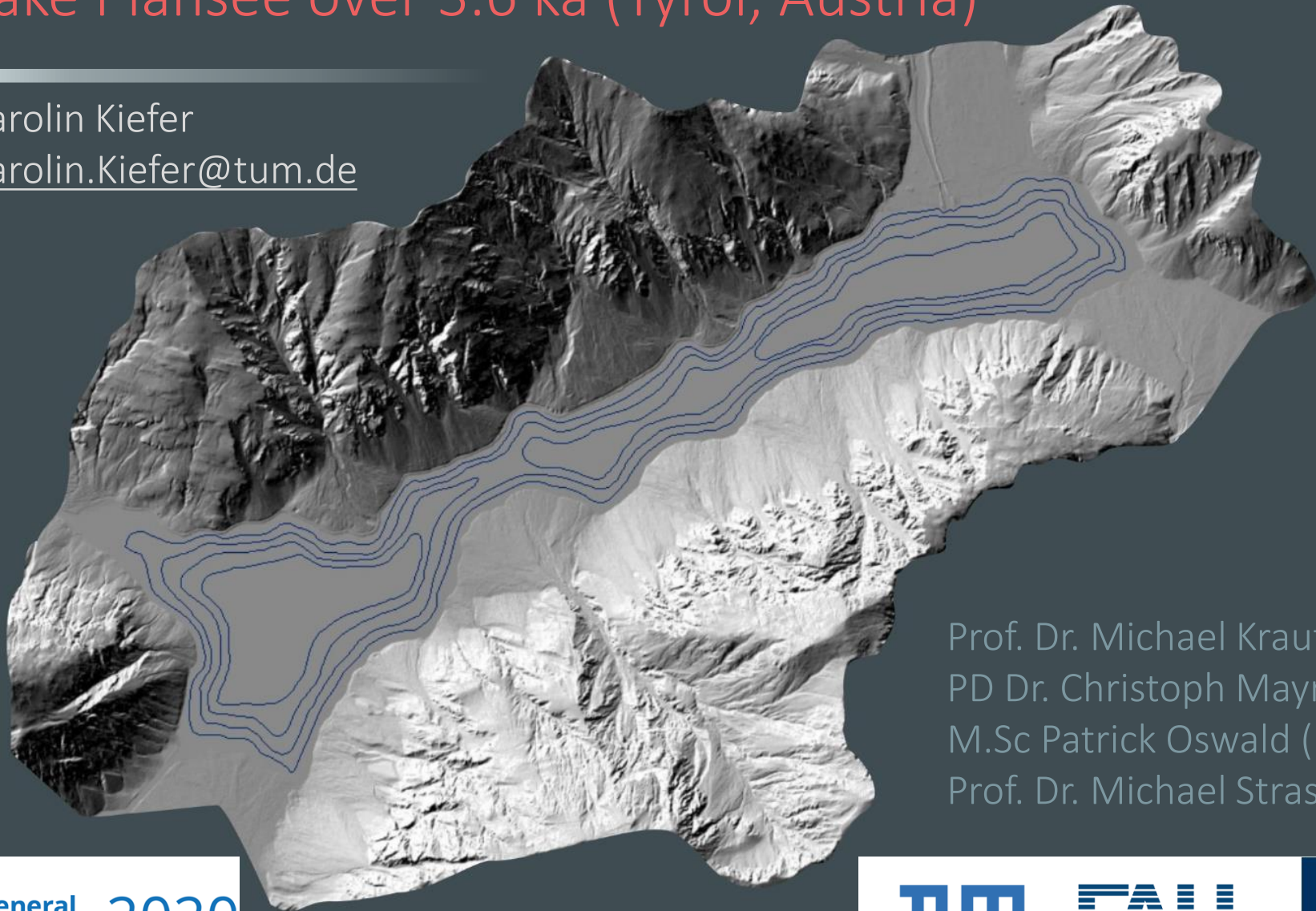


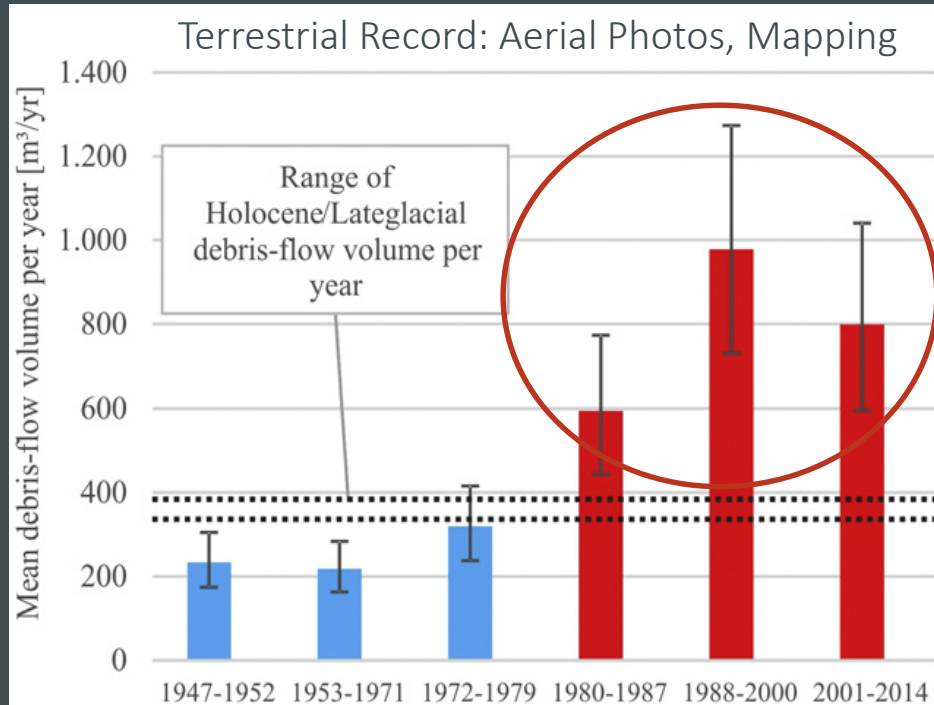
The Influence of Debris Flow Activity on the Sediment of Lake Plansee over 3.6 ka (Tyrol, Austria)

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Prof. Dr. Michael Krautblatter (TUM)
PD Dr. Christoph Mayr (FAU)
M.Sc Patrick Oswald (UIBK)
Prof. Dr. Michael Strasser (UIBK)

Can we see evidence for a change of debris flow volumes in the **sedimentary archive** analogous to the terrestrial record?

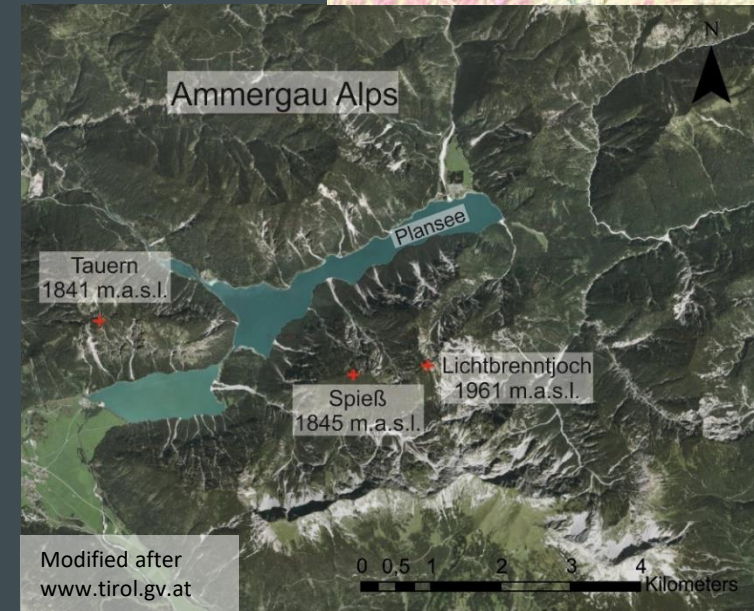


Enhanced debris flow activity
around lake Plansee
since the 1980s

2-3 times higher
than mean
Holocene rates

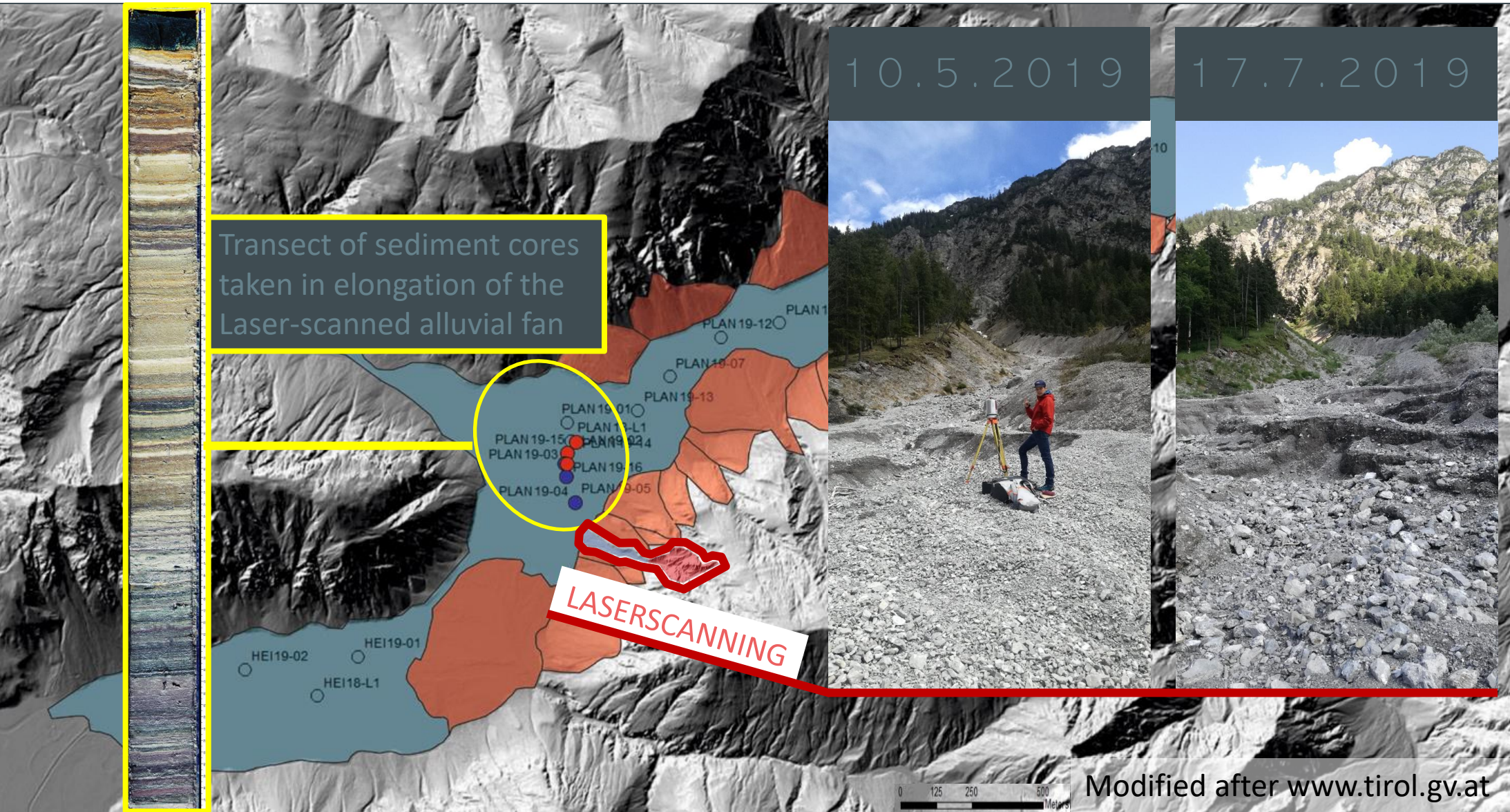
DIETRICH, A.; KRAUTBLATTER, M. (2017): Evidence for enhanced debris-flow activity in the Northern Calcareous Alps since the 1980s (Plansee, Austria). – *Geomorphology* 287: 144-158.
<https://doi.org/10.1016/j.geomorph.2016.01.013>

STUDY SITE



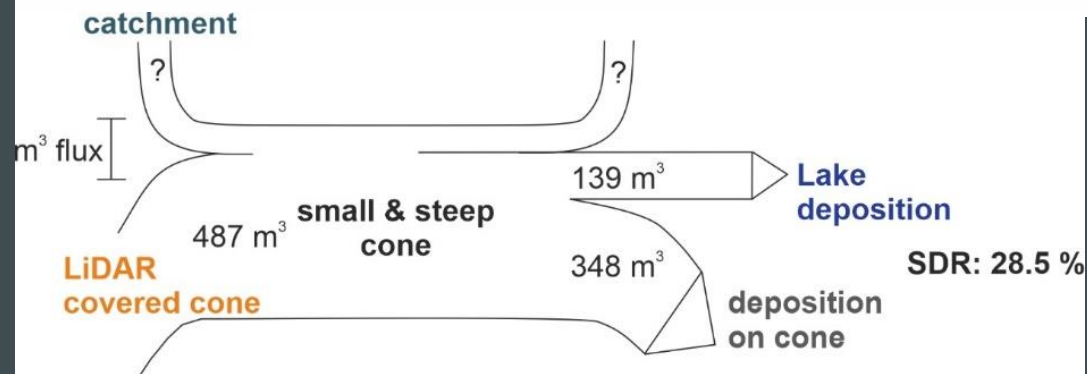
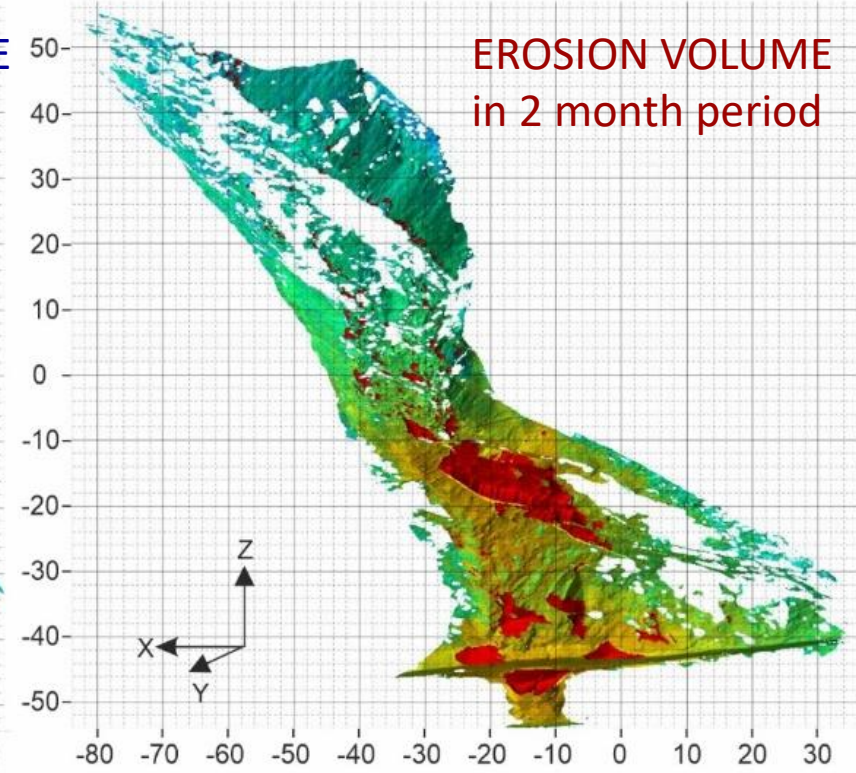
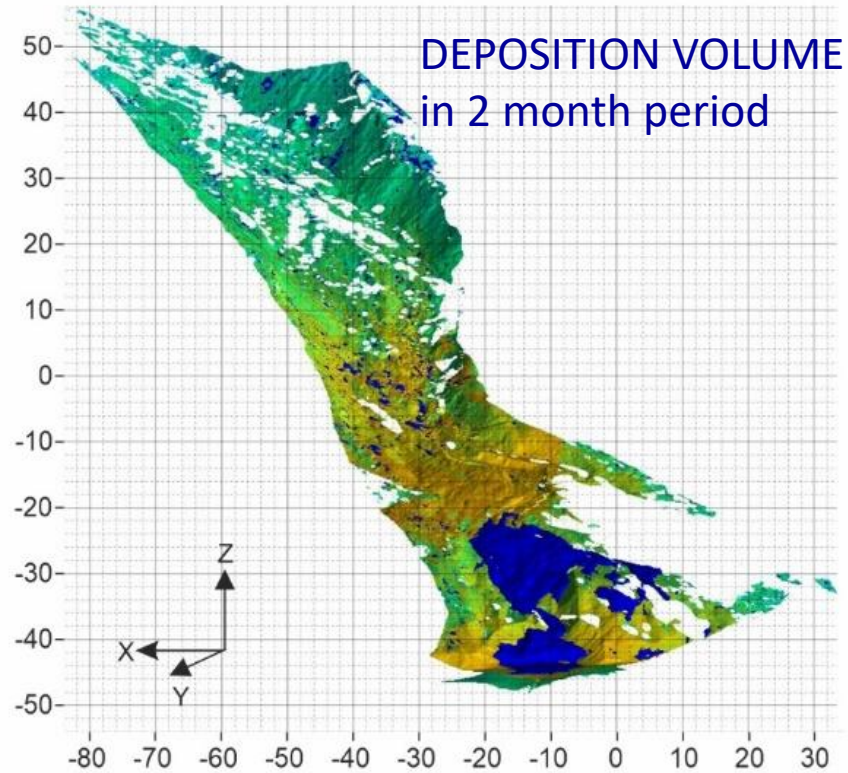
SAMPLING LOCATIONS

Lake area: 2.87 km²
Depth: 77 m



Modified after www.tirol.gv.at

RESULTS LASERSCANNING



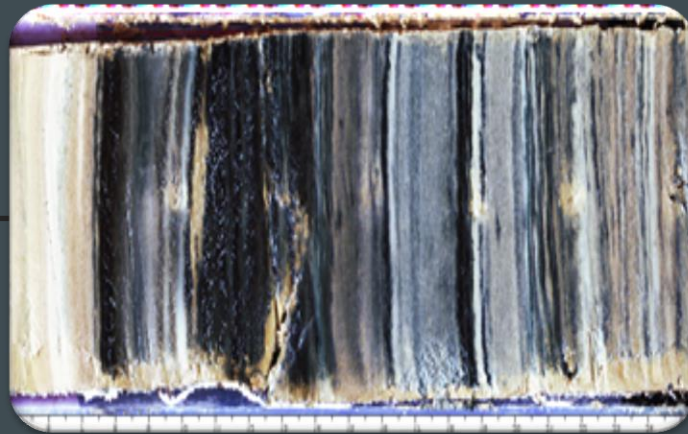
487 m³ of debris were transported in the observed time period, 139 m³ of which were deposited in the lake

↓
SEDIMENT DELIVERY RATIO: 28.5 %

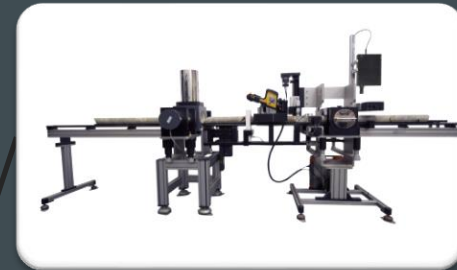
METHODOLOGY SEDIMENT ANALYSIS



Piston Corer with
Hammer Action
Ø 63 mm



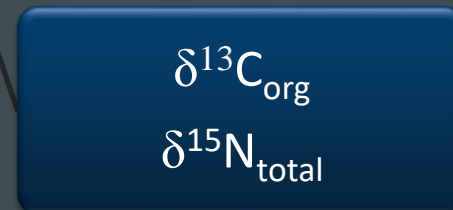
Sediment Core



GEOTEK MSCL
Density & Magnetic Susceptibility

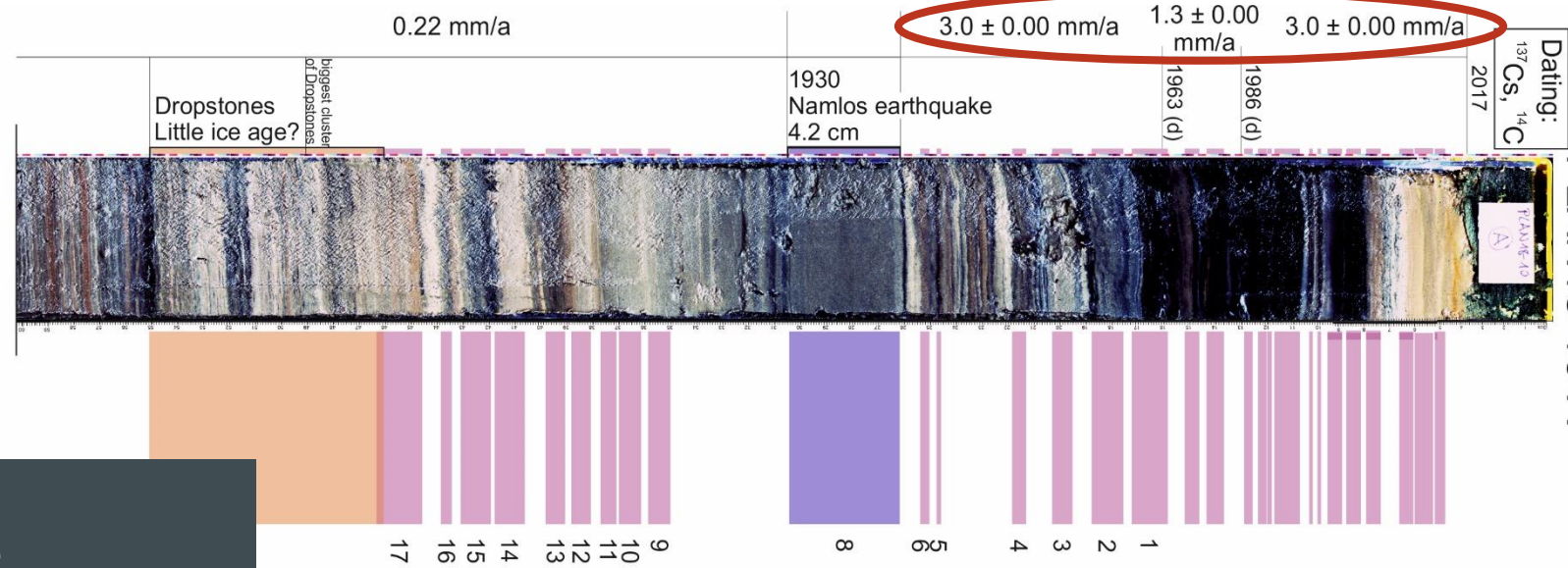
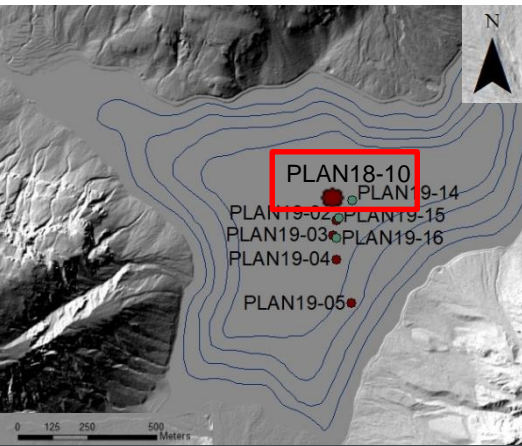


MALVERN Mastersizer 3000
Grain Size



Thermo Delta V Plus

RESULTS SEDIMENTATION RATES



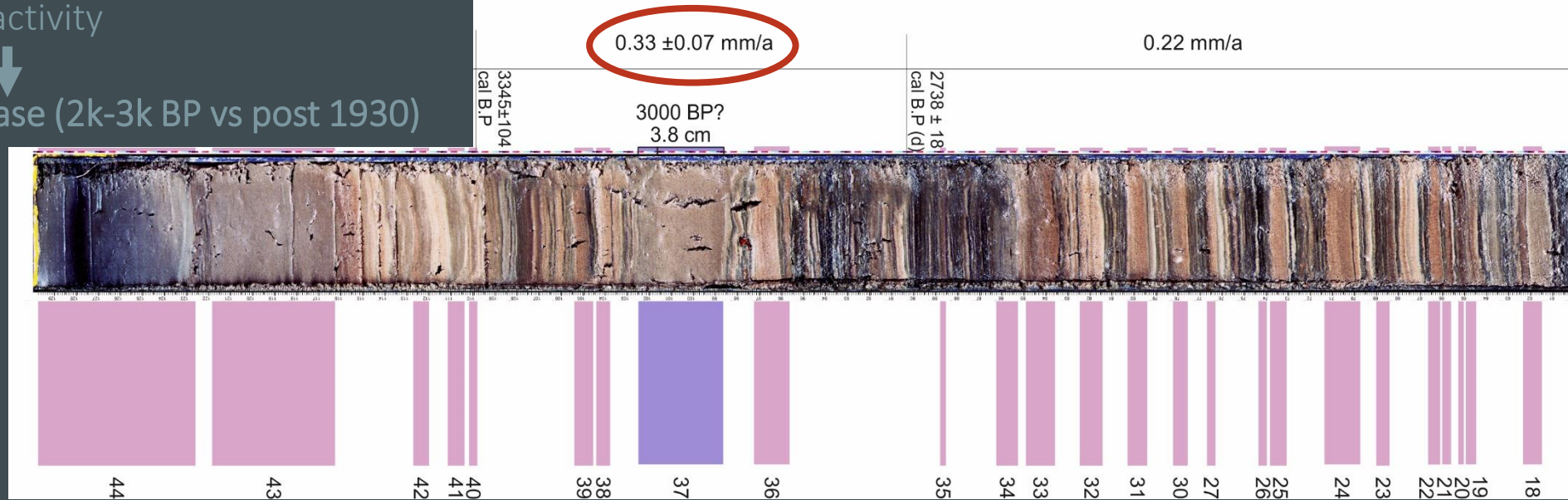
PLAN18-10-A

Dating:
 ^{137}Cs , ^{14}C

Dating method: ^{137}Cs , ^{14}C
Sedimentation rates indicate
debris flow activity

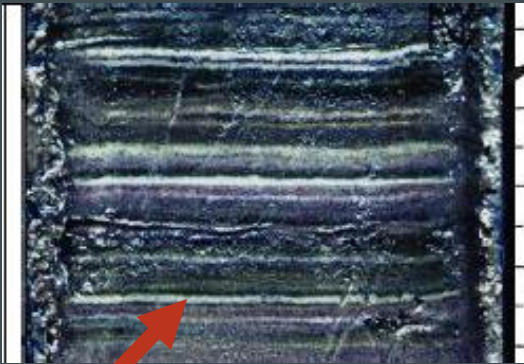


Strong Increase (2k-3k BP vs post 1930)



RESULTS TYPES OF DEPOSITS

Background
Sedimentation



Dark and light laminae

Debris Flow



Subaquatic
Suspension Flow



Homogeneous
grain size

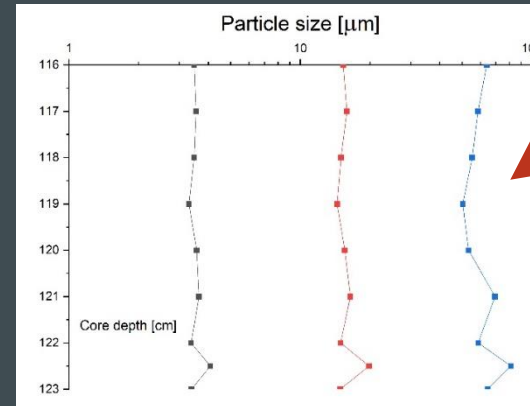
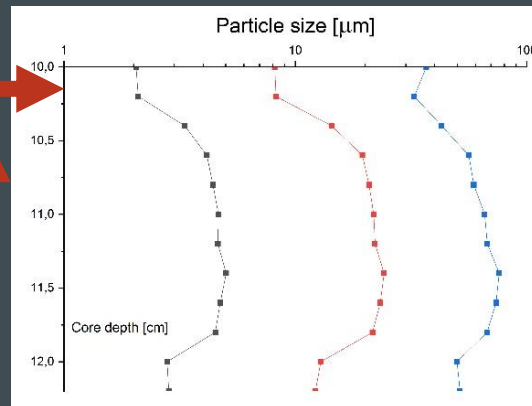
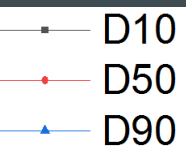
Megaevent



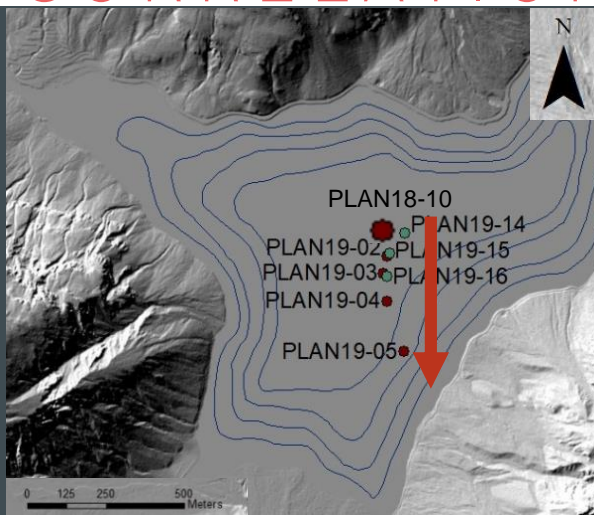
Coarse
grain size

White clay layer on top

Normal grading upwards



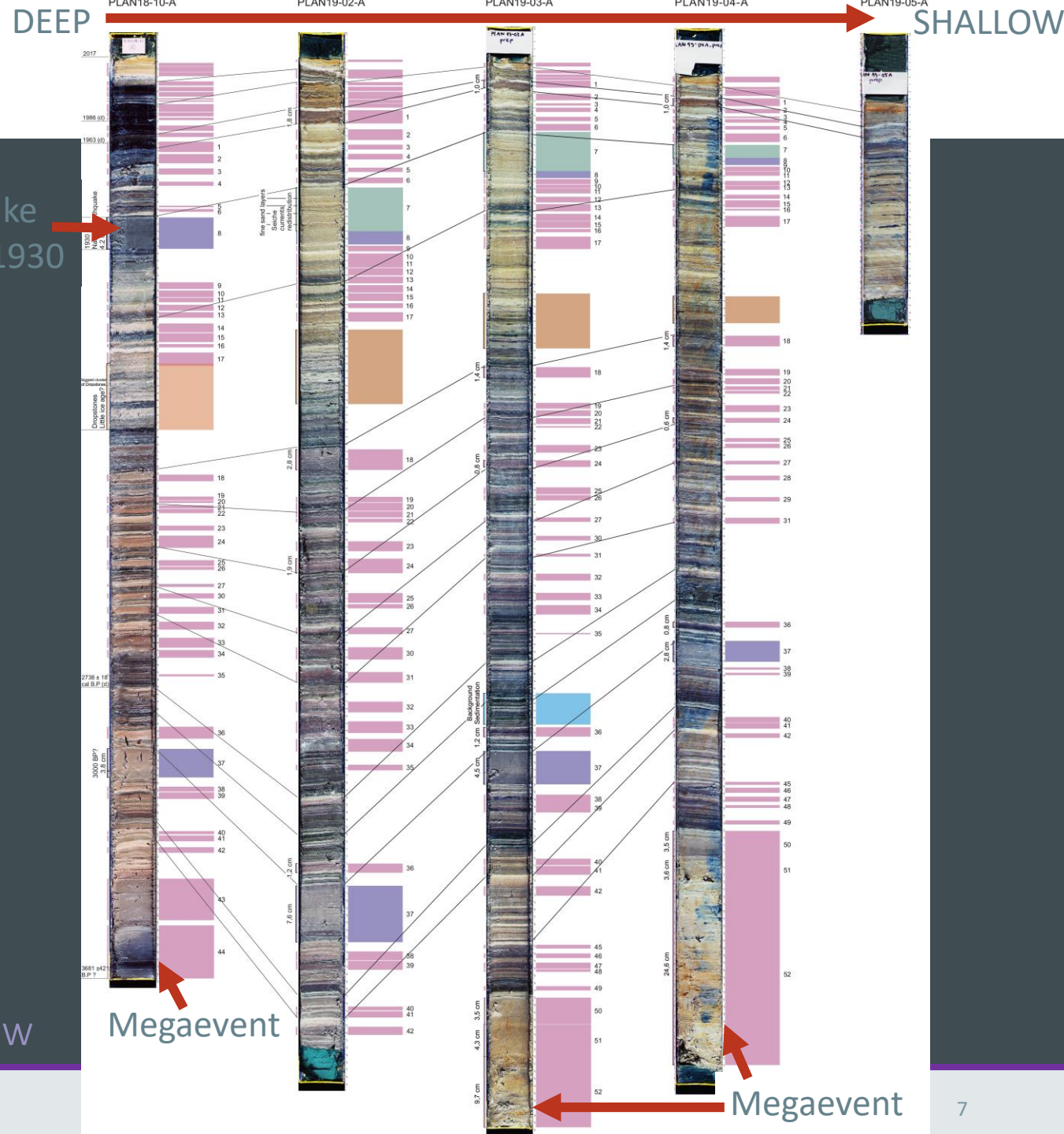
CORE-TO-CORE CORRELATION



Earthquake
Namlos 1930

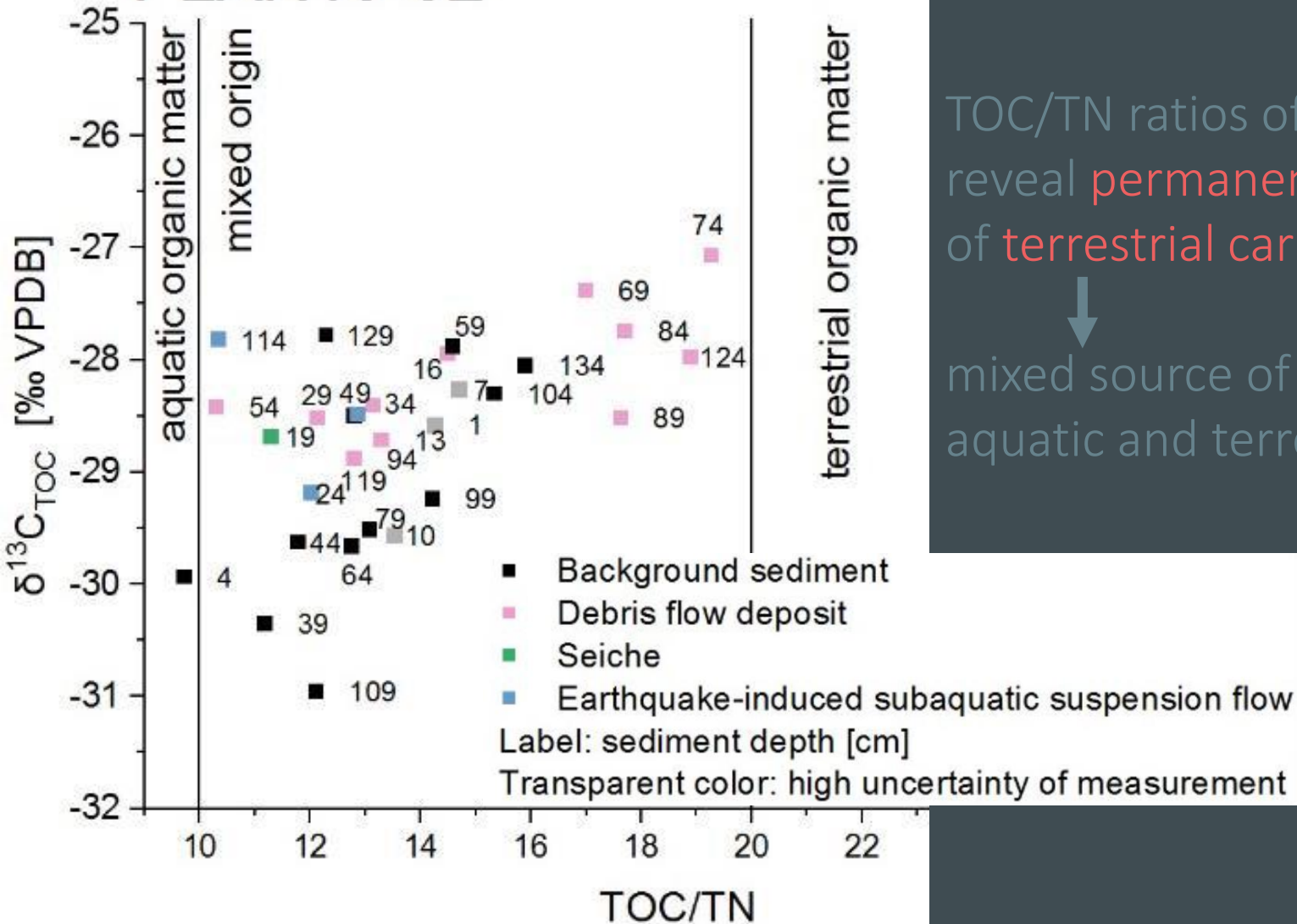
Transect of sediment cores
from deep basin
to shallow debris fan

52 Event layers were identified:
Debris flow
(34-55% of total section thickness)
Seiche
Earthquake induced suspension flow



RESULTS CARBON ISOTOPES SEDIMENT

PLAN19-02

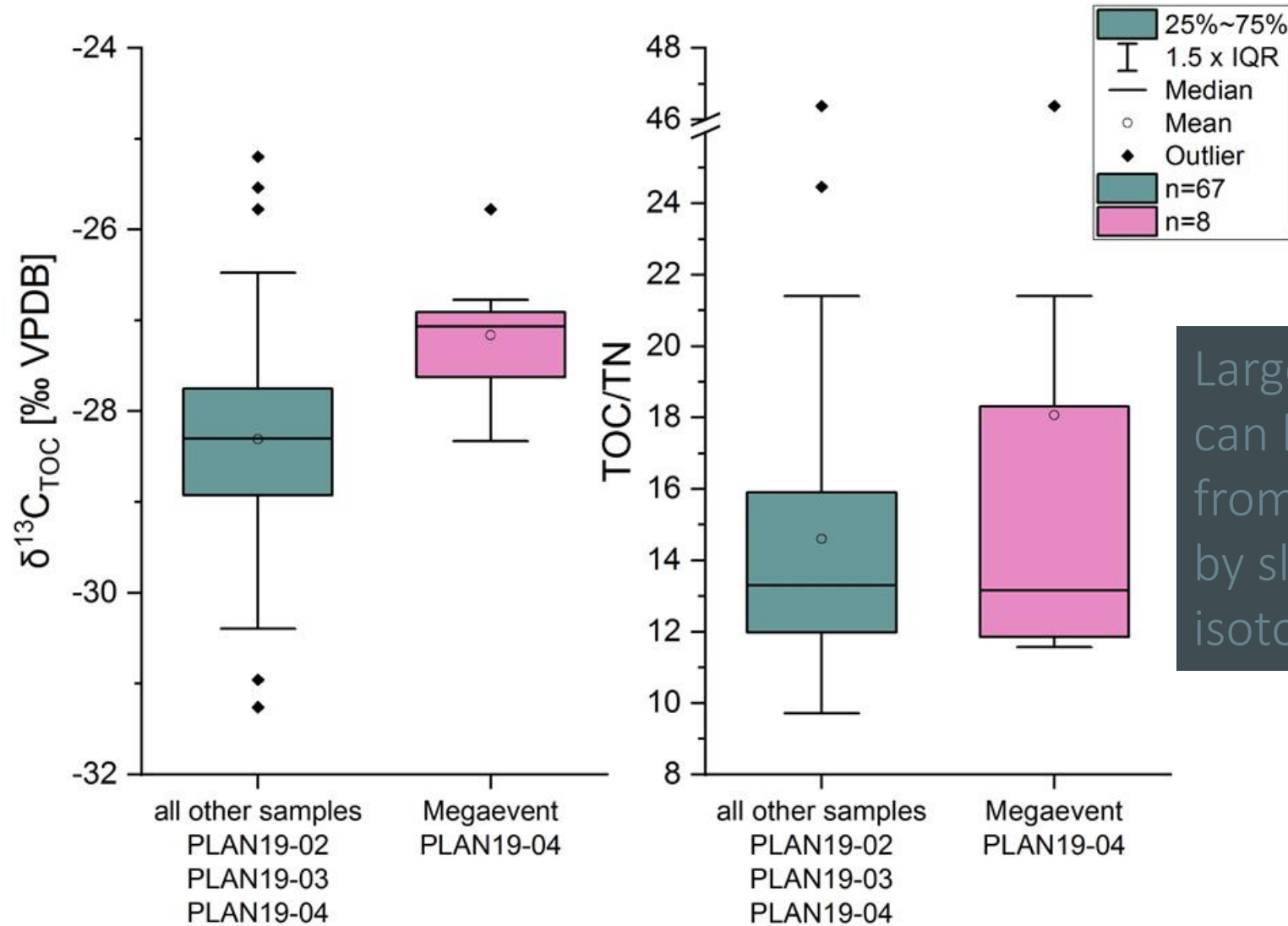


TOC/TN ratios of sediment reveal **permanent** influence of **terrestrial carbon** on the lake sediment

↓

mixed source of aquatic and terrestrial organic matter

RESULTS CARBON ISOTOPES SEDIMENT



Large debris flow events can be distinguished from background sediments by slightly **increased** $\delta^{13}\text{C}$ isotope ratios.

PRELIMINARY CONCLUSION ON ONGOING STUDIES

- └ ~ 10-fold increase of sedimentation rates in Lake Plansee after 1930
 - └ potentially linked to increase in heavy precipitation events → increased debris flow activity
 - └ potentially linked to lowered water level (5 m in winter months) from hydroelectric power plant
- └ 52 event layers identified: cover 34 % to 55% of total section thickness
- └ Three types of event deposits
 - └ Flood-triggered debris flows
 - └ Earthquake-induced subaquatic suspension flows
 - └ Megaevents
- └ TOC/TN ratios: permanent influence of terrestrial carbon on the lake sediment and mixed source of allochthonous and autochthonous organic matter
- └ Large debris flow events can be distinguished from background sediments by increased $\delta^{13}\text{C}$ isotope ratios

RECONSTRUCTION OF HOLOCENE DEBRIS FLOW ACTIVITY BASED ON CLIMATE-DRIVEN PRECIPITATION DYNAMICS

OUTLOOK

