Holocene Paleoclimate record: Preliminary results from cores in Fallen Leaf Lake, Tahoe Basin, CA USA

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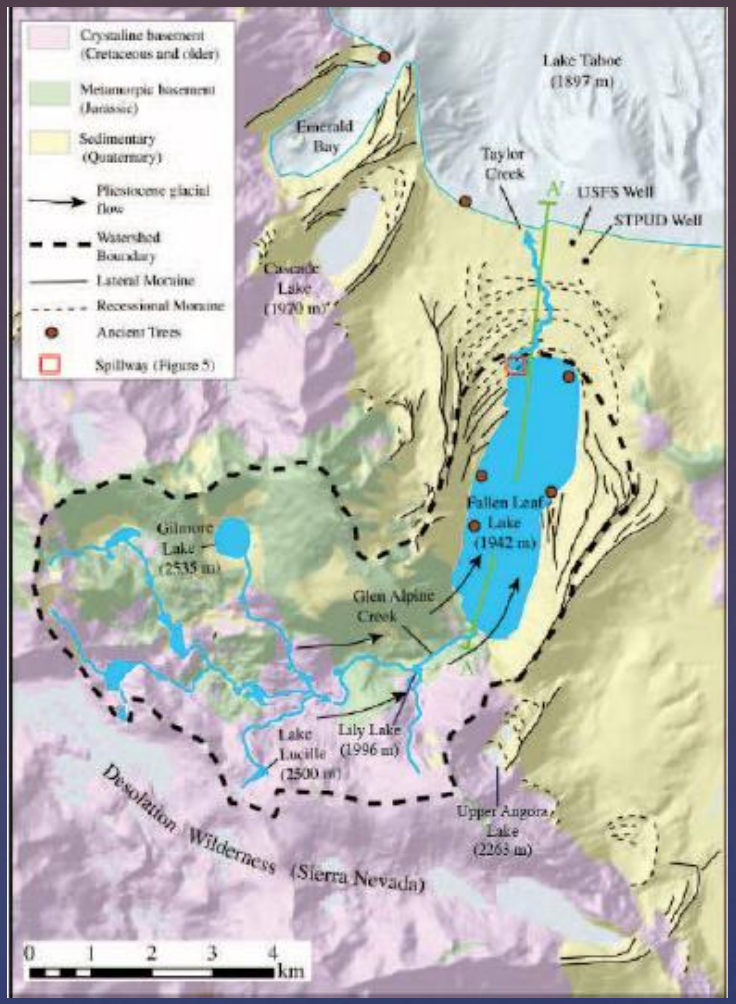
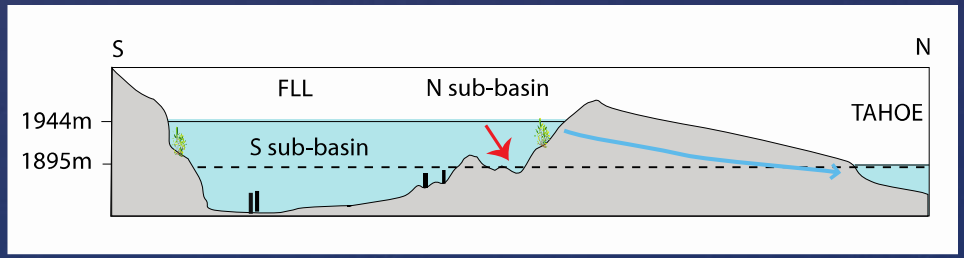
Fallen Leaf Lake- sensitive to past droughts

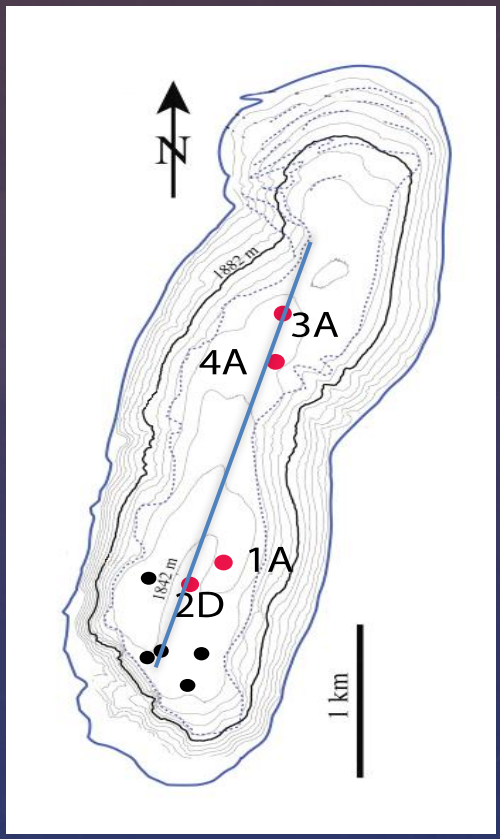
- Current lake level is 45m above Late Tahoe
- FLL drowned trees – 50-60m base level drop, multi-centennial duration (Kleppe 2005, Kleppe et al, 2011)
- How would drought induced base-level drops be manifested in lake sediment cores?



Modified from Kleppe et al., (2011)



Map of core locations



BOLLY project: 2010 Coring program
LacCore's Kullenberg coring platform

LacCore.org
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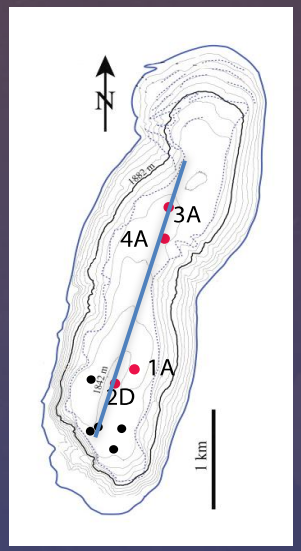
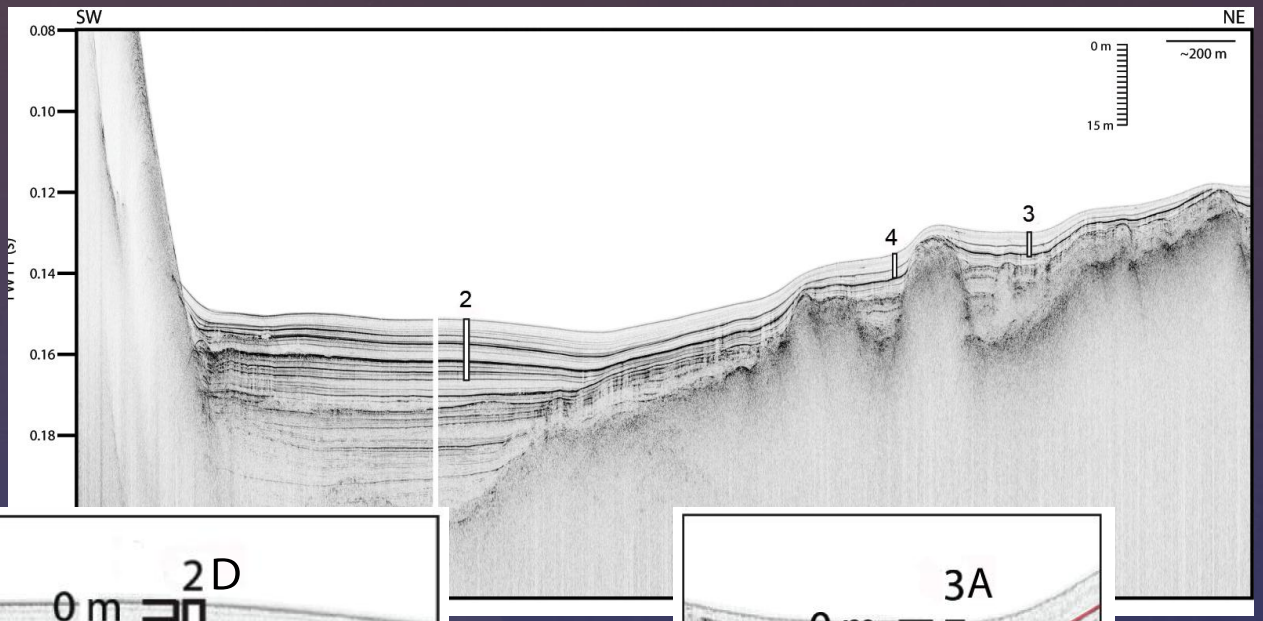
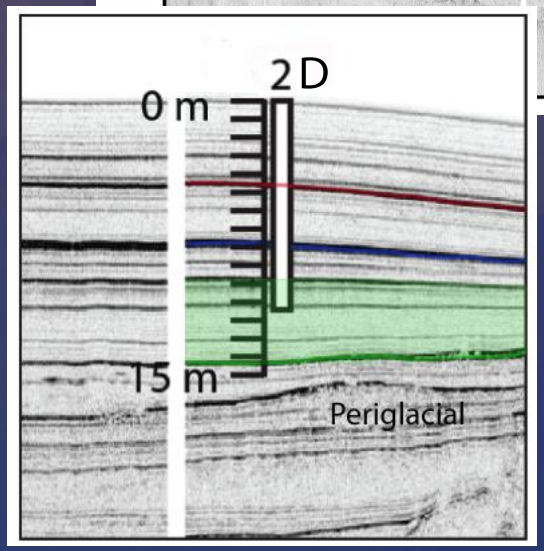
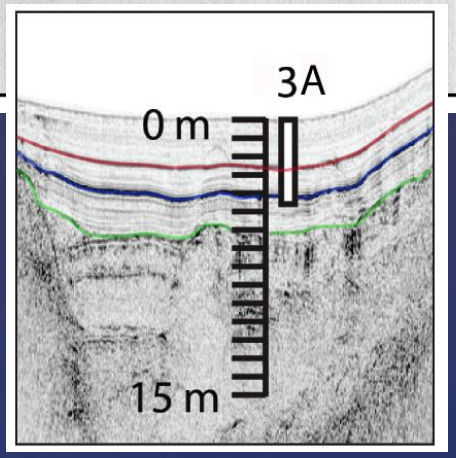
CHIRP Profile of FLL showing core positions

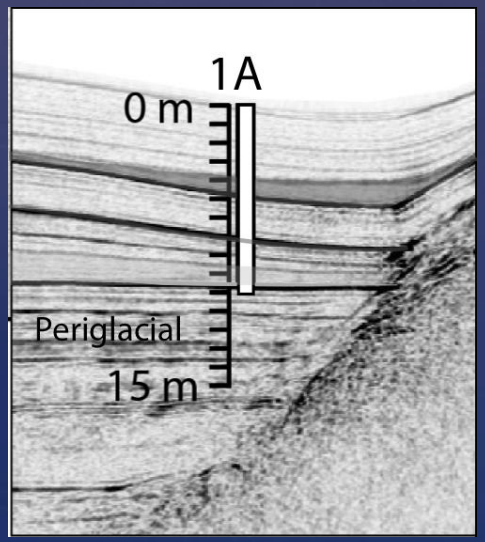
Map of core locations







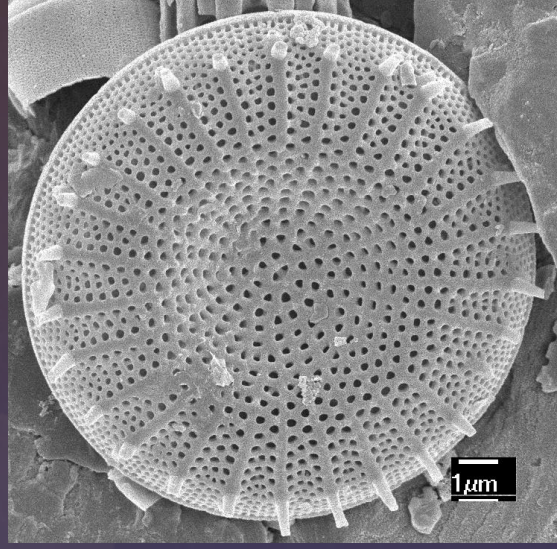


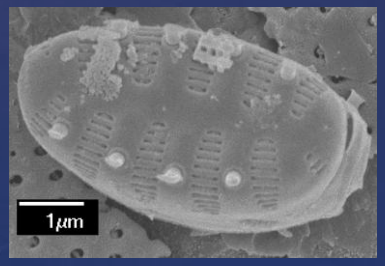


2006 CHIRP images courtesy of
G. Kent, N. Driscoll, J. Maloney

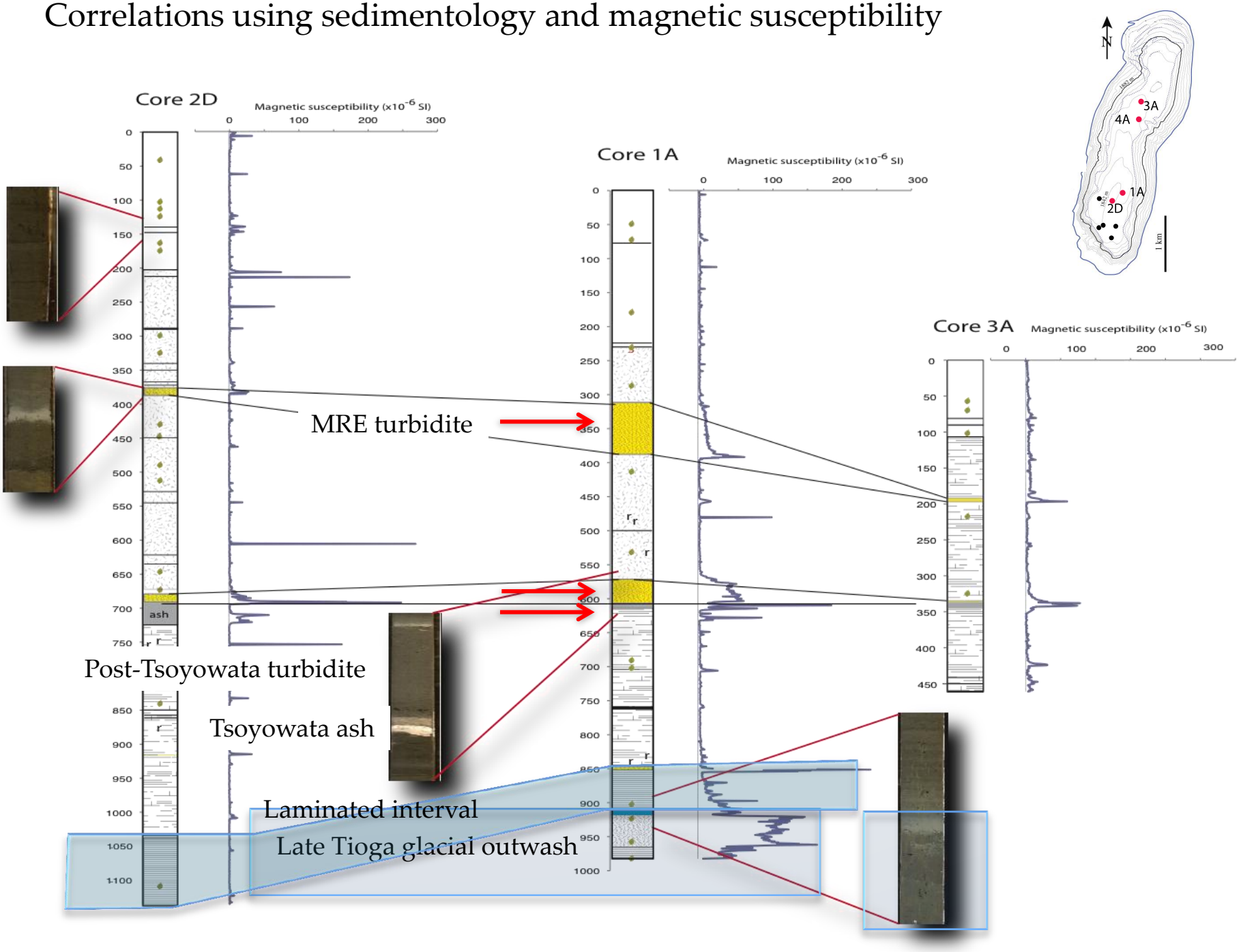
Objectives

- Characterize and date the major stratigraphic packages observed in the lake cores
- Generate baseline organic geochemistry to evaluate sensitivity as climate proxy
- Using Develop sedimentary diatom record as a proxy for past climate, particularly drought history



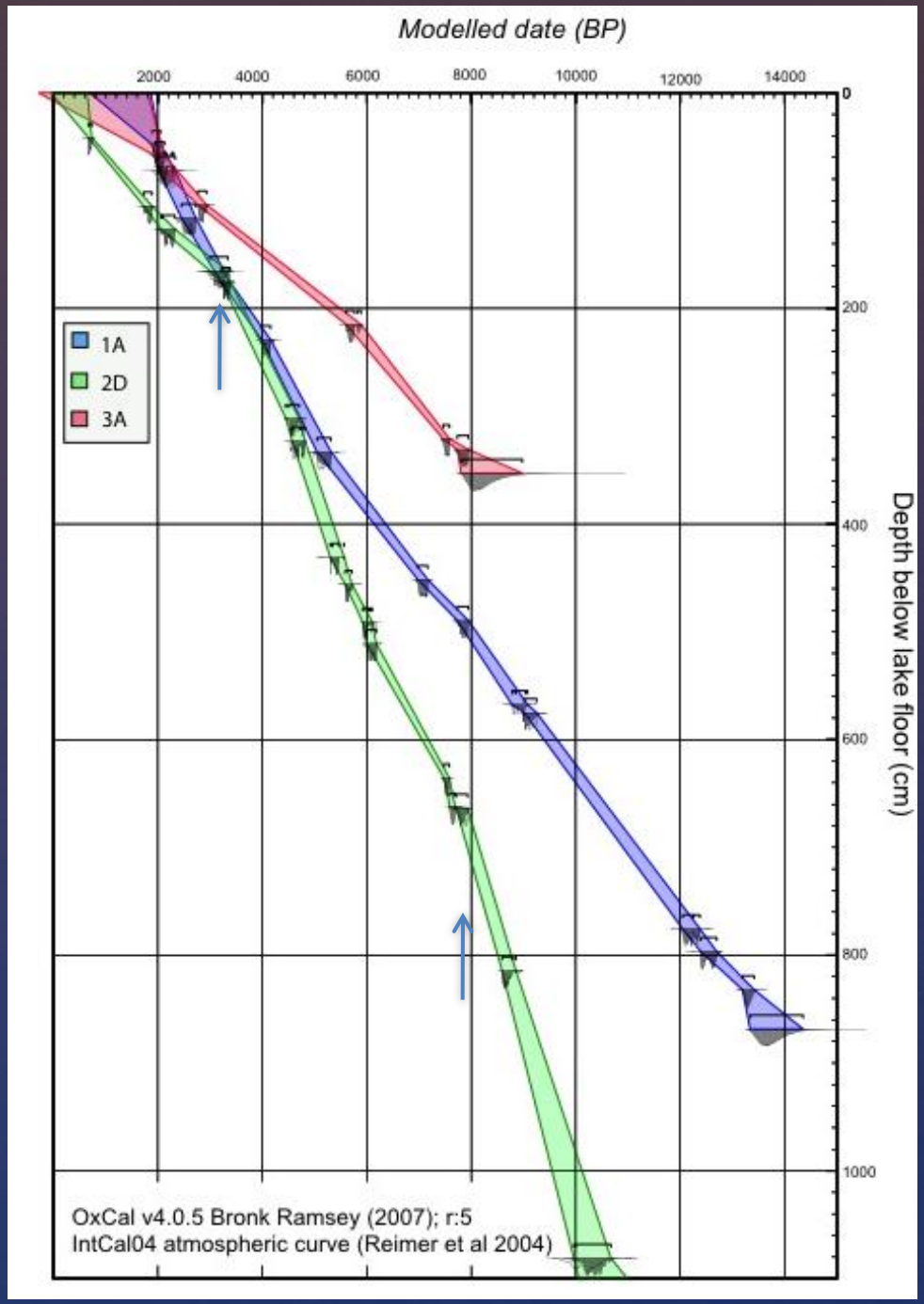


Correlations using sedimentology and magnetic susceptibility

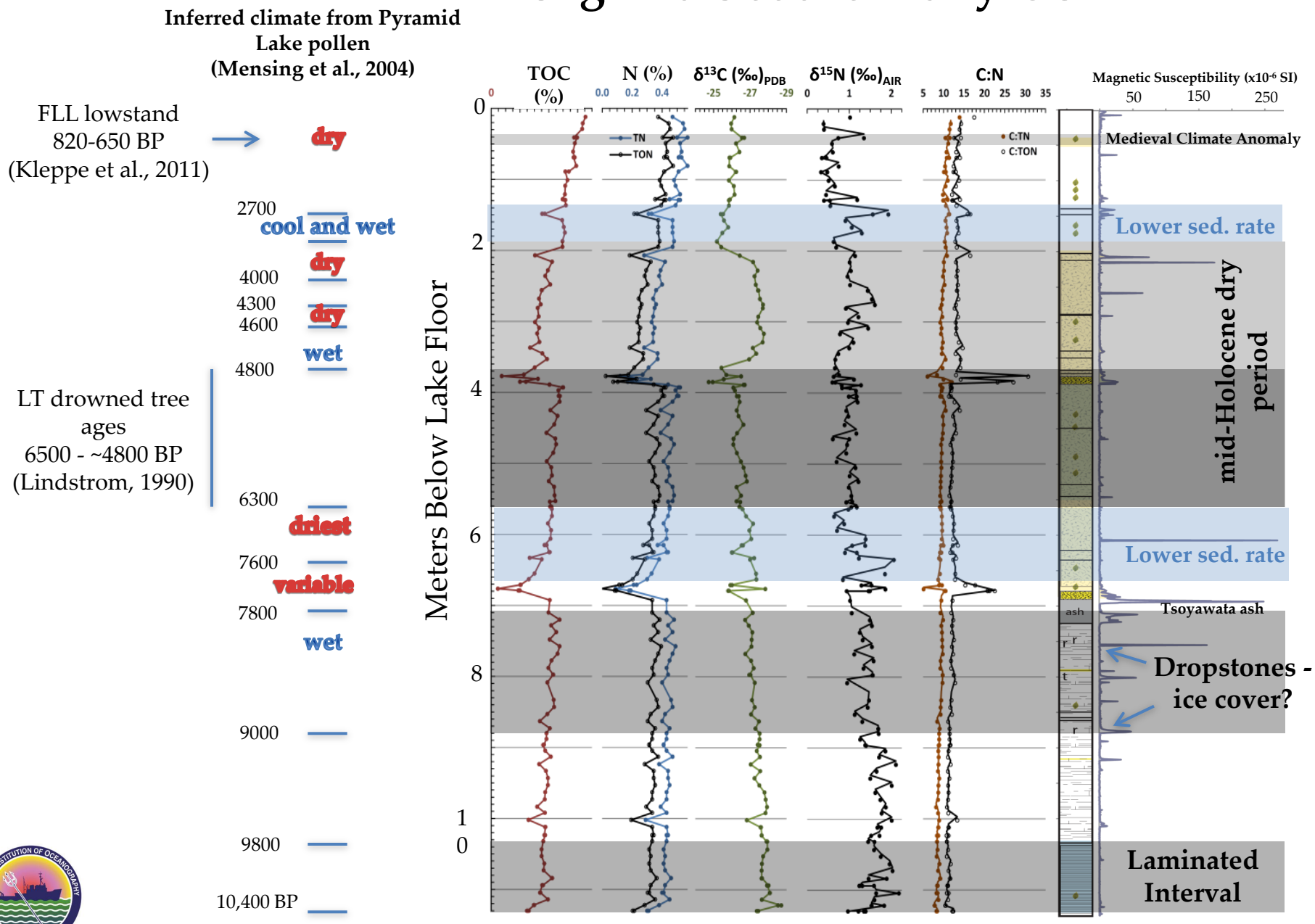


Age model

- 37 AMS ^{14}C ages generated at CAMS
- Top of core 2D constrained by ^{210}Pb
- Macrofossils (pine needles, leaves)
- Only 1 reversal

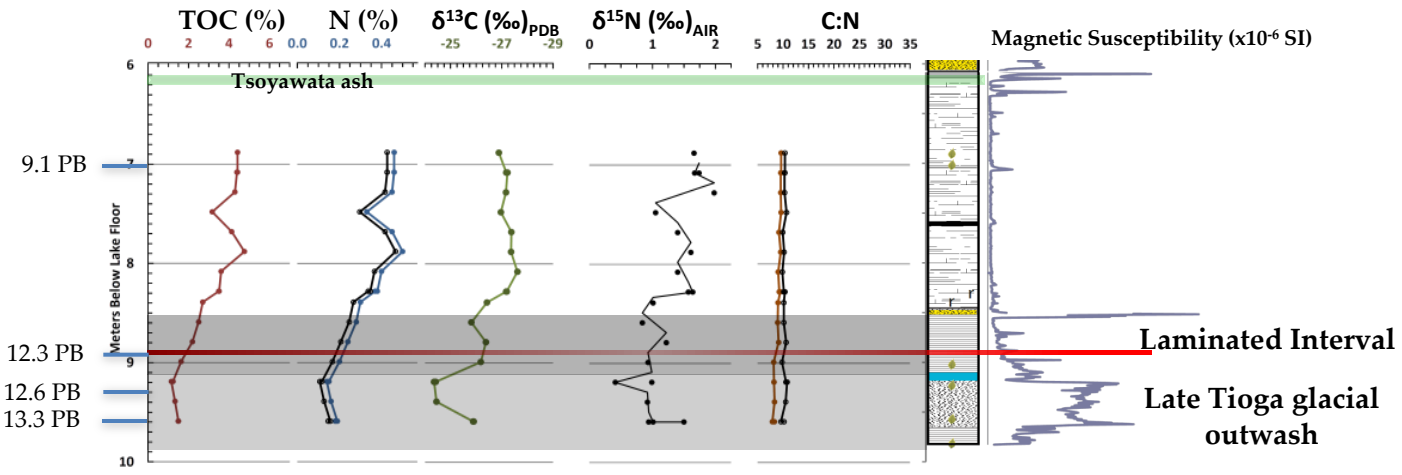


Organic Geochemistry CORE 2D

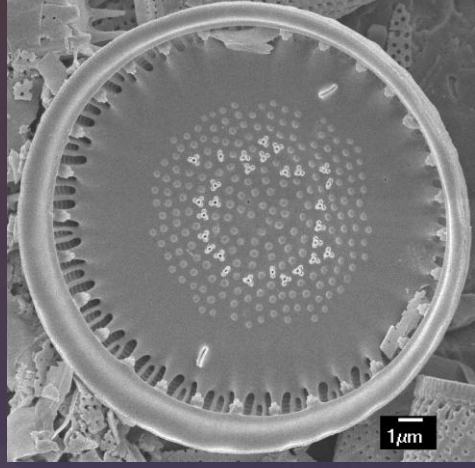


Organic Geochemistry CORE 1A - completed on base only

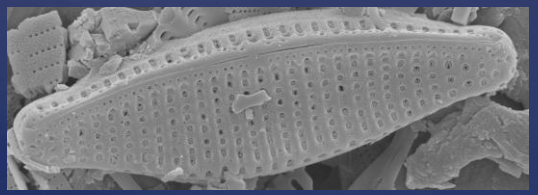
End Tioga glaciation well constrained at 12.5 BP

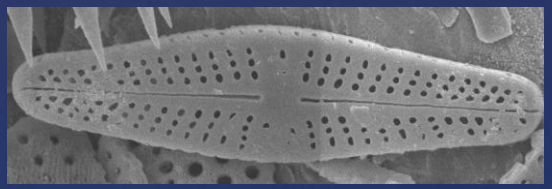


Diatom analysis



- Taxonomic analysis
- 20 cm snapshot view of Holocene for long term trends and shifts
- High resolution sampling of selected intervals
  - Across geochemical and sedimentological shifts
  - Drought events (eg MCA)
- Spatial assessment between northern and southern sub-basins as a depth proxy

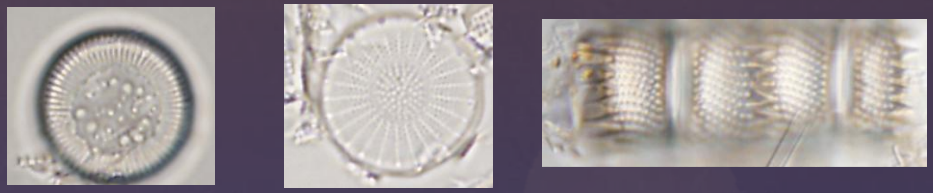




Late Tioga diatoms - mixed flora dominated by shallower water mesotrophic forms

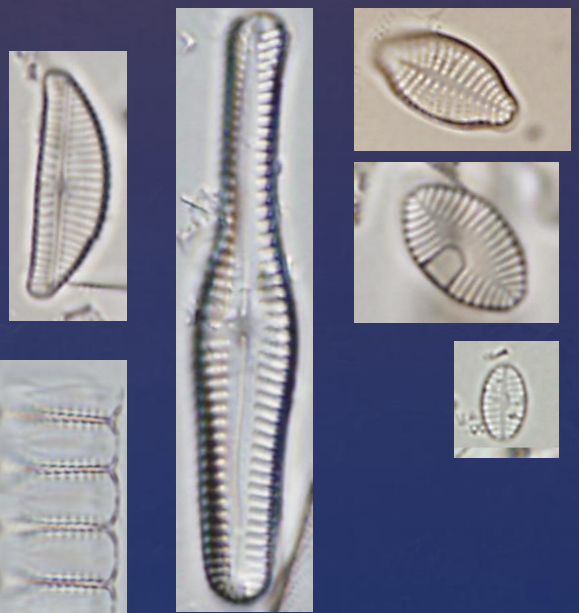
Phytoplankton:

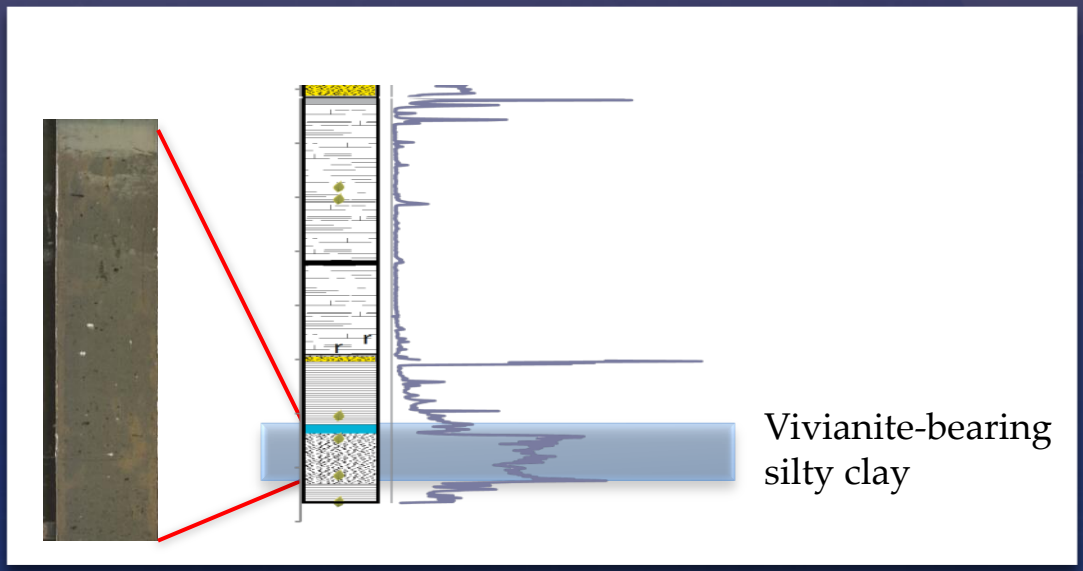
- *Cyclotella rossi* group
- *Discostella*
- *Stephanodicsus*
- *Aulacoseira pusilla*



Periphyton:

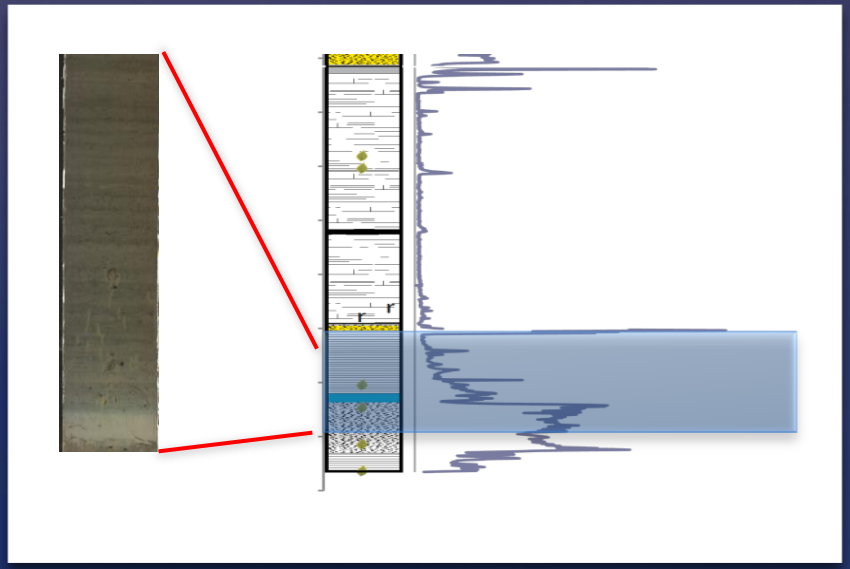
- Small monoraphids (eg. *Psammothidium, Karayevia, Planothidium*)
- *Epithemia, Gomphonema*
- Araphid periphyton

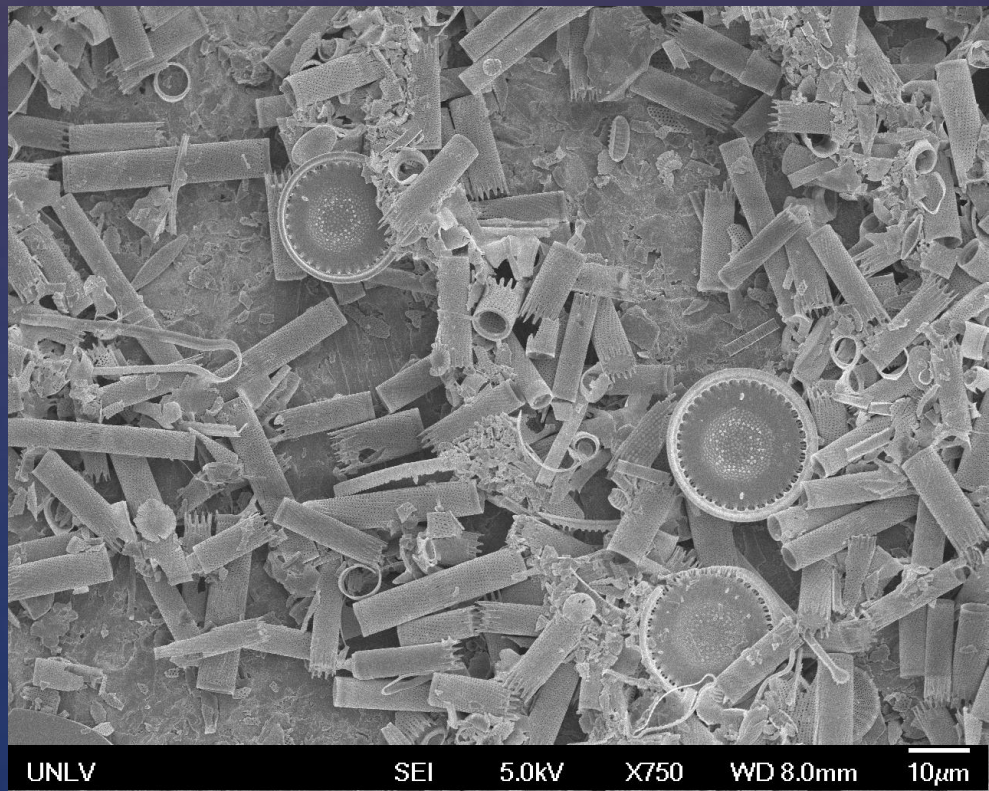




Laminated interval diatoms – transitions into flora dominated by centric phytoplankton

- *Aulacoseira subarctica* - winter taxon, moderate P demands, windy, vigorous mixing
- Cyclotelloids
  - *P. bodanica* – epilimnial species
  - *D. woltreckii*
  - *D. stelligera*
- Periphyton smaller component

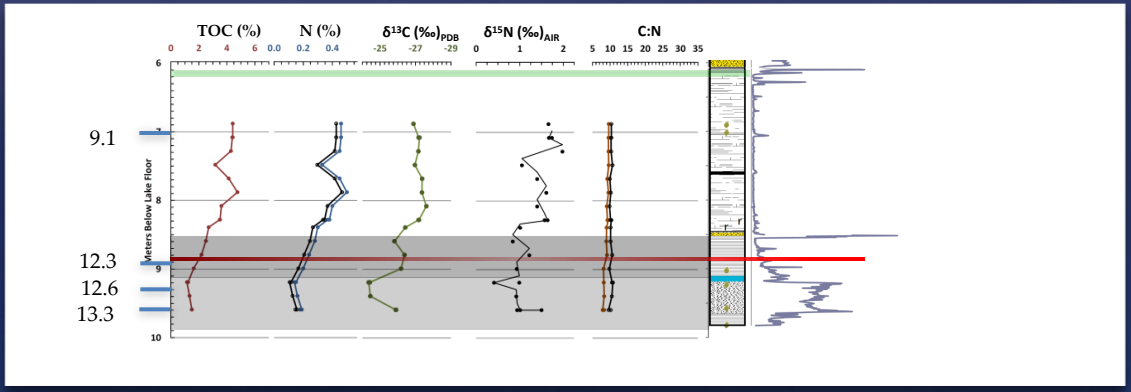




Summary

Late Pleistocene (base or core 1A):

- Late Tioga glaciation constrained at 12,500 BP with FLL age model
- Shift in % TOC and TON - clastic content
- Shift in $\delta^{13}C$ and $\delta^{15}N$ change in source material
- Diatoms–mesotrophic shallow water flora



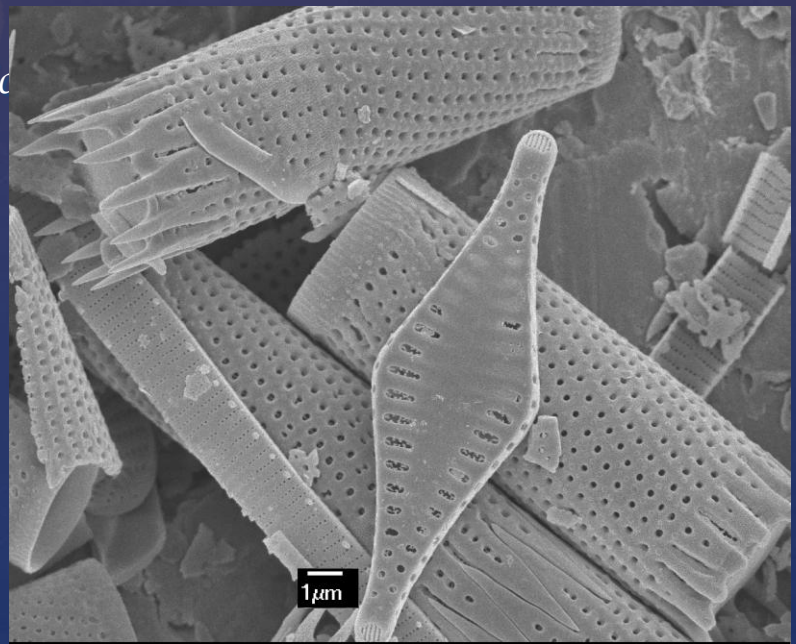
Summary (cont'd)

Holocene (core 2D):

- Sedimentation rates reasonably high (1.9-1.4 mm/year):
  - Lower during 6.3-7.6 BP
  - 2.7-3.4 BP

- Geochemistry
  - C:N ratios stable, steady supply of source material
  - turbidites show strong terrestrial carbon signature
  - Several inflections in $\delta^{13}C$ and $\delta^{15}N$

- Diatoms – large % of variance in *Aulacoseira subarctic*
  - *A. subarctica* dominated: wetter windy conditions – turbulence and mixing, intermittent ice cover



Acknowledgements

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