

Seasonal evolution and  
salt/freshwater fluxes of  
first-year sea ice:  
Comparison between pack  
ice and landfast sea ice

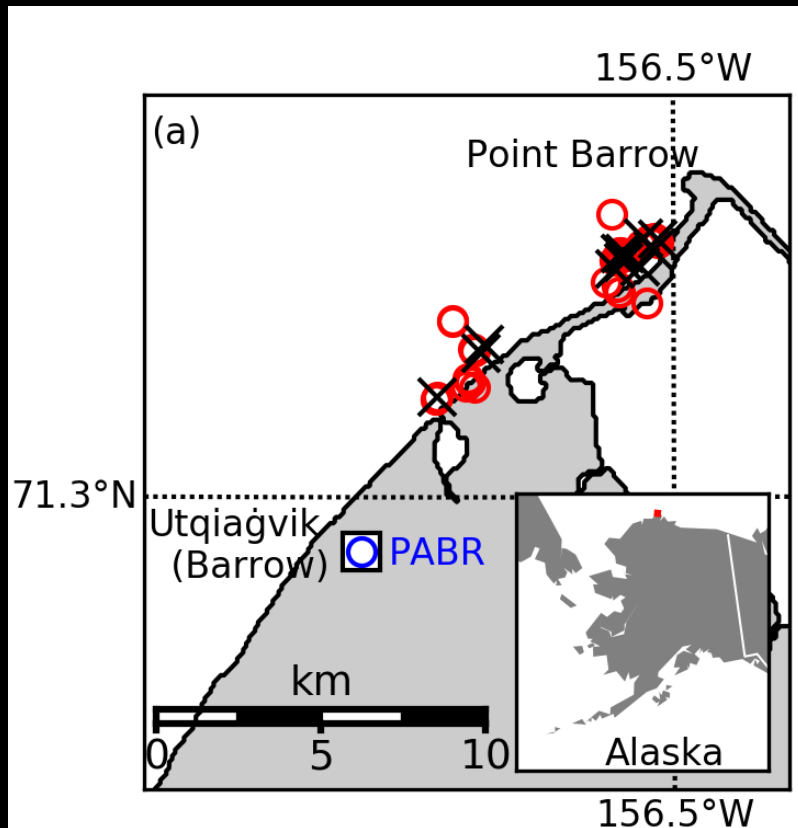


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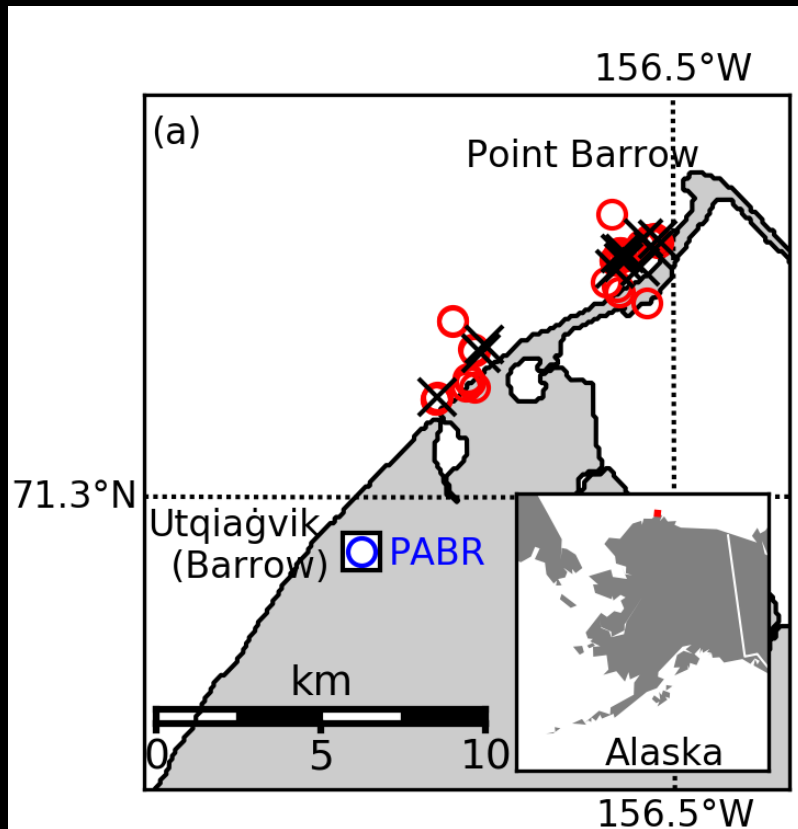
- Landfast ice
  - Utqiagvik, formerly Barrow
  - 10-15 m water depth
  - 20 years of data





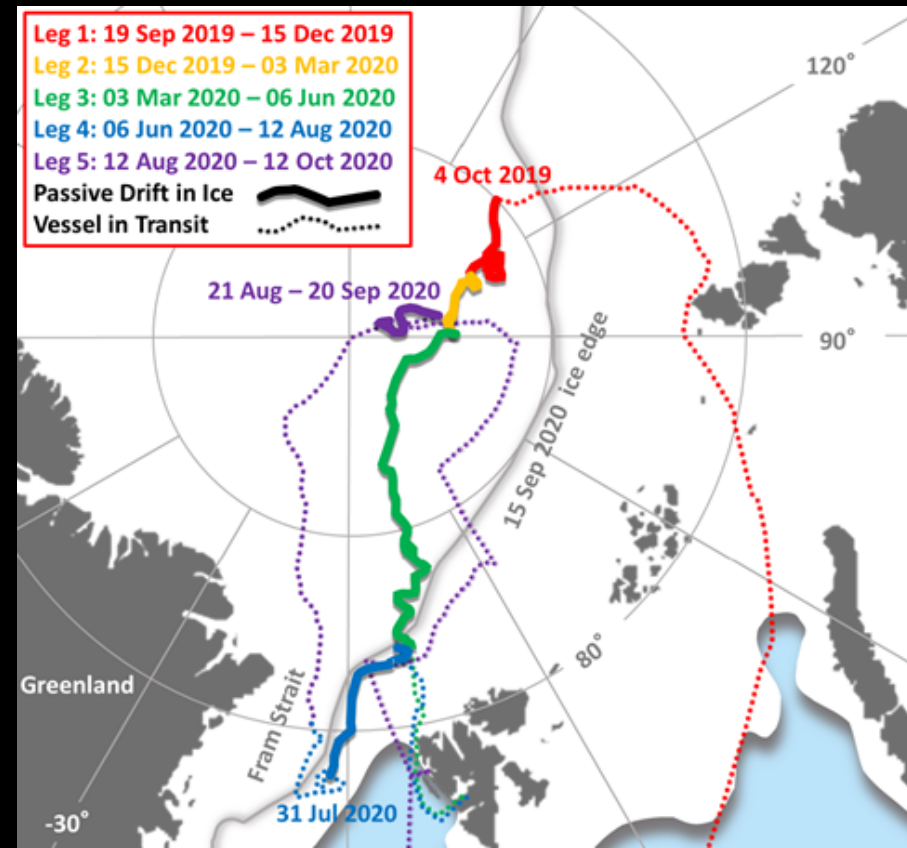
- Landfast ice

- Utqiagvik, formerly Barrow
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- 20 years of data



- Drifting pack ice

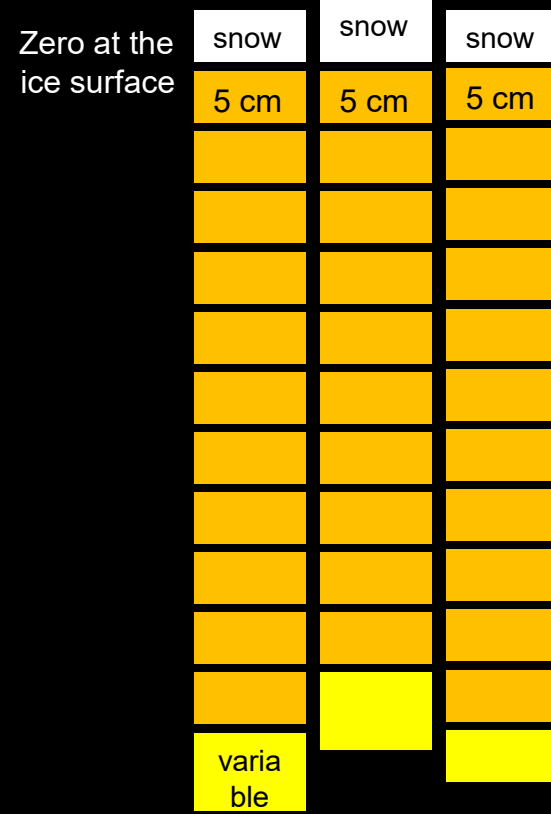
- MOSAIC expedition
- 500 – 4000+ m water depth
- 1 year





- Traditional sectioning

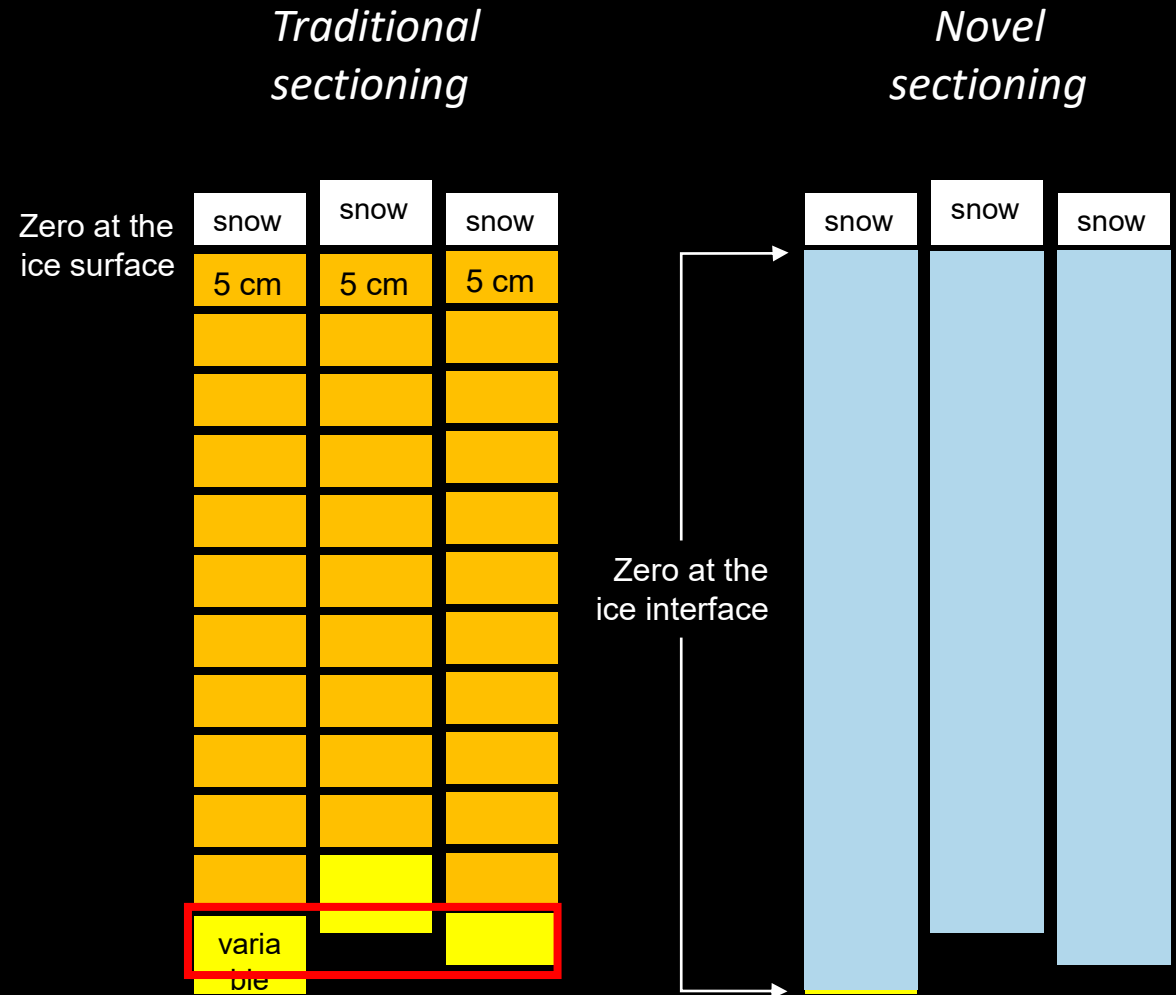
*Traditional  
sectioning*







- Traditional sectioning
  - Difficult to compare sections away from reference
- Novel sectioning method
  - Connects physical and biological ice core properties





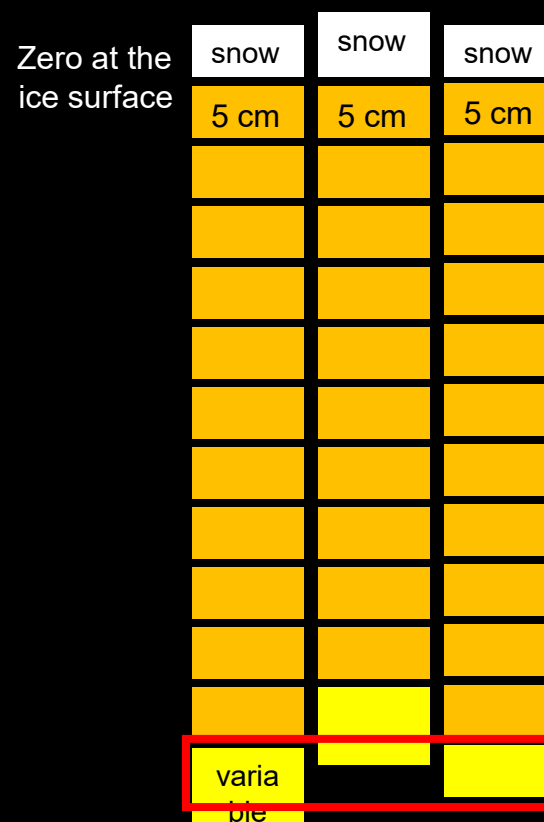
- **Traditional sectioning**

- Difficult to compare sections away from reference

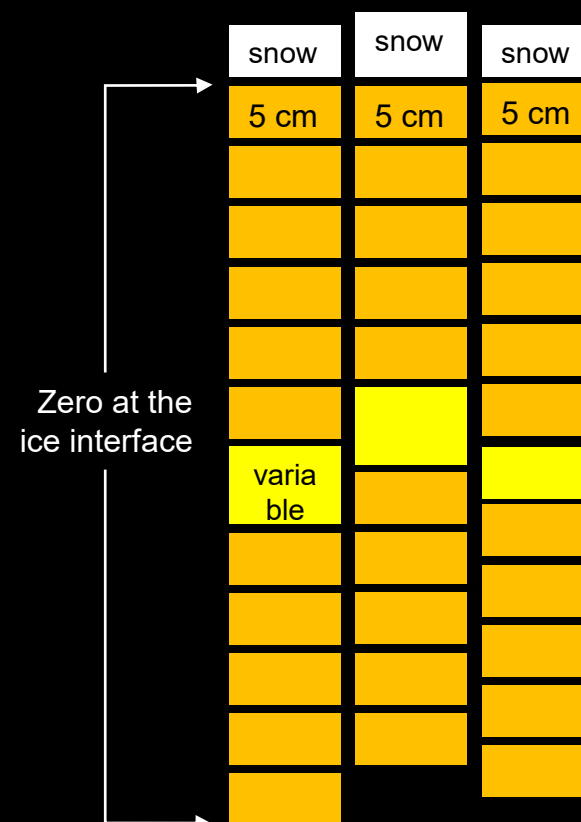
- **Novel sectioning method**

- Connects physical and biological ice core properties
- Section depth are referenced to closest interface

*Traditional sectioning*

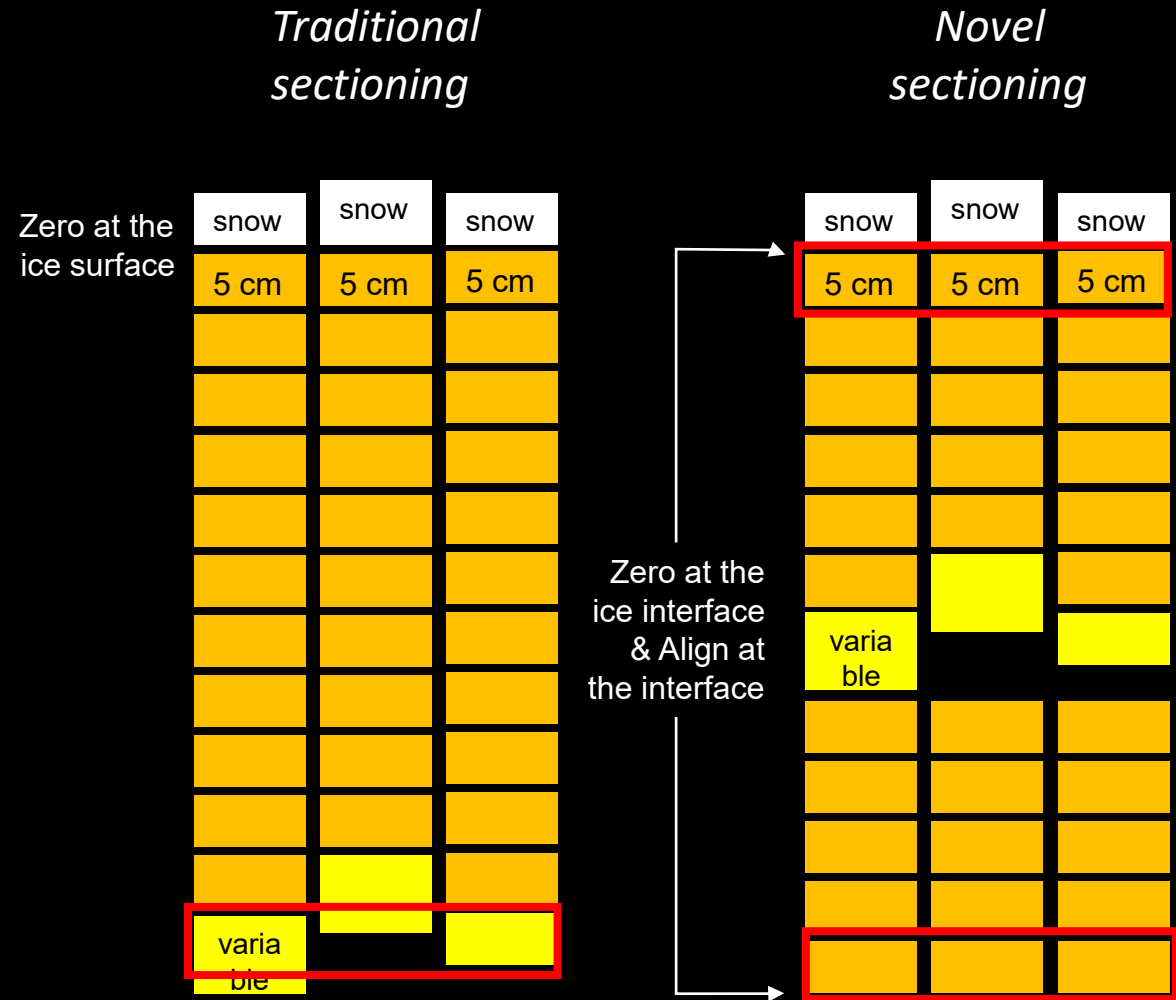


*Novel sectioning*





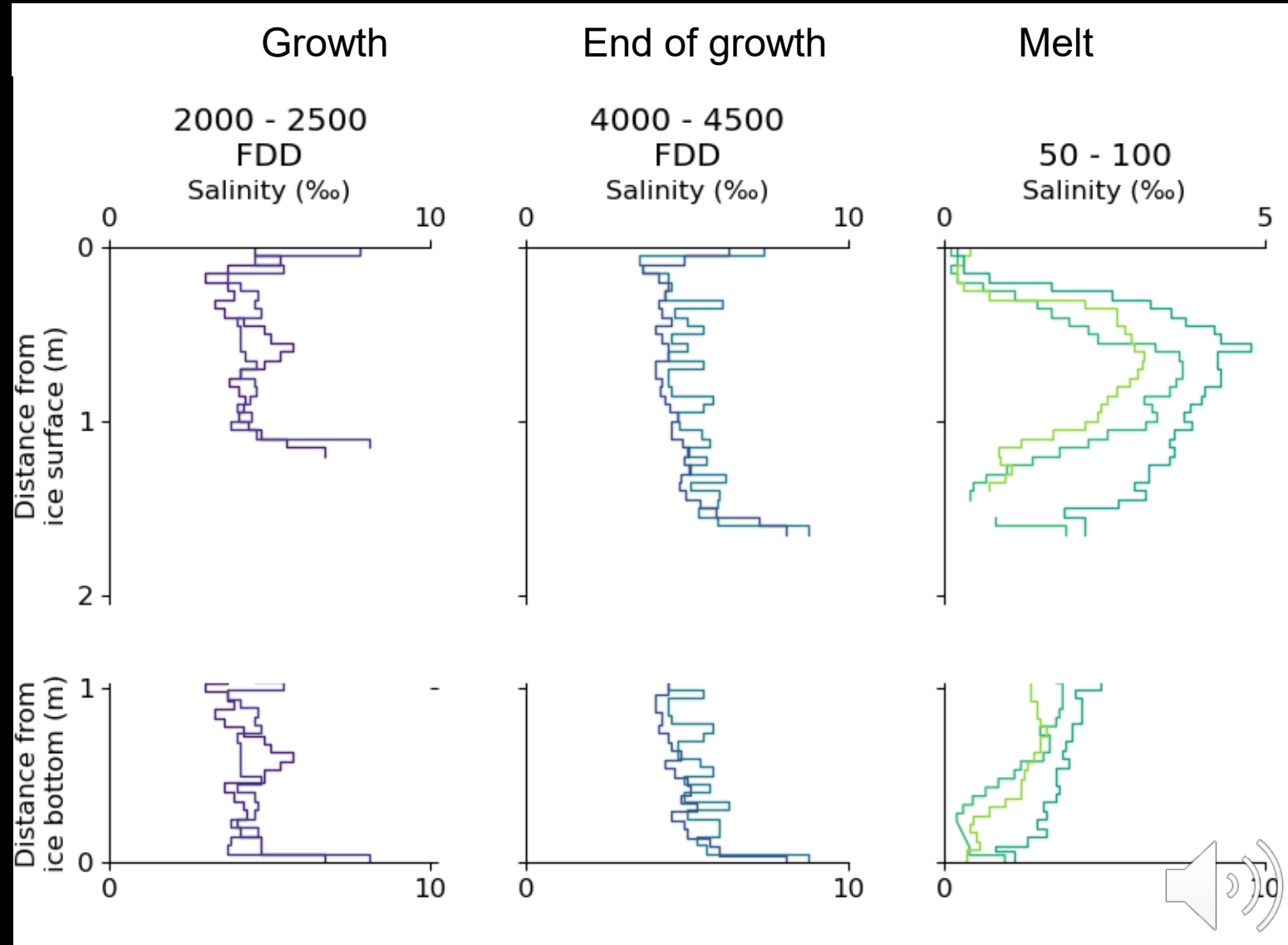
- Traditional sectioning
  - Difficult to compare sections away from reference
- Novel sectioning method
  - Connects physical and biological ice core properties
  - Section depth are referenced to closest interface
  - Comparable horizons at each interface







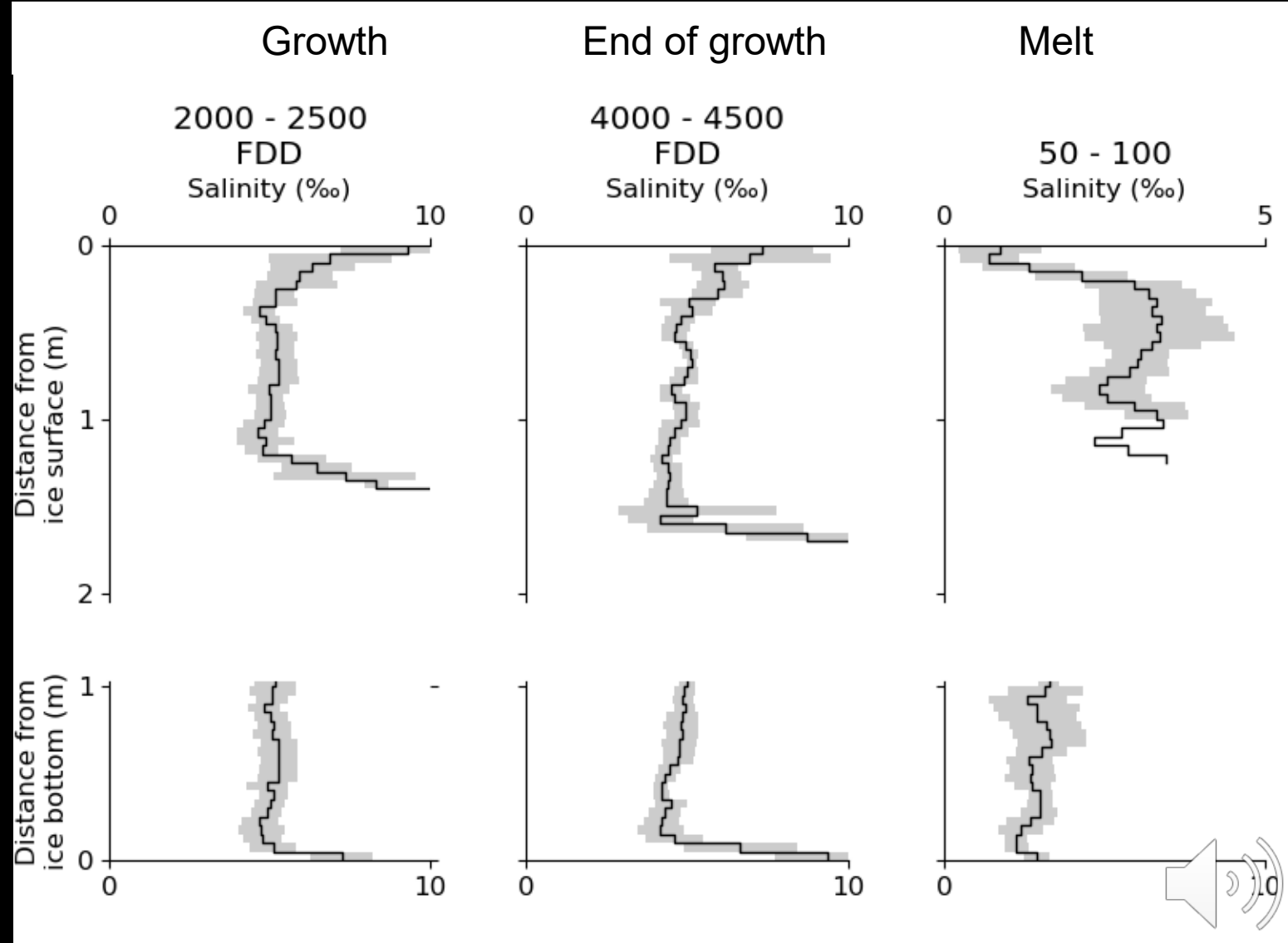
- Cumulative Degree day aggregation
- MOSAIC
  - Weekly coring events
  - One event by color

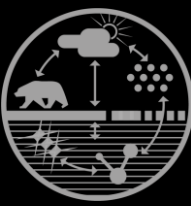




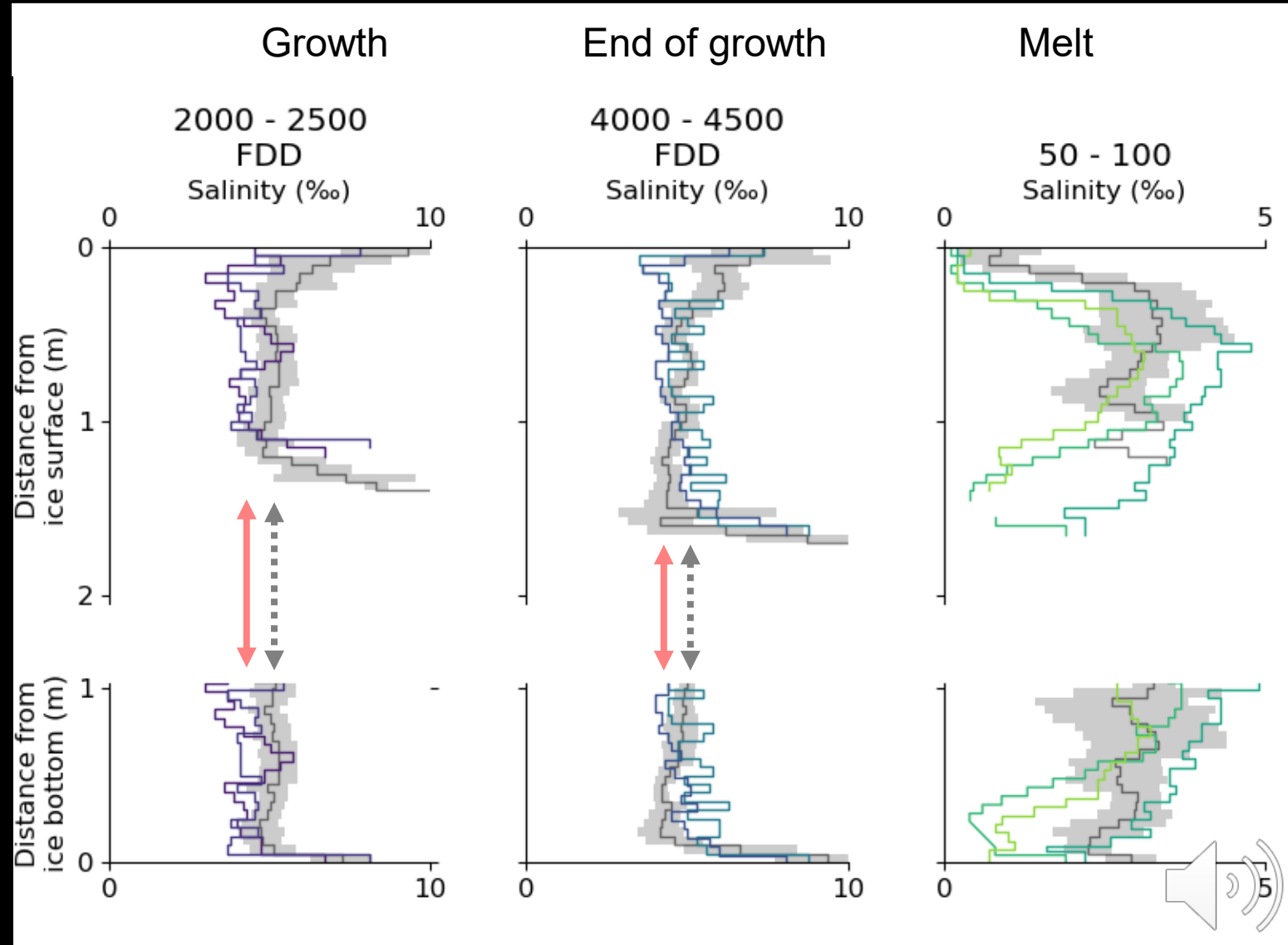
- Cumulative Degree day aggregation
- Utqiagvik
  - 180 cores over 20 years
  - Mean  $\pm$  std

Utqiagvik data: Oggier et al.  
<https://doi.org/10.5194/tc-2020-52>



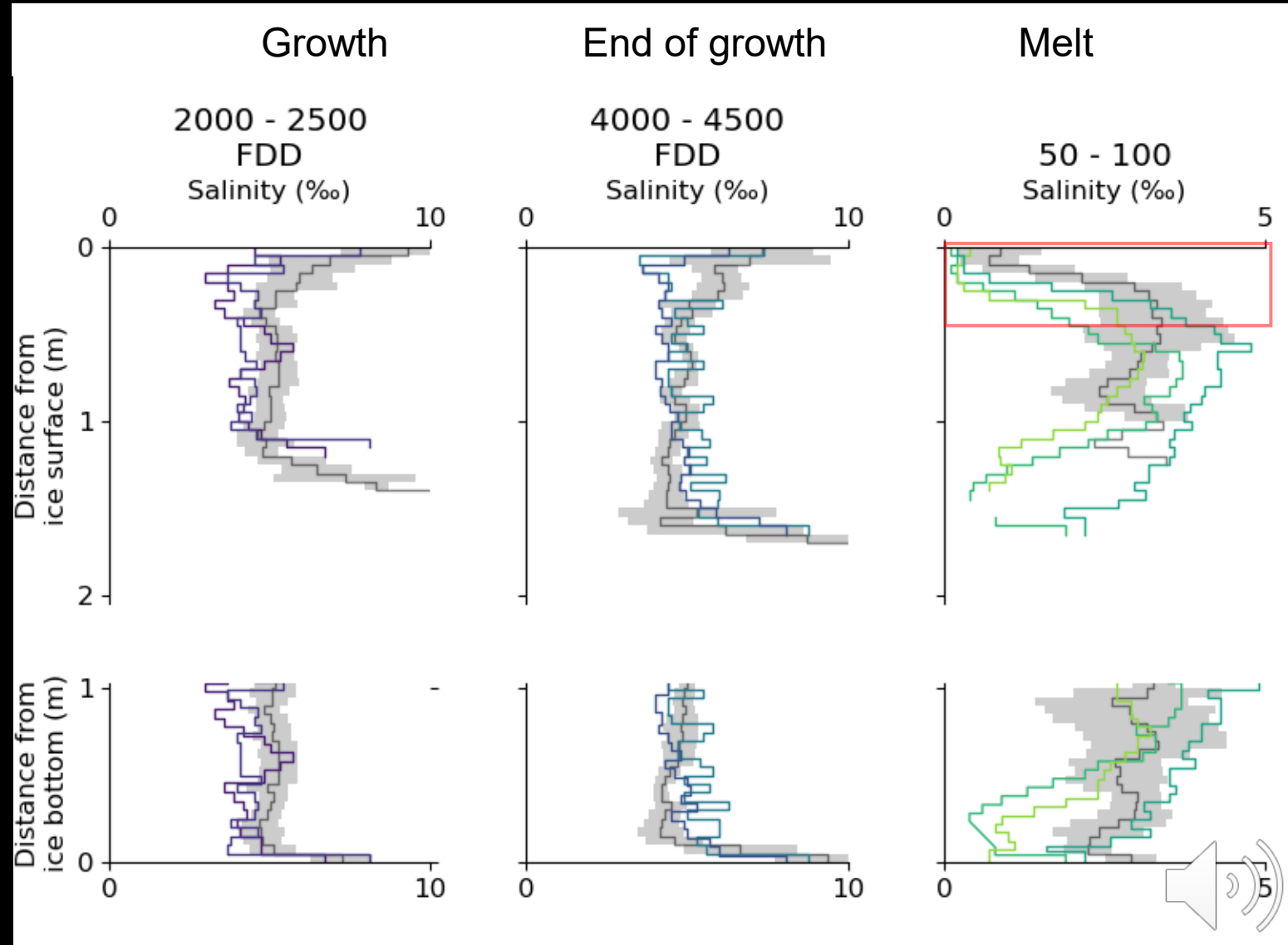


- Lower salinity near surface during growth in pack ice than landfast ice  
*growth rate, seawater salinity...?*



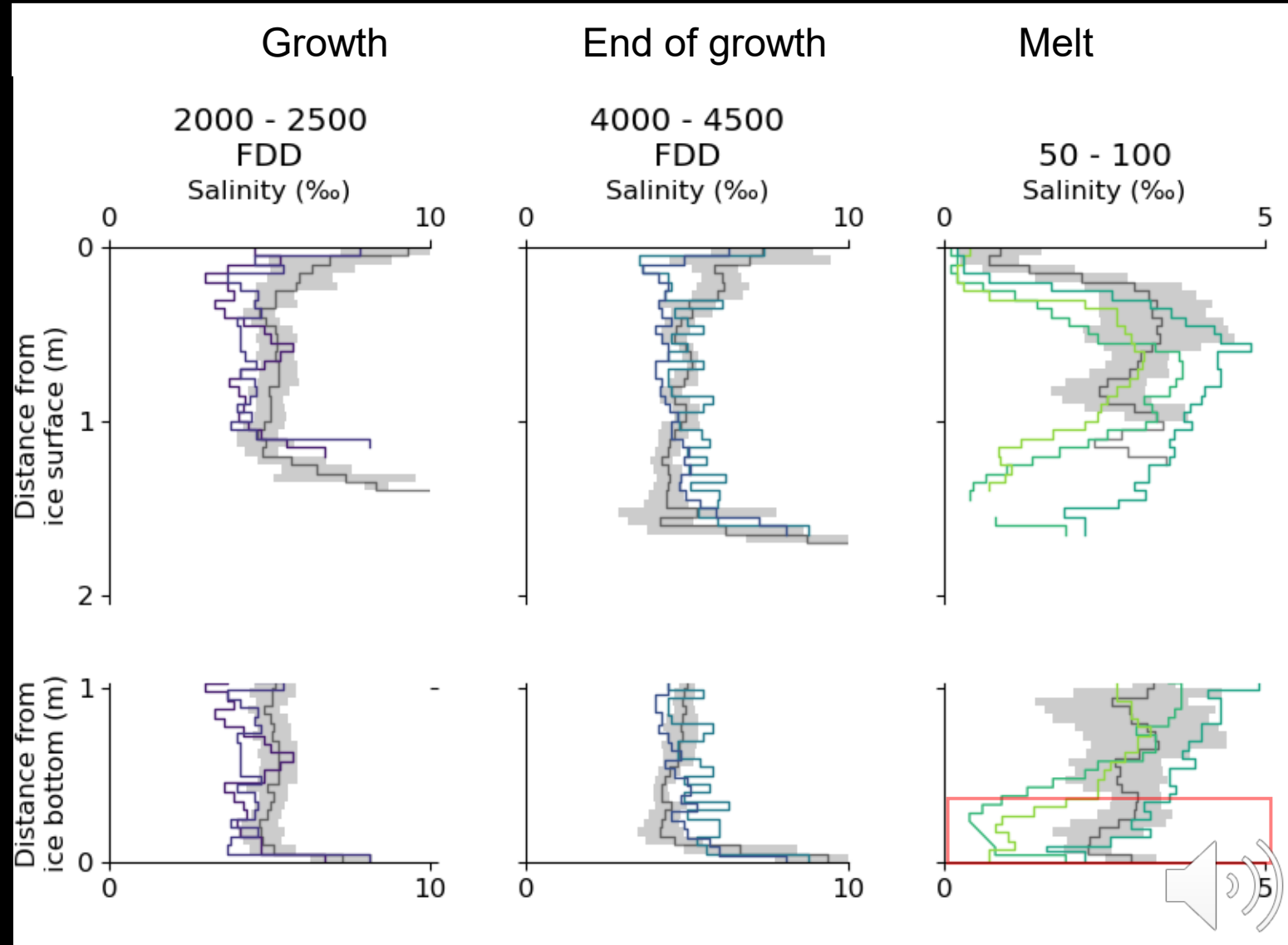


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*growth rate, seawater salinity...?*
- Greater desalination during melt in pack ice than landfast ice  
*snow accumulation?*





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*growth rate, seawater salinity...?*
- Greater desalination during melt in pack ice than landfast ice  
*snow accumulation?*
- Under ice meltwater lens in pack ice during the melt





- Repeated coring offers insights into sea ice seasonal cycle
  - New ice core methodology: successful in capturing processes at both interfaces
- Salinity evolution typical for first year ice both for pack and landfast ice
- Difference in bulk salinity at the ice surface and timing of desalination are likely to translate in difference in nutrient, POC/PON cycle and biodiversity, and affect gas and energy transfer across the atmosphere-ice-ocean interface.

Data/analysis paper to be submitted in fall 2021 + data soon available at PANGAEA & NSF Arctic Data Center.





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