Towards Identifying Biogenic Data Products for Advancing Modeling of **Carbon Sequestration in the Arctic Seas**

Artur Palacz¹, Maria Grigoratou², Nathan Briggs³, Stefano Ciavatta², Mattia Greco⁴, Monika Kedra¹, Marja Koski⁵, Chris Lindemann^{6,7}, Andy Visser⁵, Veli Çağlar Yumruktepe⁸, Ingrid Wiedmann⁹

S

OCU

1. Knowledge gaps in marine carbon cycling, particularly the role of biological processes, pose challenges in understanding and forecasting future changes.

2. Inadequate communication between data providers & users combined with the lack of open access data hinder the capacity to map and predict marine carbon cycling changes, especially in polar regions like the Arctic Ocean.

Aim: Multidisciplinary expert collaboration to identify **priority** biogenic data products for advancing modelling carbon sequestration in the Arctic Ocean DS Carbon sequestration: sum of processes that capture and store atmospheric carbon dioxide for a significant time.

0

iti

efi

Data product: A data product which can be directly used for modeling processes related to carbon sequestration, either to inform the model (its parameters, state variables or equations) or evaluate its outputs.

Biogenic: refers to carbon resulting from organic processes in marine environments, encompassing living and dead organic matter, respired carbon, and mineral carbonates across various ocean reservoirs.

- Biological processes of carbon sequestration related to
- carbon **uptake**
 - carbon **export**
 - carbon **recycling**

Targeted oceanic habitats: water column, benthic boundary layer, & sea floor in the coastal and open Arctic Ocean

Targeted marine life group: Plankton



ctio

Community perspectives on identifying important processes for advancing modelling carbon sequestration in the Arctic (Figure 1).



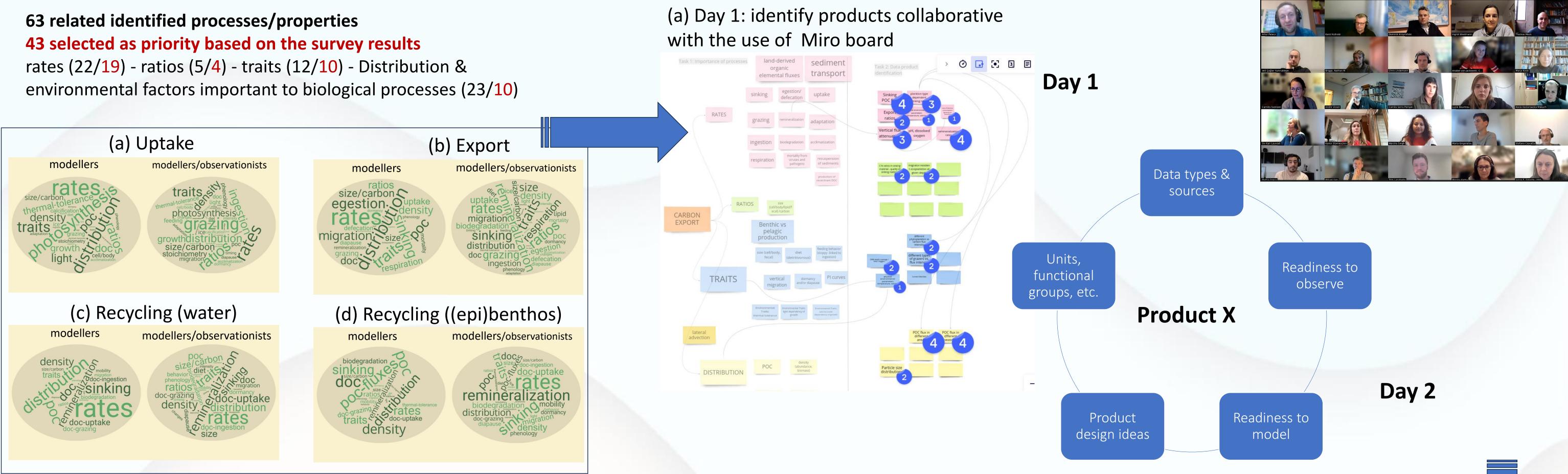
Identify biogenic products related to the priorities from the survey, their observing status, and model readiness (Figure 2).

Perspective article – 47 authors (in preparation)

Participants from phases 1 & 2 co-author a perspective article on biogenic data for modeling Arctic carbon sequestration.

Priorities based on community survey responses

Online Workshop to identify and describe Top 10 Biogenic Data Products



(b) Day 2: A schematic of the discussion and a Sankey diagram of the top 10 products

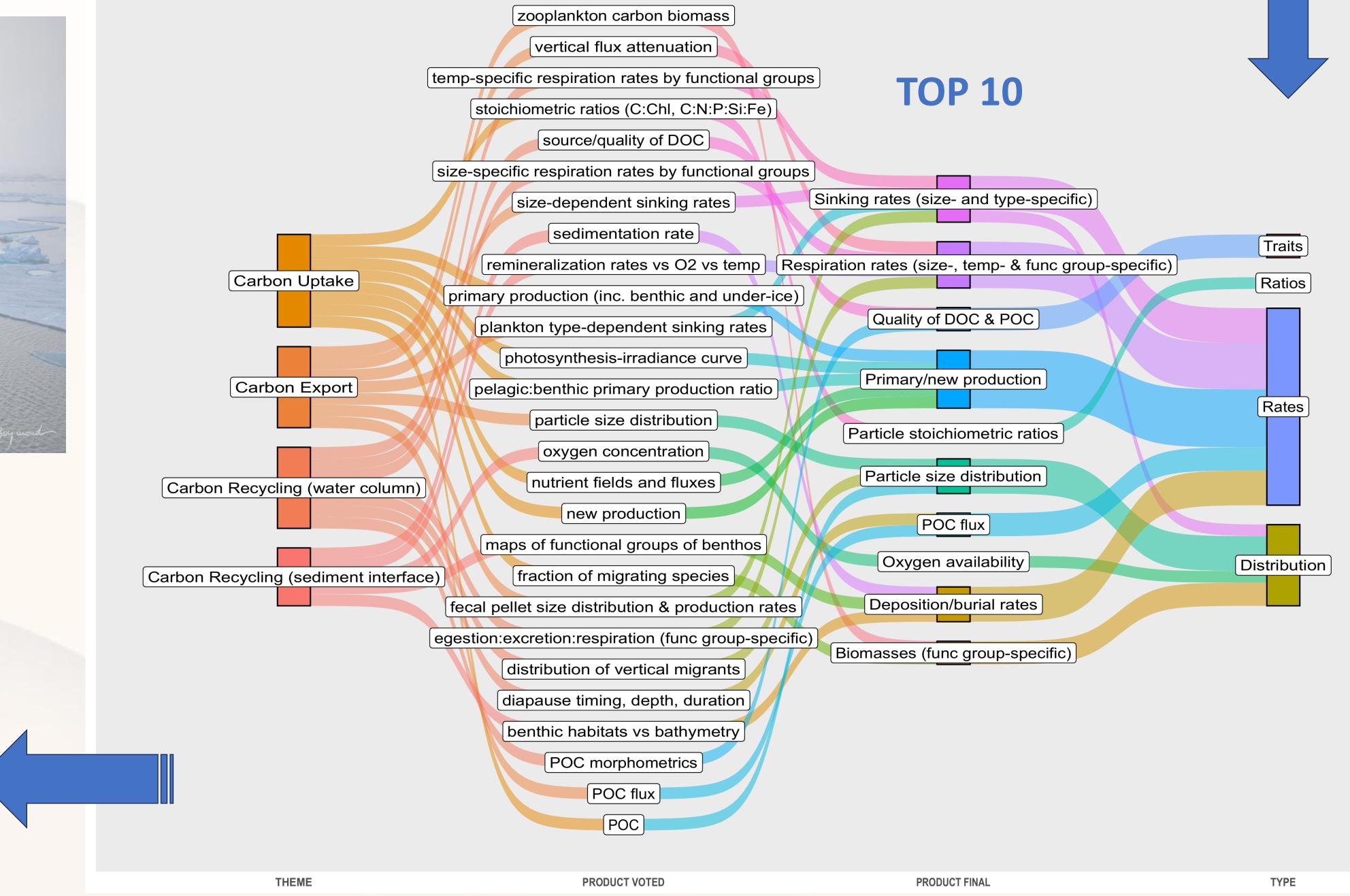
Figure 1: Word clouds from the important processes/properties identified in the survey by experts either on modelling (modellers) or both modelling and observations (modellers/observationists) for carbon (a) uptake, (b) export, (c) recycling in the water column and (d) recycling in the benthic boundary layer, & sea floor



Biogenic Data Products to Advance Ocean Carbon Sequestration Modelling in the Arctic



Perspective Article & Product



implementation plans

Synthesis of the workshop outcomes to finalize the list of the top 10 biogenic products (and related identified products) for advancing modelling carbon sequestration in the Arctic, their observing status, and model readiness to use the data products.

This synthesis will provide feedback to the GOOS list of **Essential Ocean Variables (EOVs).**

Figure 1: (a) An example of a miro board developed on Day 1 by a subgroup of participants for carbon export. (b) A schematic of the topics addressed on day 2 and a Sankey diagram for the Top 10 biogenic products identified by the workshop participants.



1: Institute of Oceanology of Polish Academy of Sciences, Sopot, Poland. 2: Mercator Ocean International, Toulouse, France. 3: National Oceanography Centre, Southampton, UK. 4: Institut de Ciències del Mar, Spanish National Research Council, Barcelona, Spain. 5: DTU aqua, Copenhagen, Denmark. 6: University of Bergen. 7: Norwegian Institute for Water Research, Bergen, Norway. 8: Nansen Environmental and Remote Sensing Center, Bergen, Norway. 9: University of Tromso, Tromso, Norway



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 869383

