

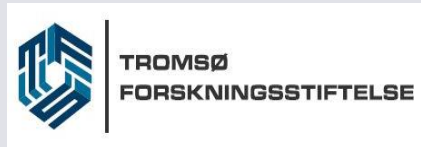
# Development of a proxy toolbox for reconstructing polar ocean surface hydrography based on large-scale culturing of the planktic foraminifera *Neogloboquadrina pachyderma*

*Adele Westgård, Julie Meilland, Thomas B. Chalk, Freya E. Sykes, Andy Milton, Michael Kucera, Gavin Foster, Mohamed M. Ezat*

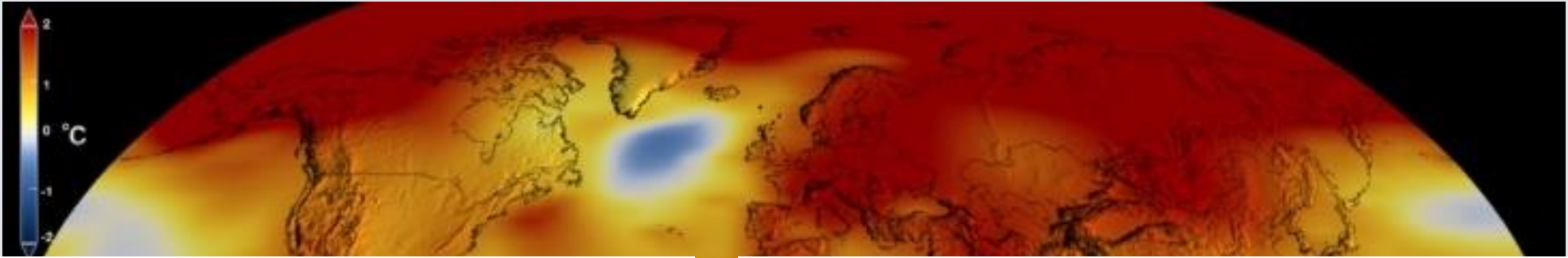
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# Arctic Amplification



PHYSICAL OCEANOGRAPHY

## Ocean sensitivity to freshwater

[Pepijn Bakker](#) 

[Nature Climate Change](#) **12**, 419–420 (2022) | [Cite this article](#)

## ARTICLES

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**nature**  
climate change

## Arctic sea-ice decline weakens the Atlantic Meridional Overturning Circulation

Florian Sévellec<sup>1\*</sup>, Alexey V. Fedorov<sup>2</sup> and Wei Liu<sup>2</sup>





# Our objectives

- To reconstruct Arctic Ocean surface hydrography and Ocean-cryosphere interactions.
- Establish a novel proxy-toolbox based on culturing *N. pachyderma* under independently variable conditions.



# Culturing foraminifera

Sample  
collection (63  $\mu\text{m}$   
plankton net)



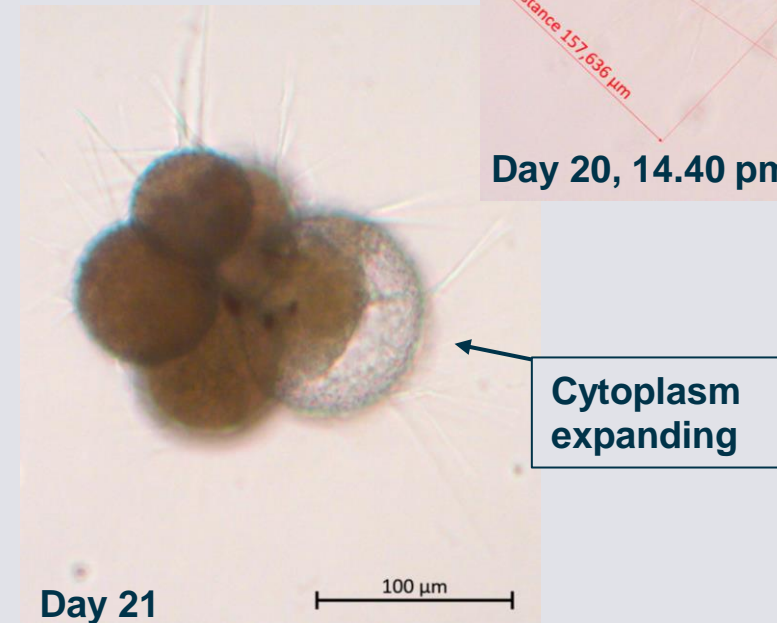
Picking  
specimen healthy,  
small (<120  $\mu\text{m}$ )



Individual flasks  
different water  
conditions

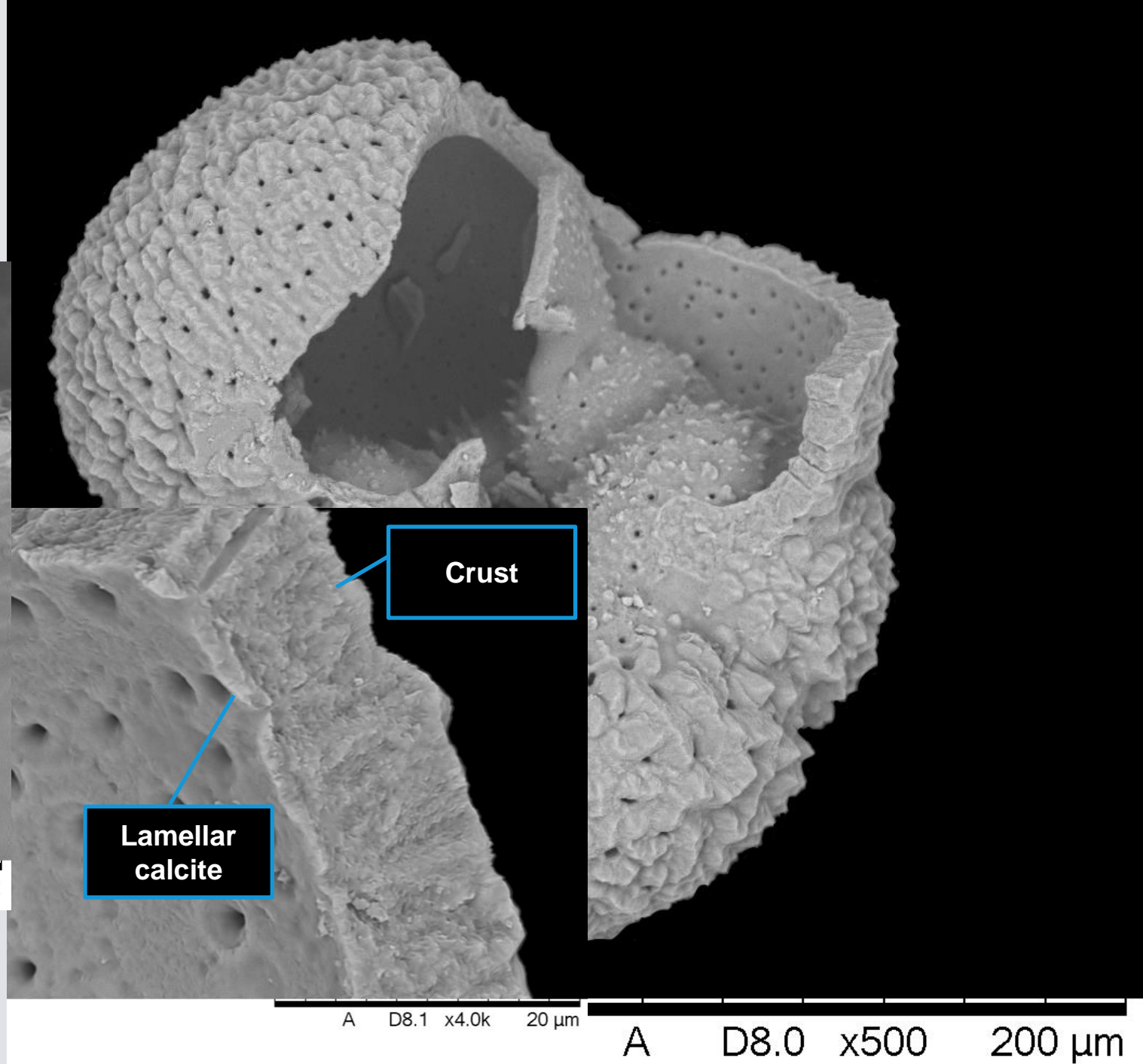
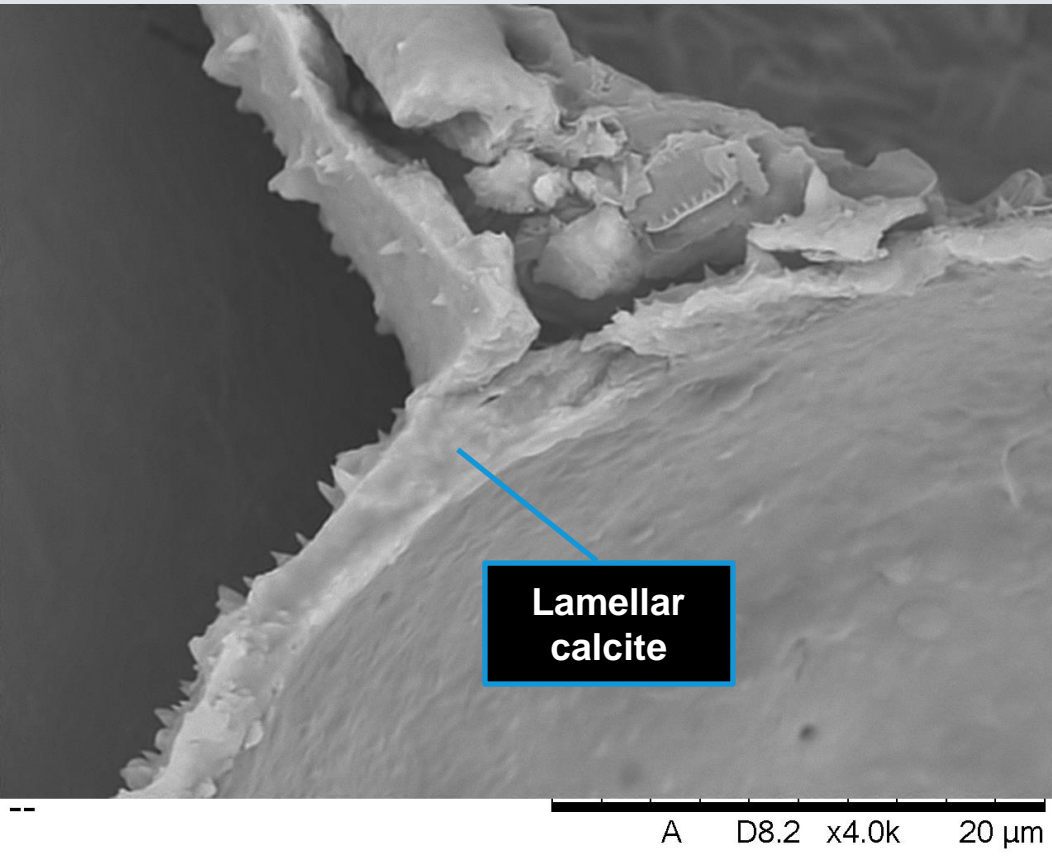
*Water conditions based on field  
conditions and realistic past and future  
ocean conditons.*

Treatment	Minimum	Maximum
Temperature	2°C	7°C
Salinity	29‰	37‰
pH	7.7	8.4
Barium Concentration	5 ng/ml	42 ng/ml
Carbonate ion concentration	73 $\mu\text{mol/kg}$	150 $\mu\text{mol/kg}$

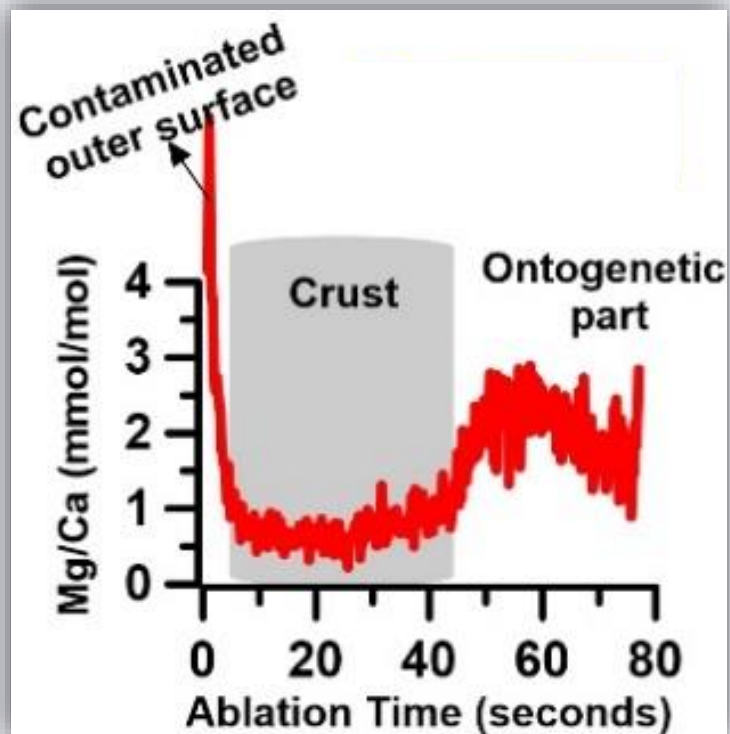




# Crust and lamellar calcite

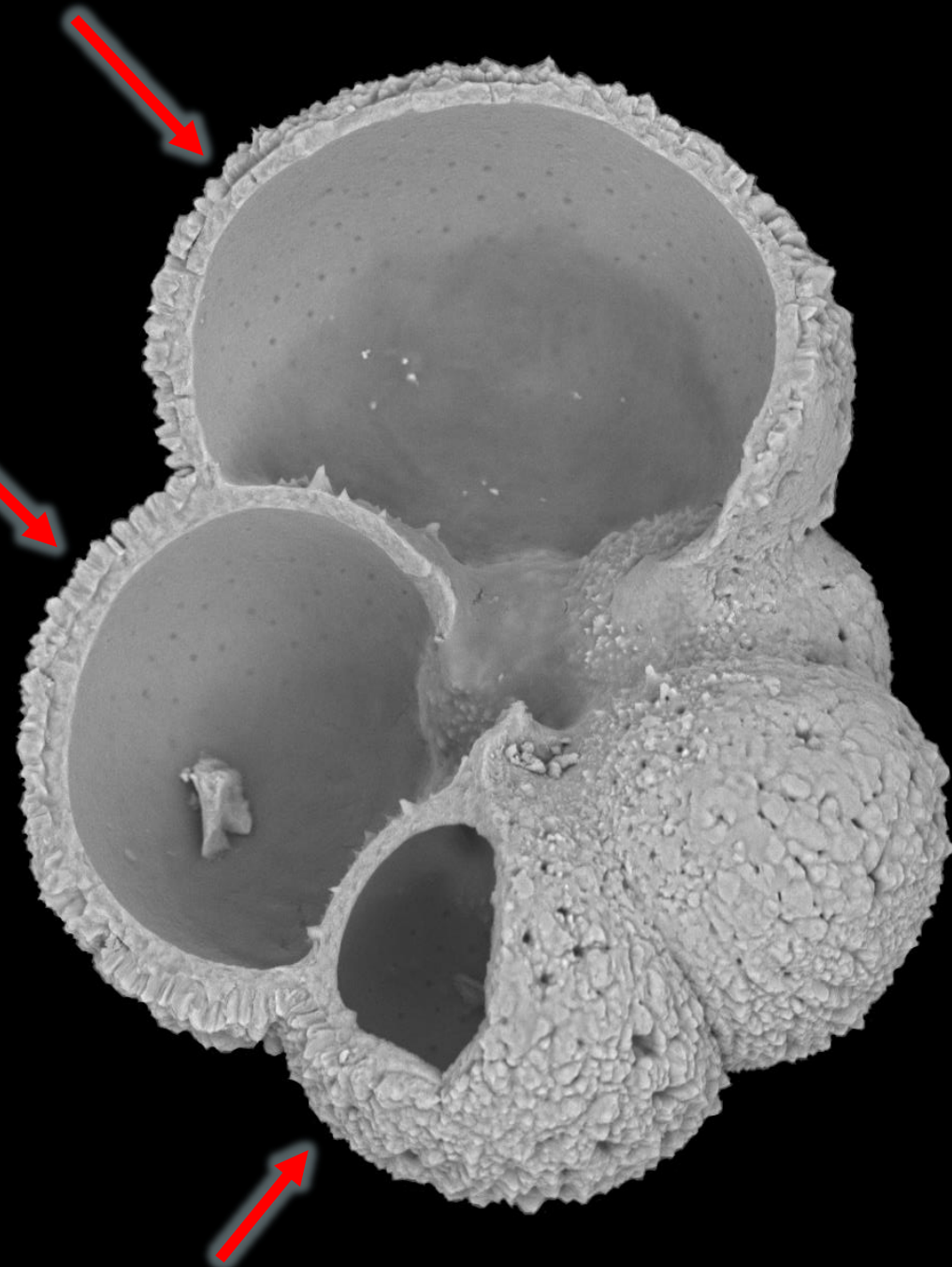


# LA-ICP MS

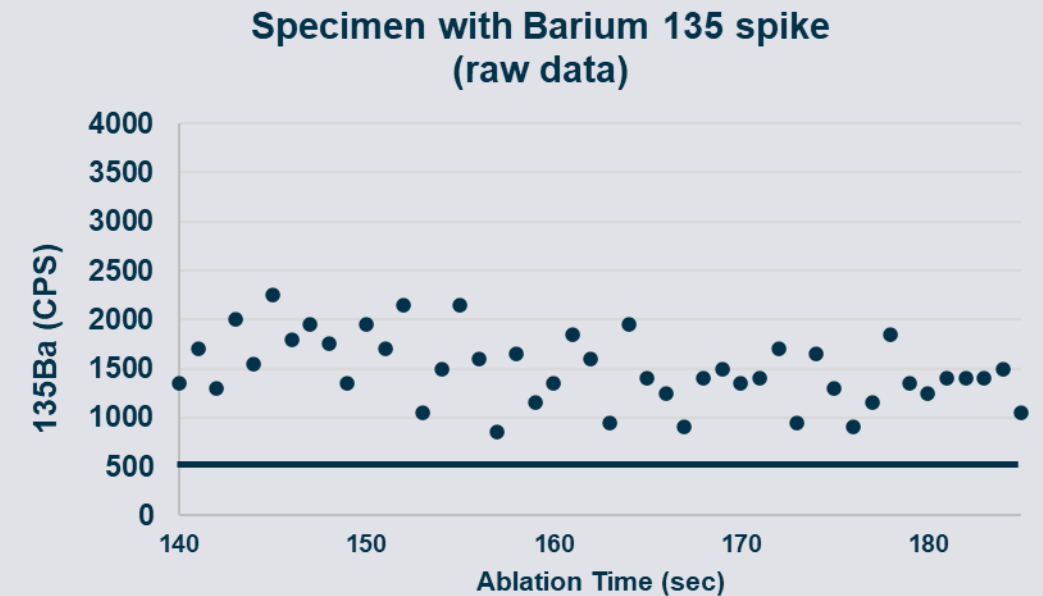
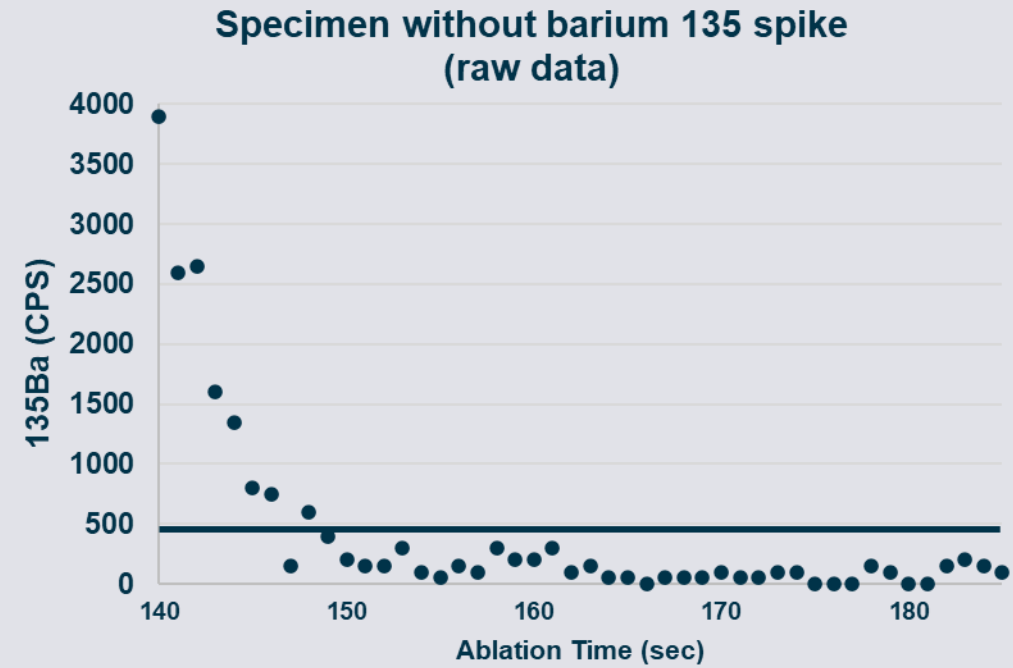
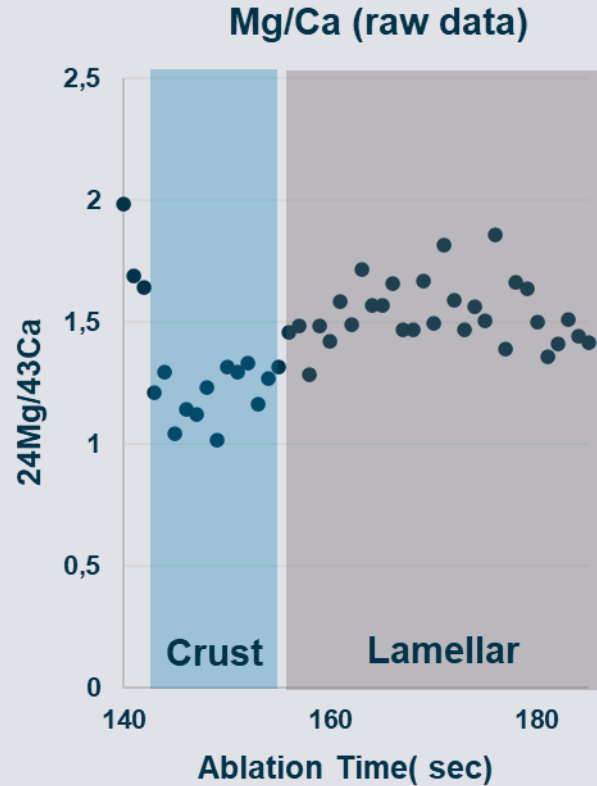


Example laser profile from fossil *N. pachyderma* by M. Ezat

A D8.2 x800 100 µm



# LA-ICP MS



Data displayed on this slide is raw, unprocessed LA-ICP MS data from cultured *N. pachyderma* specimens



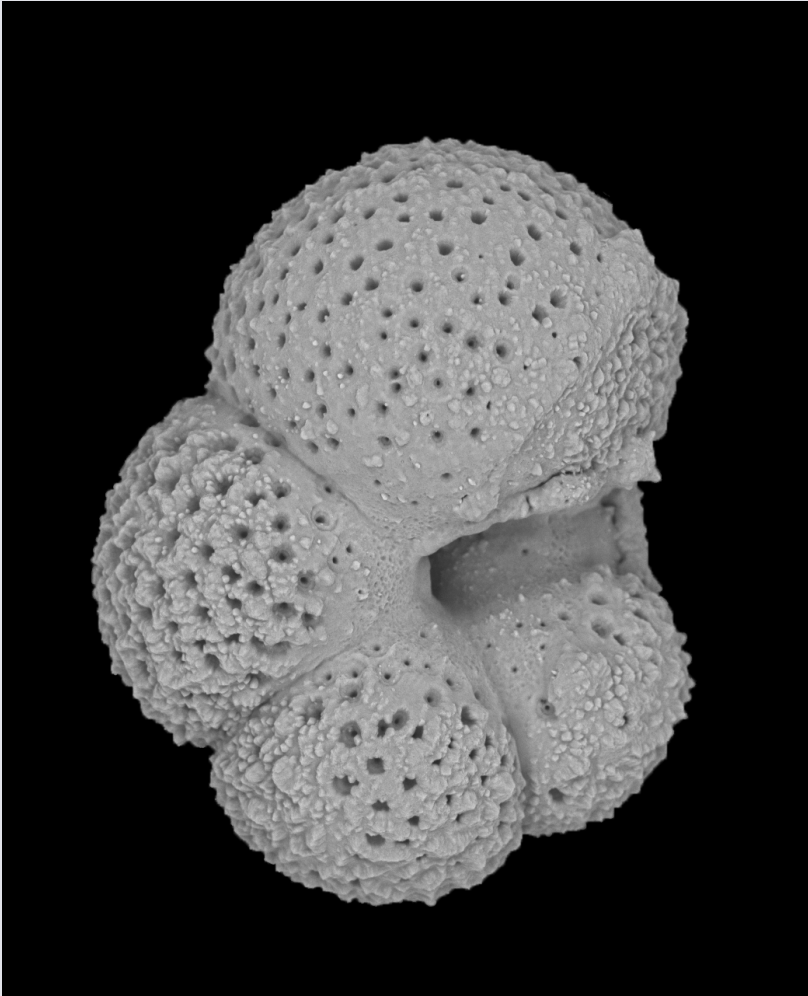


# Summary

- We had successful experiments summer 2021, *N. pachyderma* grew in a range of conditons.
- We observed crust formation in culture – we aim to distinguish crust from lamellar calcite in our proxy calibrations
- Trace element analysis (and calibration) is **underway**.
- Next steps: Culturing *Globigerina bulloides* and *N. pachyderma* and decoupling the carbonate system.







## Thank you!

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Adele Westgård  
PhD Candidate  
[adele.westgard@uit.no](mailto:adele.westgard@uit.no)  
@AdeleWestgard



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