



Bathymetry changes due to delayed basal ice melt at the proglacial lake Obersulzbachsee, Hohe Tauern, Austria

– Implications for sediment budgeting

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and

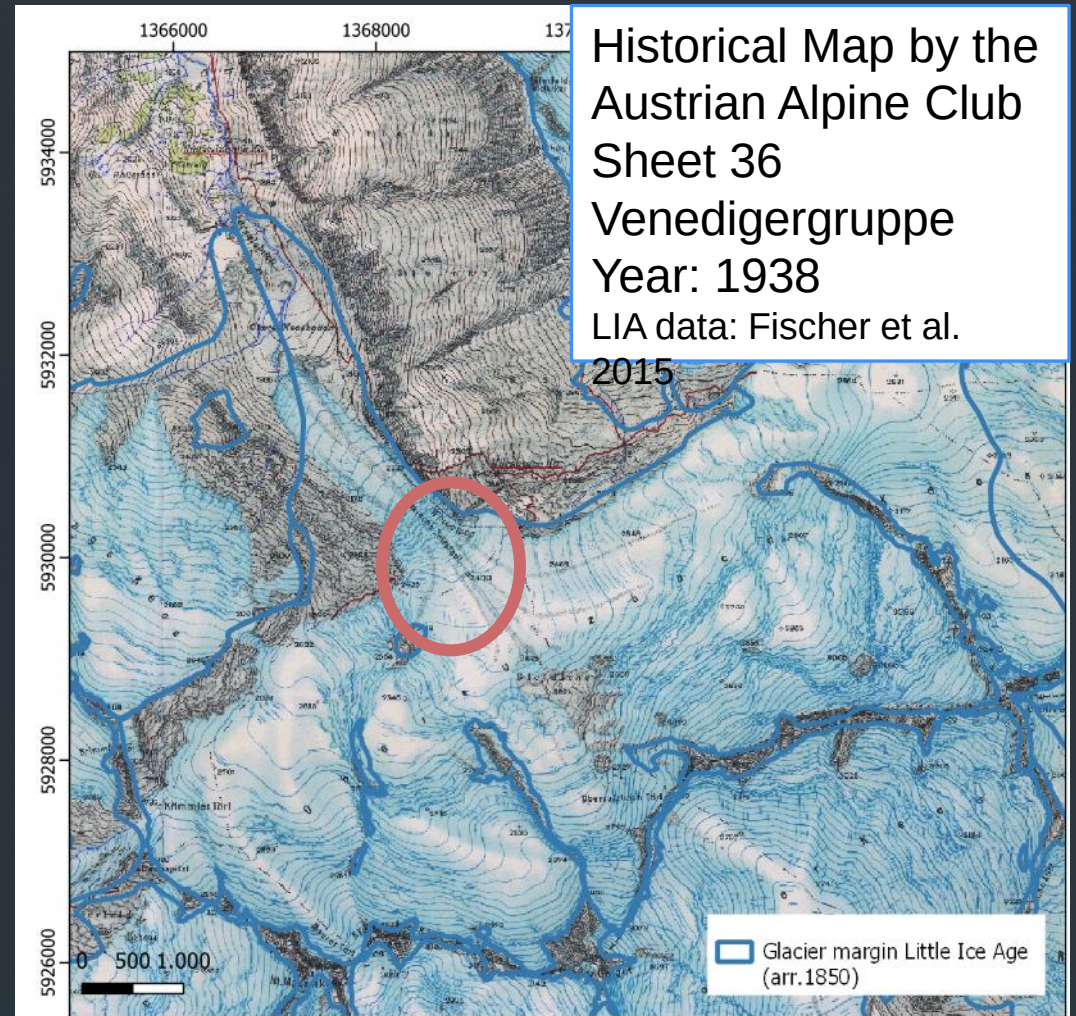
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University of Applied Sciences
Vienna, Austria

- Numerous new lakes are forming in the mountain areas around the world.
- Lake formation is an indicator of climate change
- Lakes impact on the sedimentary cascade

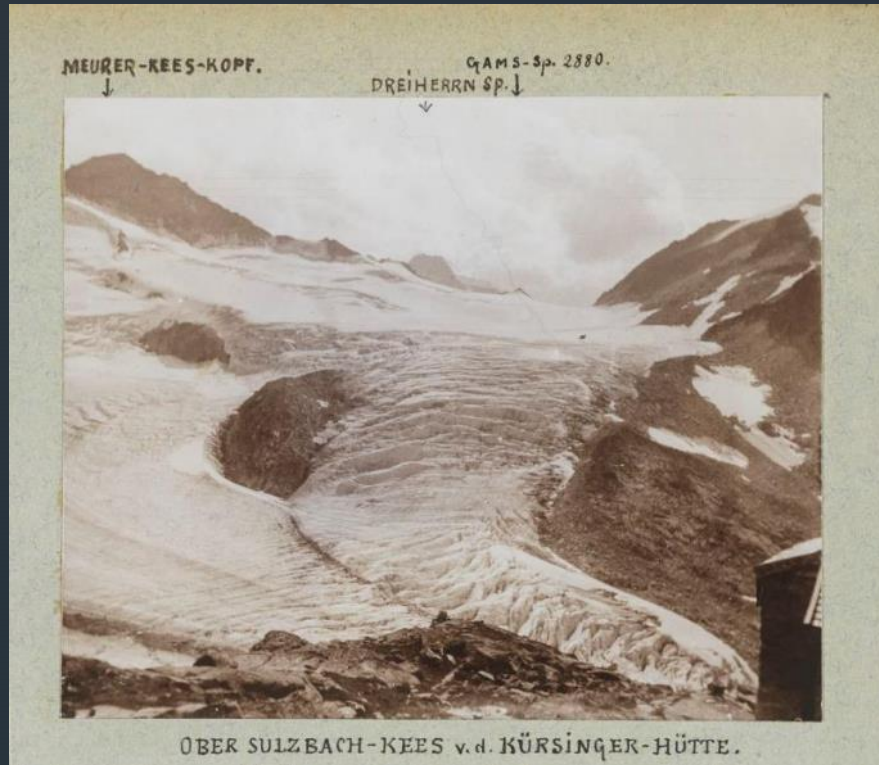
How does a glacier lake evolve?

What are the implications of basal ice on the lake sedimentation?

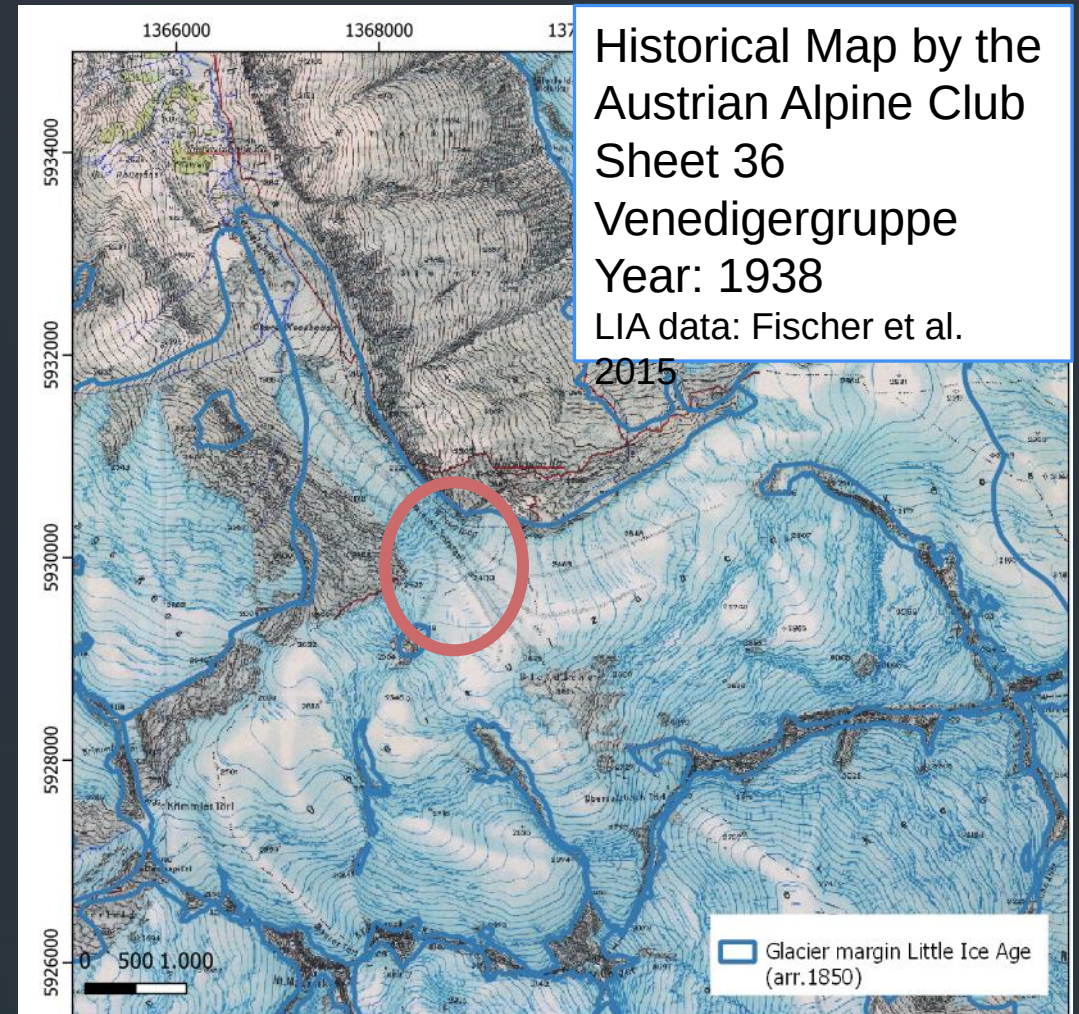




Arr. 1885

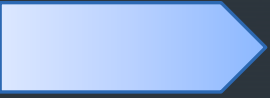


https://www.sn.at/wiki/Datei:Sulzbacherkees_um_1885.jpg

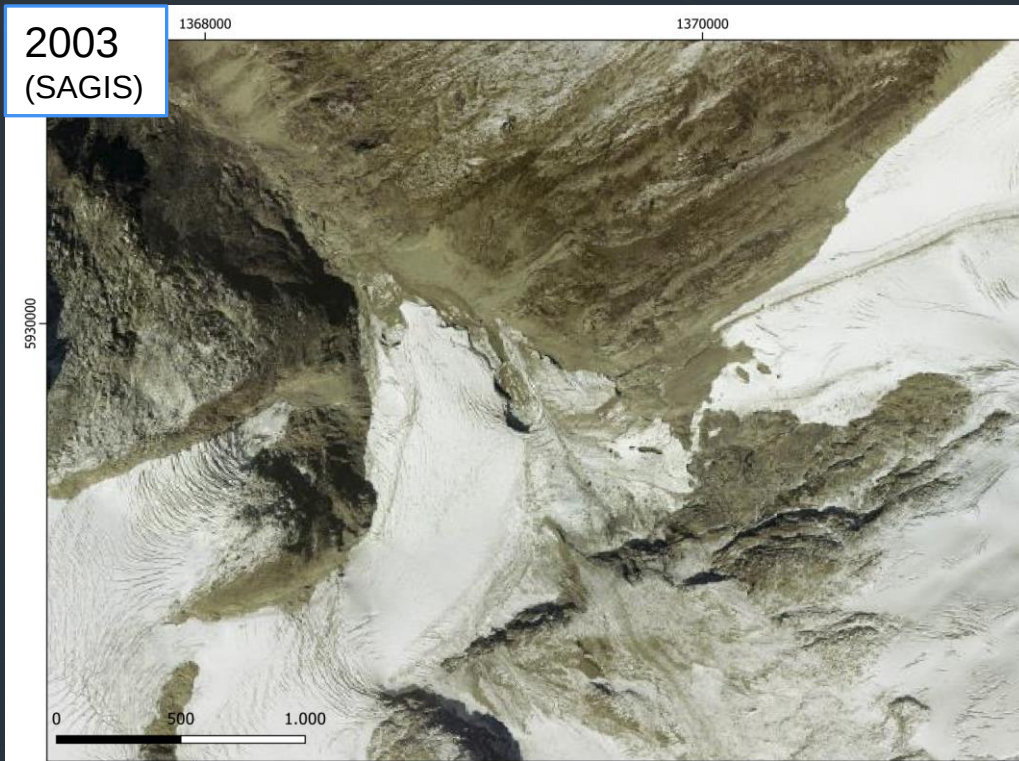


Lets watch a glacier lake evolve...

1999/2000

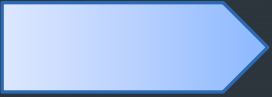


Lake starts evolving

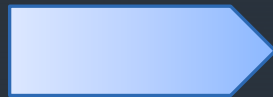


Lets watch a glacier lake evolve...

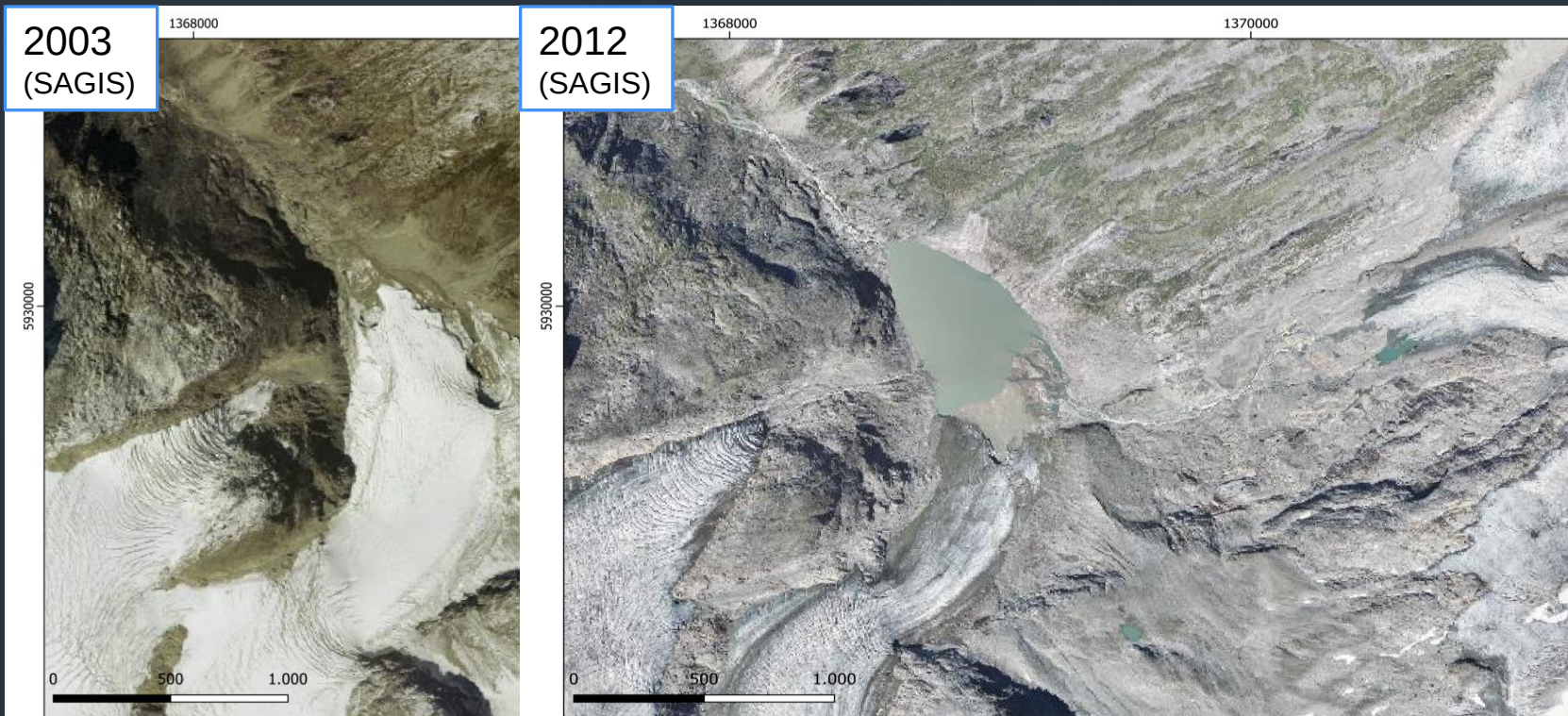
1999/2000



2010/11

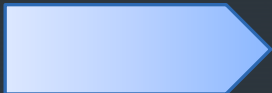


Lake starts evolving Glacier tongue leaves the lake



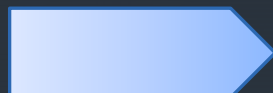
Lets watch a glacier lake evolve...

1999/2000



Lake starts evolving

2010/11



Glacier tongue leaves the lake

Lake Sulzsee

Facts (2015):

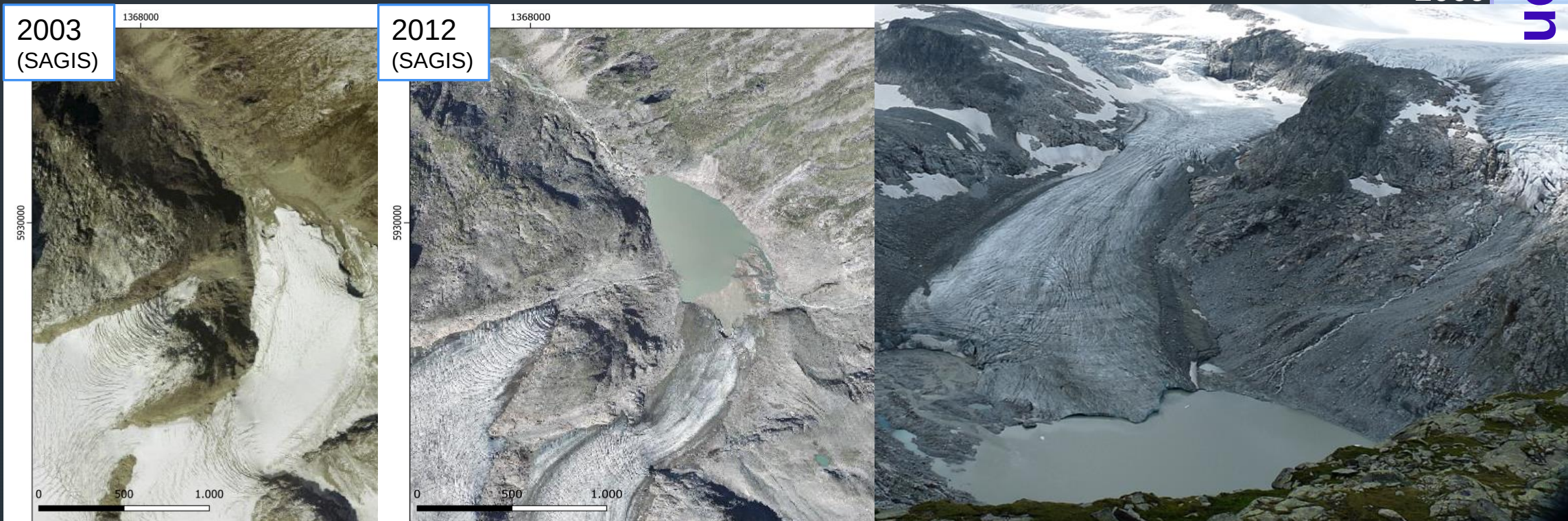
Area: 130,000 m² (280*530 m)

Delta area: 85,000 m²

Volume lake: 2.5 Mio m³

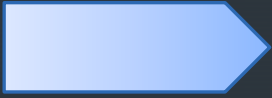
2009

Lake formation



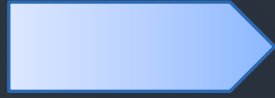
Let's watch a glacier lake evolve...

1999/2000



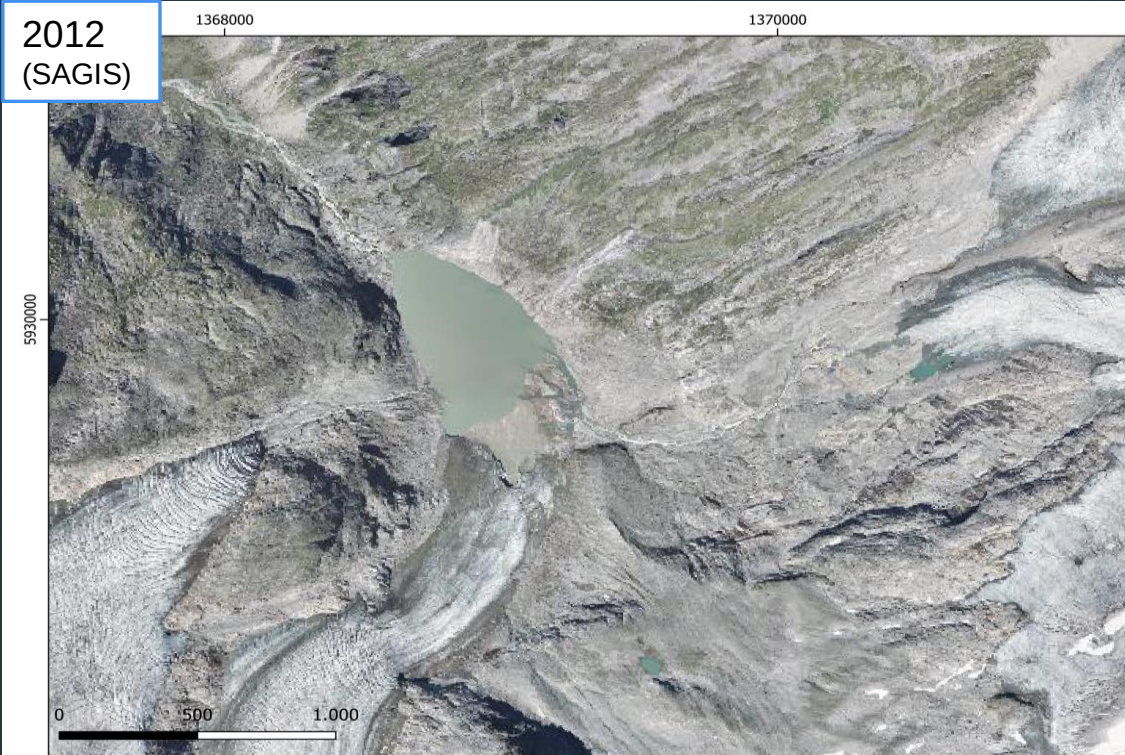
Lake evolves

2010/11



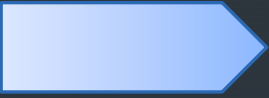
Glacier tongue leaves the lake

2012
(SAGIS)



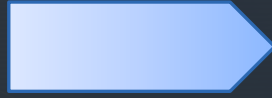
Let's watch a glacier lake evolve...

1999/2000



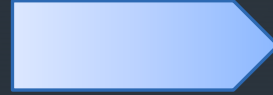
Lake evolves

2010/11

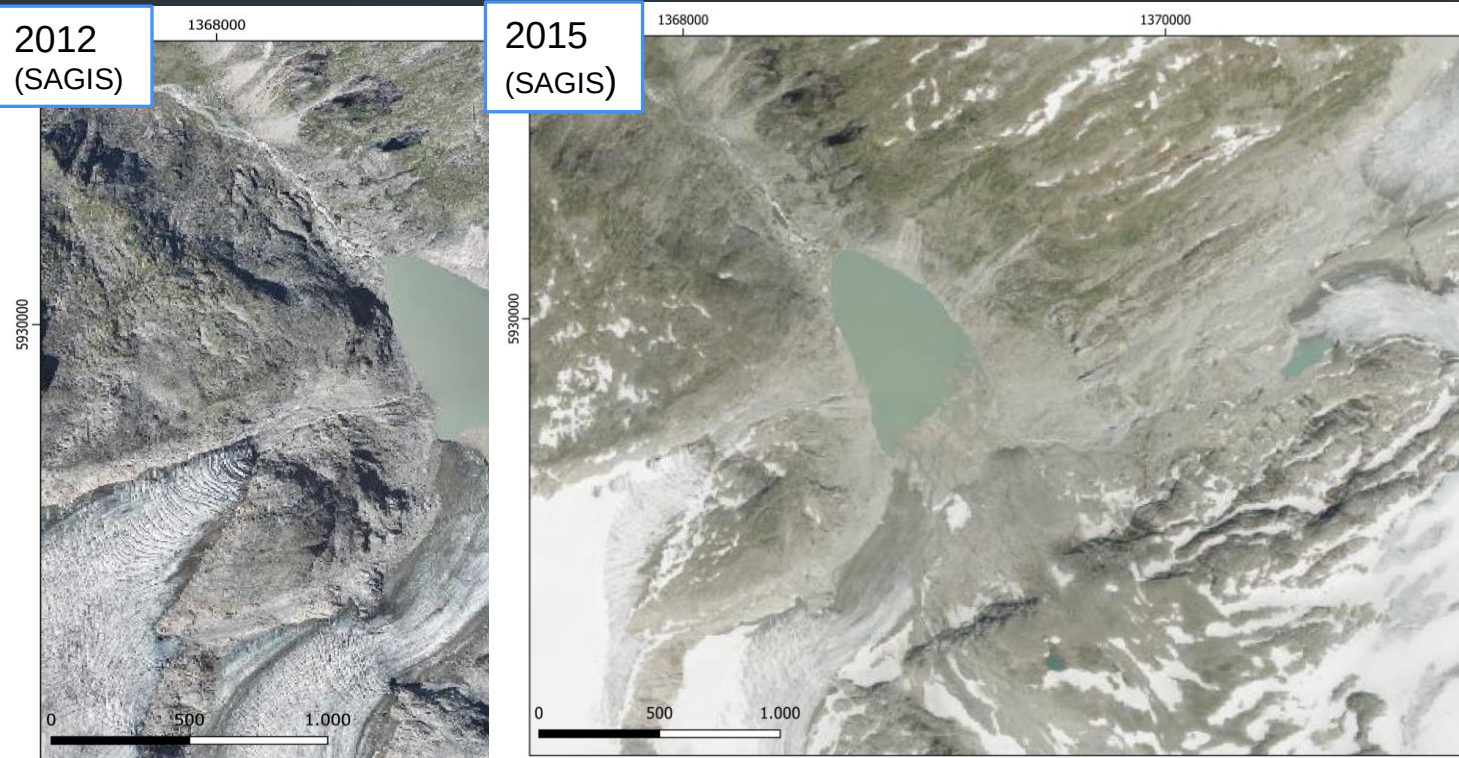


Glacier tongue leaves the lake

2010 -

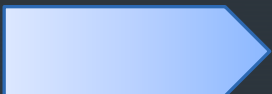


Delta forms



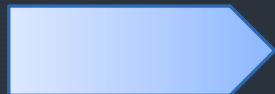
Lets watch a glacier lake evolve...

1999/2000



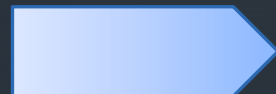
Lake evolves

2010/11



Glacier tongue leaves the lake

2010 -



Delta forms

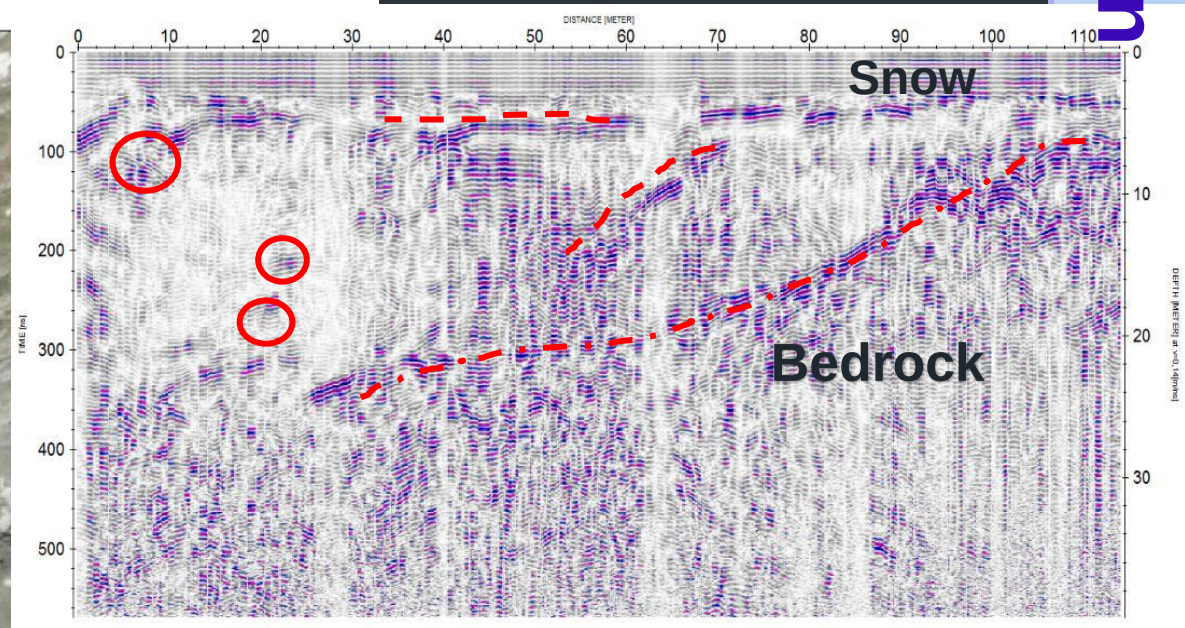
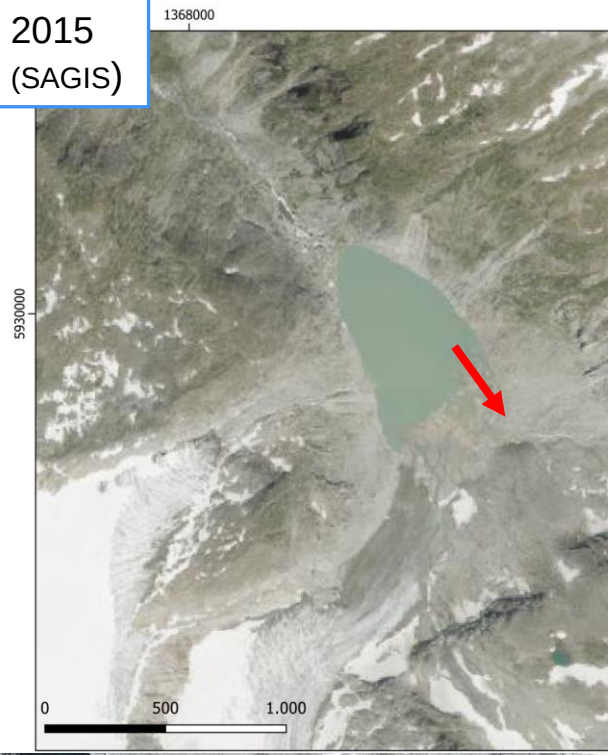


Georadar – sounding on the frozen delta (2016)

2012
(SAGIS)



2015
(SAGIS)



Otto et al. (in prep)

Let's watch a glacier lake evolve...

1999/2000



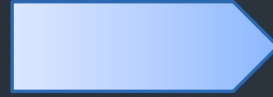
Lake evolves

2010/11

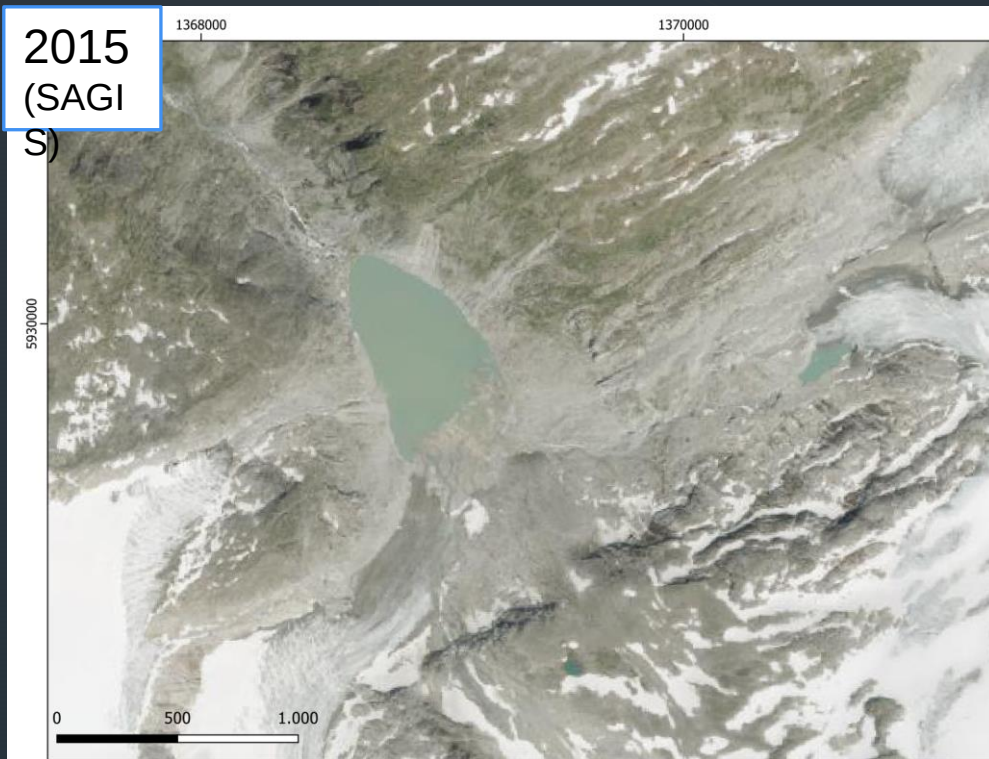


Glacier tongue leaves the lake

2010 -

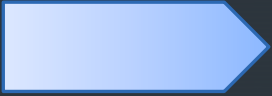


Delta is forming



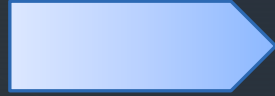
Lets watch a glacier lake evolve...

1999/2000



Lake evolves

2010/11

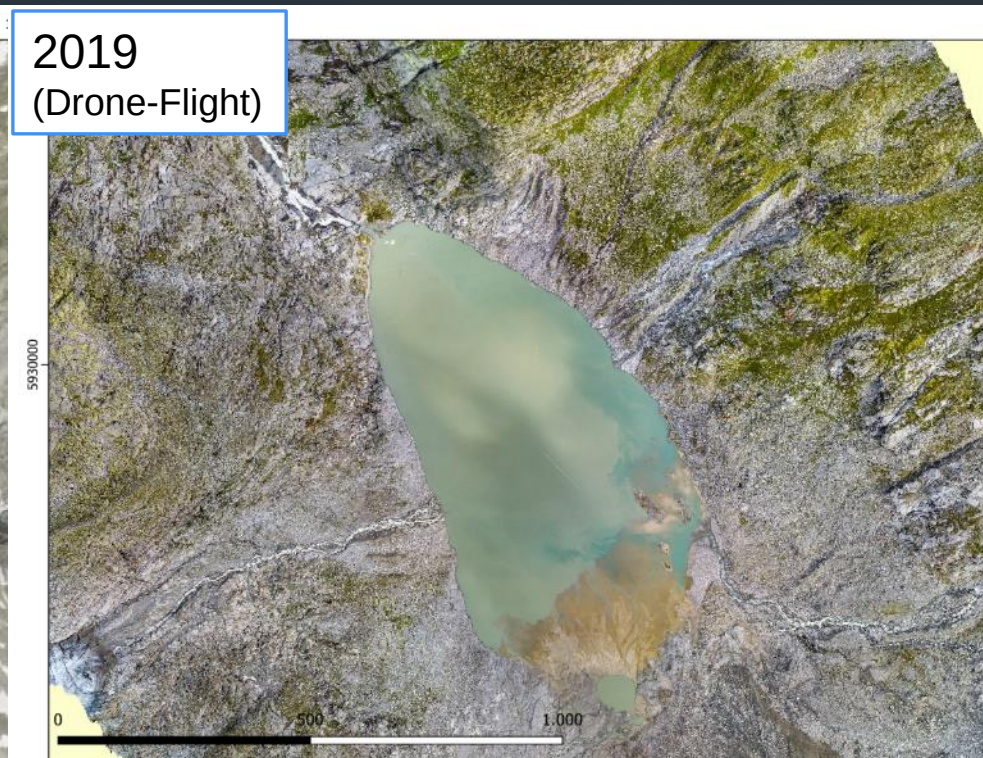
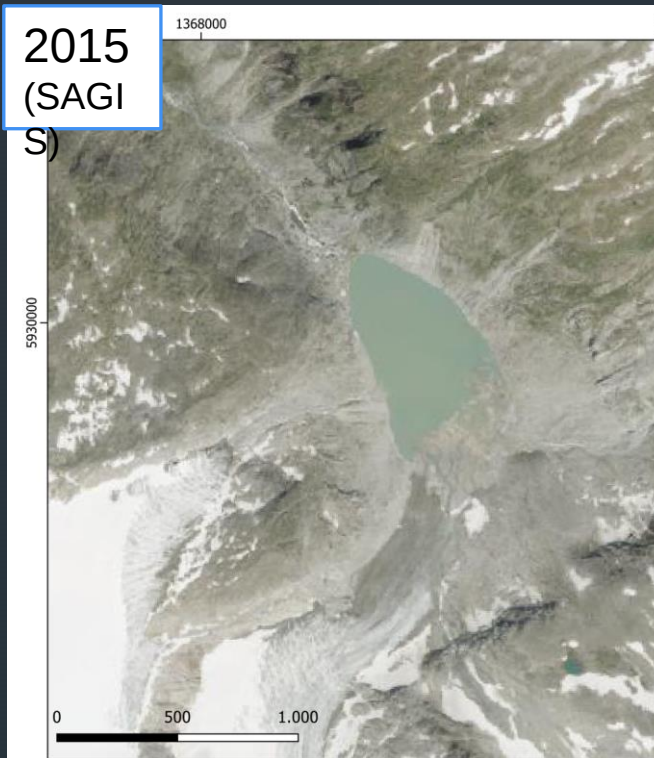


Glacier tongue leaves the lake

2010 -

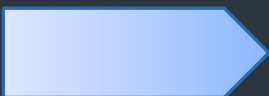


Delta is forming



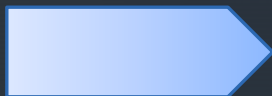
Lets watch a glacier lake evolve...

1999/2000



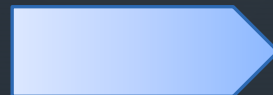
Lake evolves

2010/11



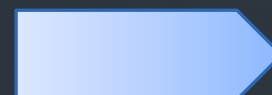
Glacier tongue leaves the lake

2010 -



Delta is forming

2019/20

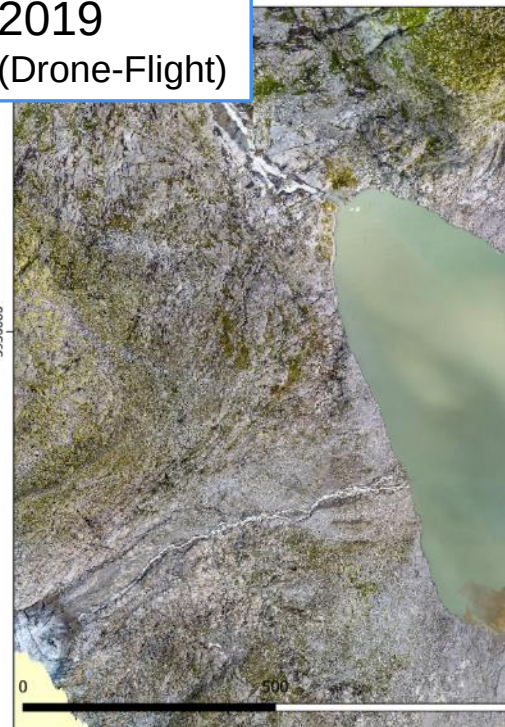


Delta sediments sink into lake

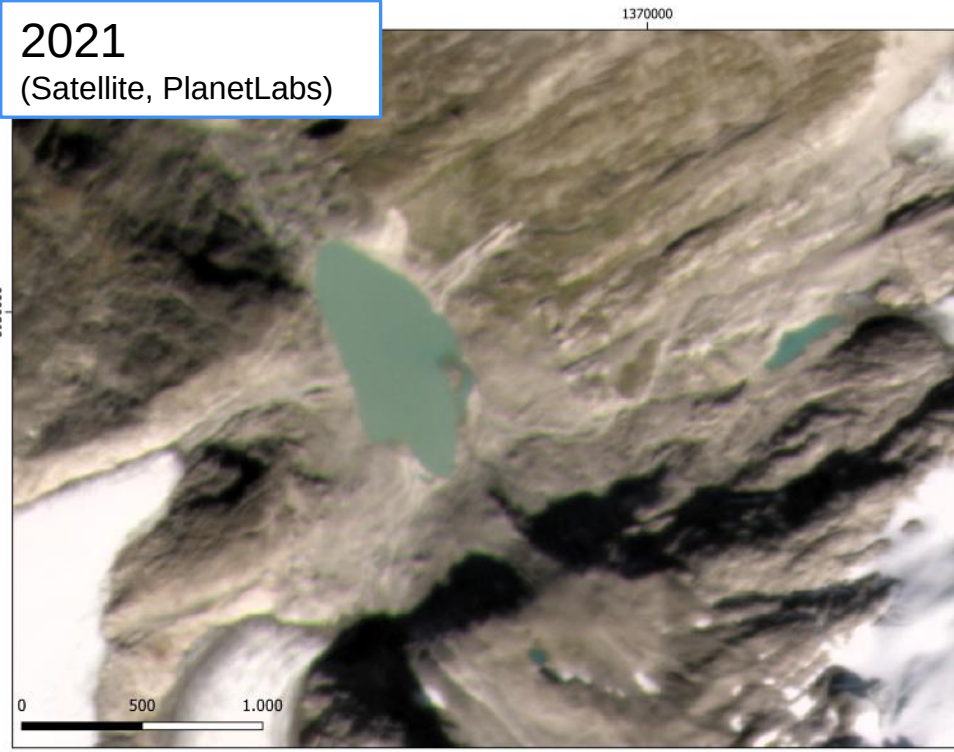
2015
(SAGI
S)



2019
(Drone-Flight)

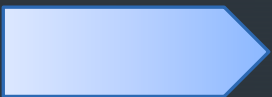


2021
(Satellite, PlanetLabs)



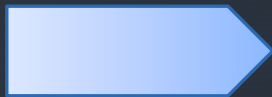
Let's watch a glacier lake evolve...

1999/2000



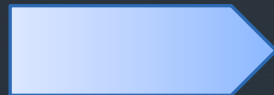
Lake evolves

2010/11



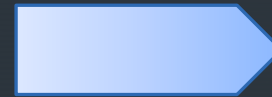
Glacier tongue leaves the lake

2010 -



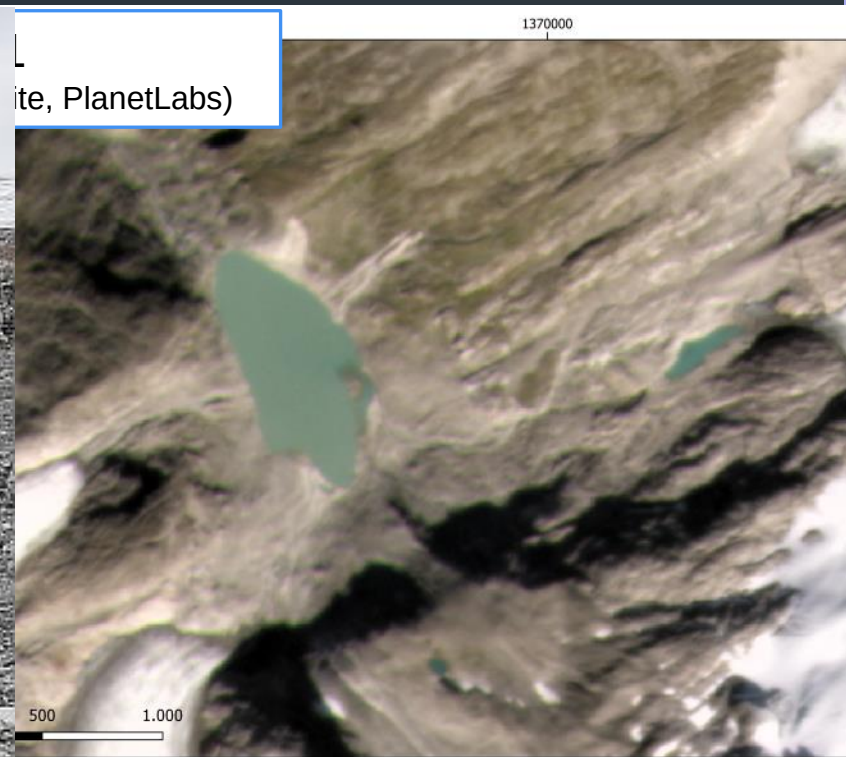
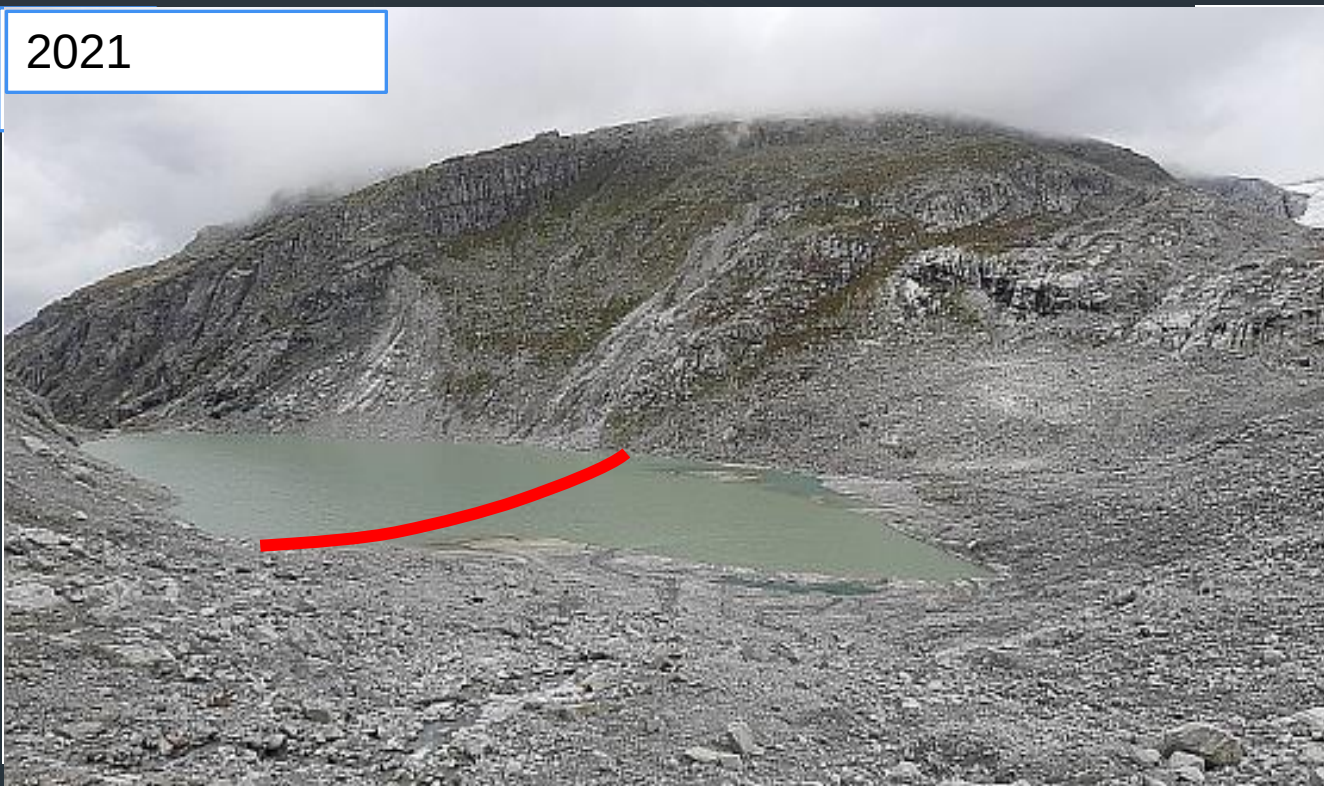
Delta is forming

2019/20



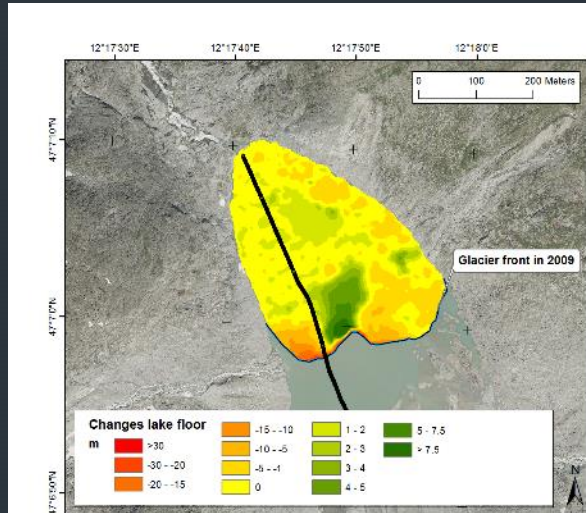
Delta sediments sink into lake

2021



Lake and lake floor evolution

Lake floor change
2009-2015

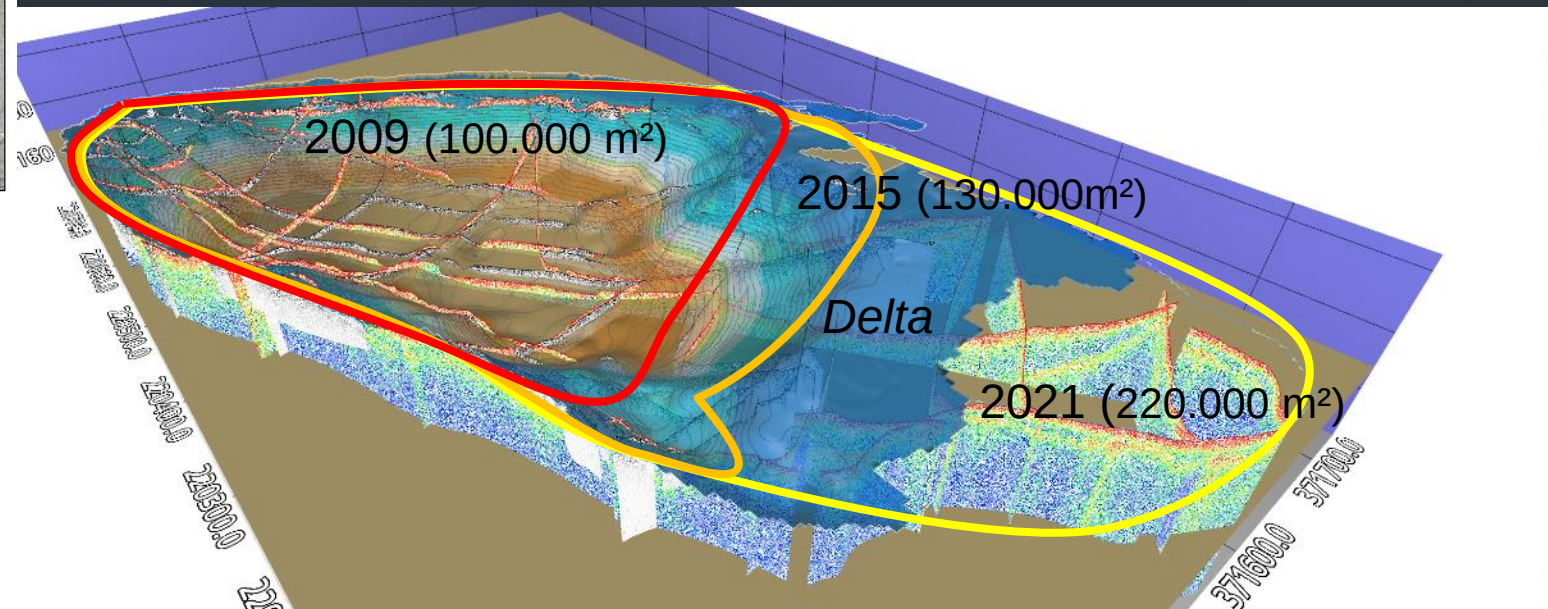


Data: Hydro Land Salzburg
(Bathymetry), Land
Salzburg, SAGIS (2015),
Field data

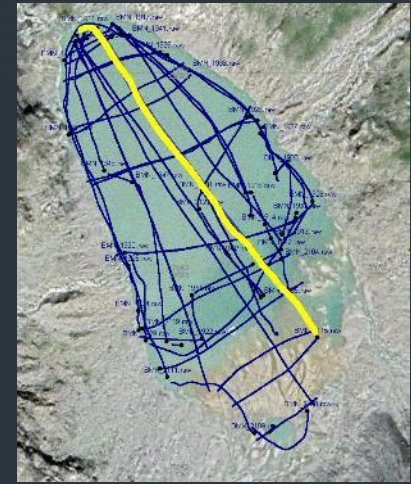
Echo sounding



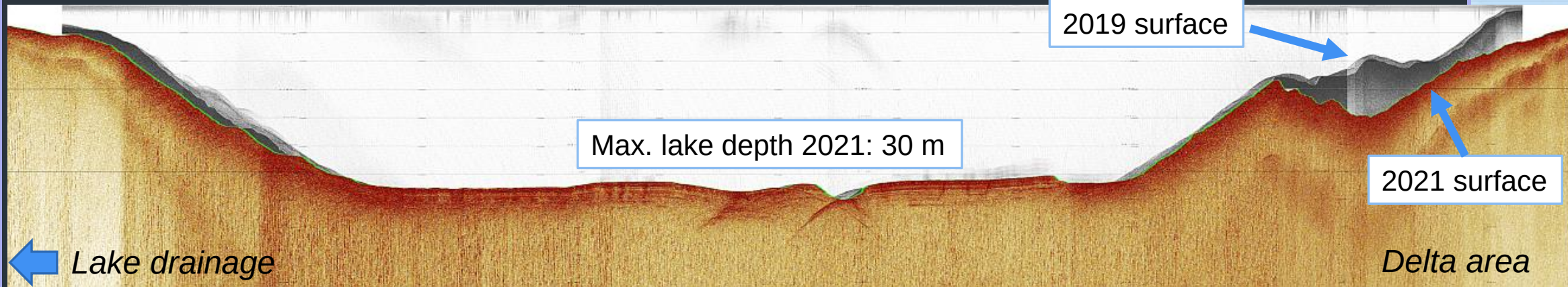
Evolution of the lake area and lake floor (2009 – 2021)



Lake and lake floor evolution

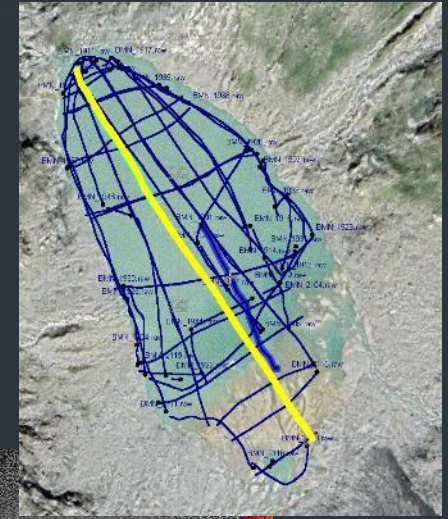
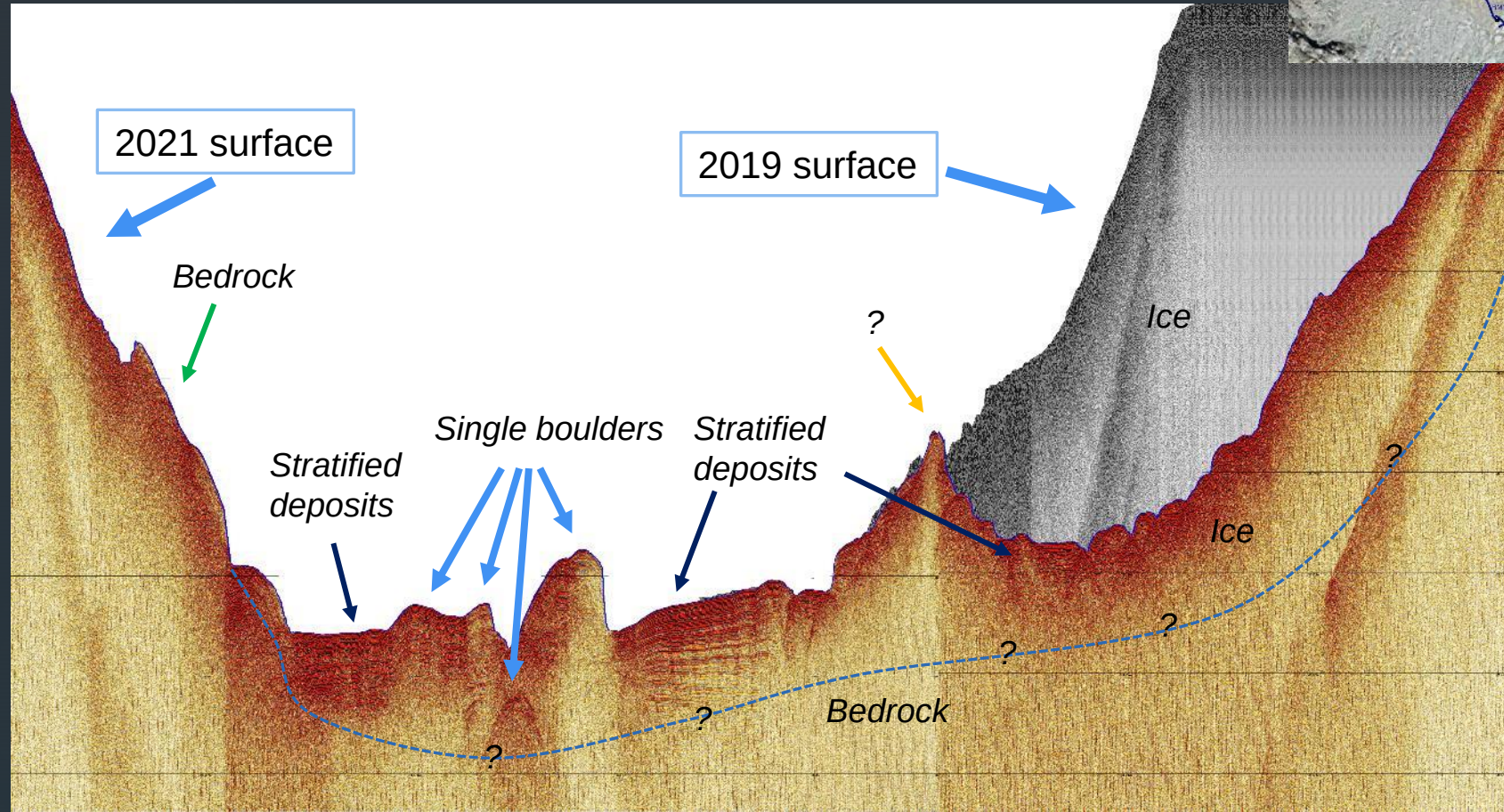


Lake floor changes

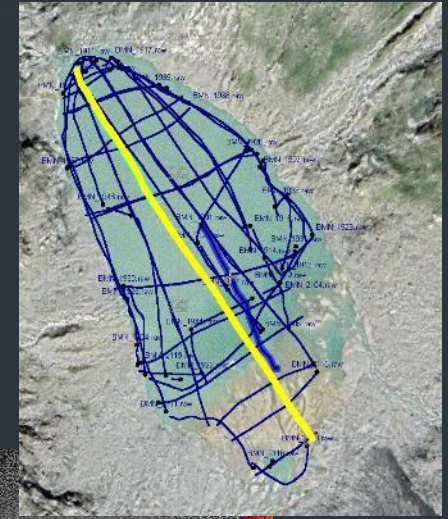
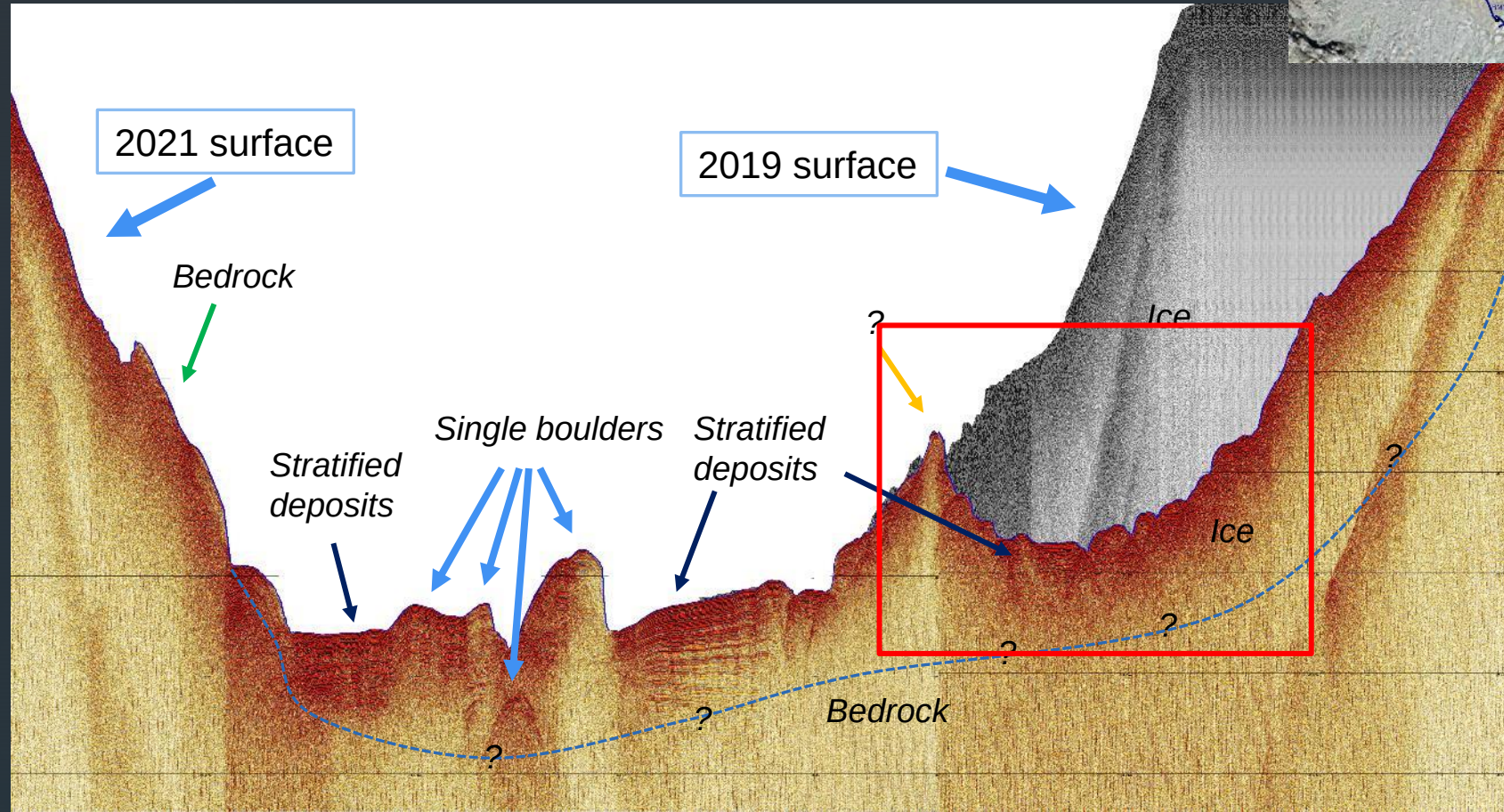


(Otto et al. (in prep.))

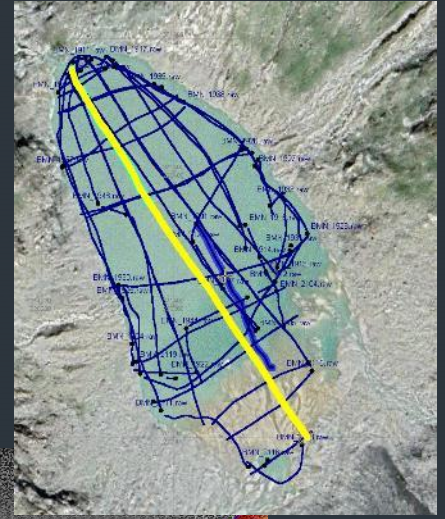
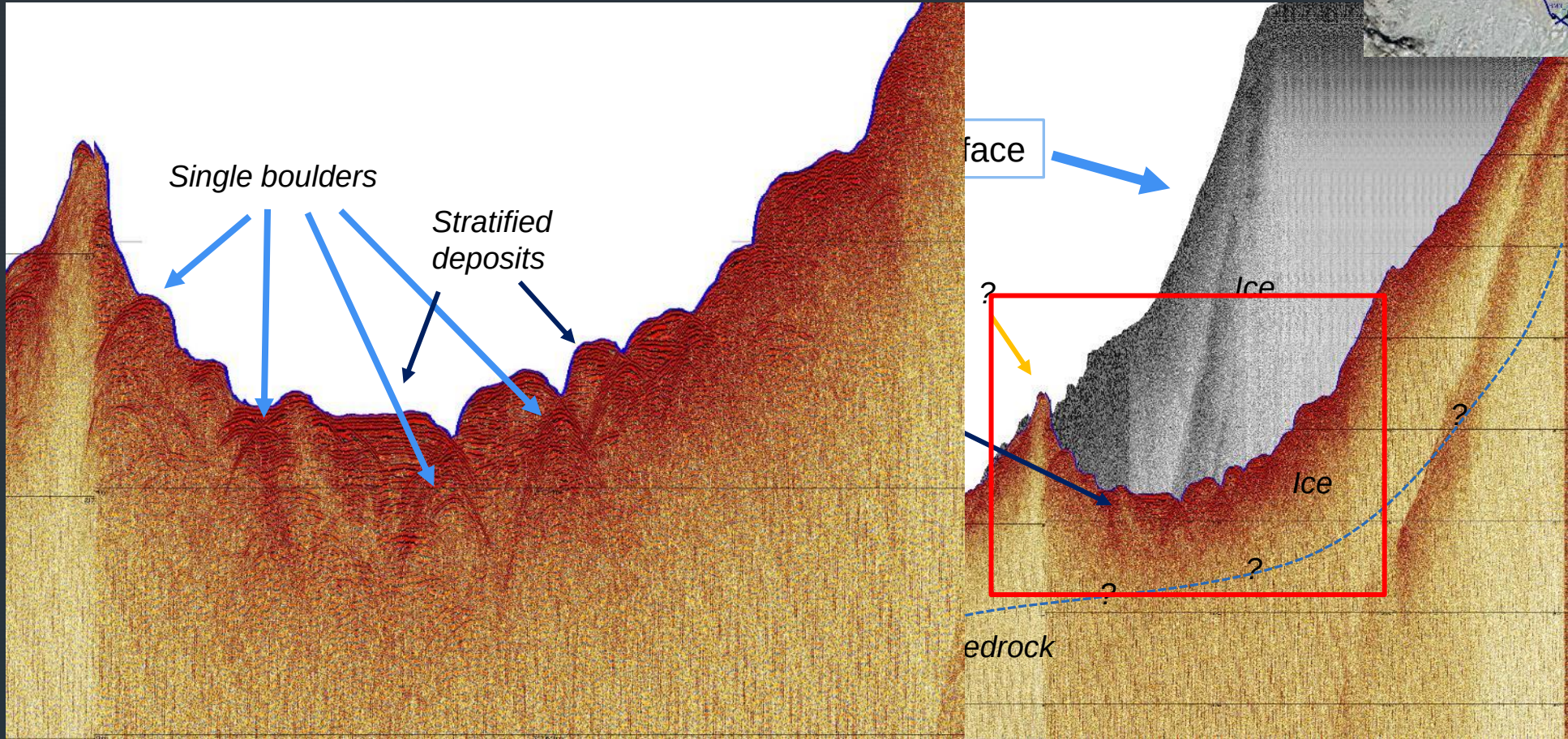
Sediment structures



Sediment structures



Sediment structures



Preliminary conclusions

- Glacier ice buried by sediments at the bottom of the lake and below the former delta
- Conservation of ice for more than 20 years below water/sediments
- Ice melt delayed and retarded by 5-10 years
- Heterogenous sedimentation structures at the lake bottom
- Ice melt in delta area leads to a modification of sedimentation structure due to settling of sediments
- Sediment budgeting by volume mapping affected by ice preservation
- More to come...



Thank you!

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