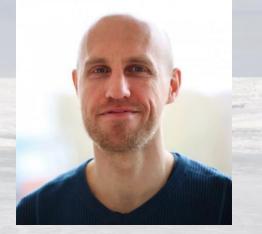
Recurrent and unique patterns of microbial seasonality in the Arctic Ocean revealed by autonomous sampling



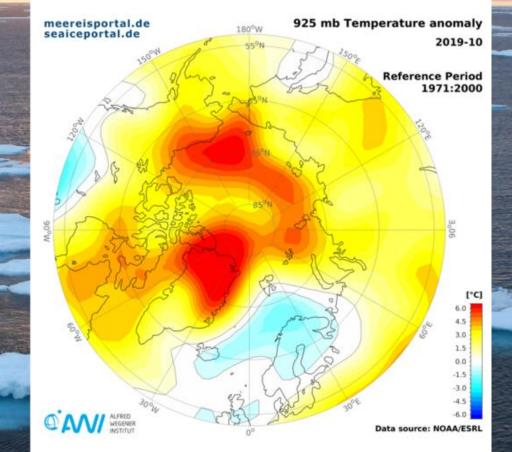
FRAM Frontiers in Arctic Marine Monitoring



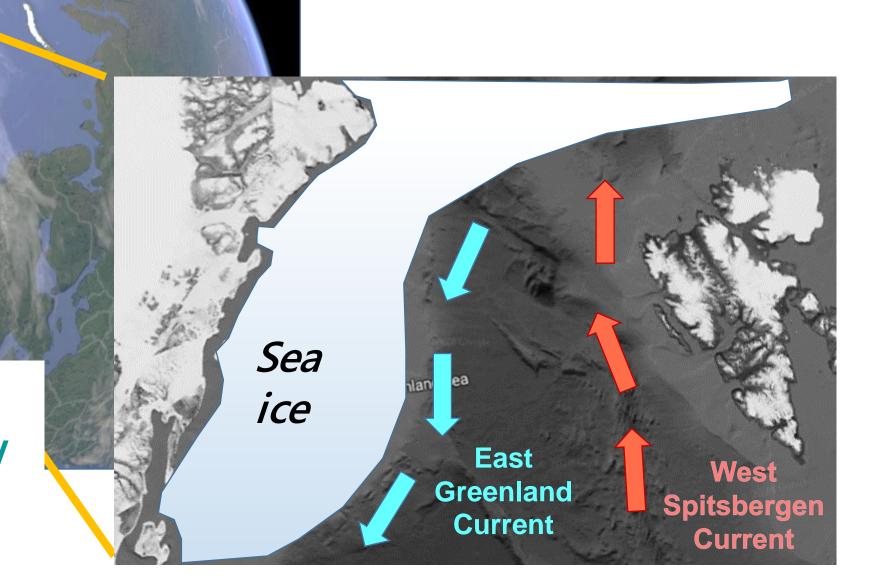
Matthias Wietz orcid: 0000-0002-9786-3026 matthias.wietz@awi.de

The Arctic is changing

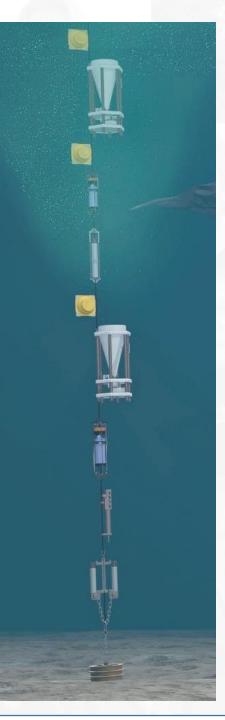
Long-term observations essential: identify natural variability vs. human impact



The AWI "Hausgarten" / FRAM LTER







Year-round moorings + annual summer expeditions

- Biology from surface to seafloor
- Physical oceanography
- Benthopelagic coupling

Sediment

trap







High-resolution, automated microbial time-series

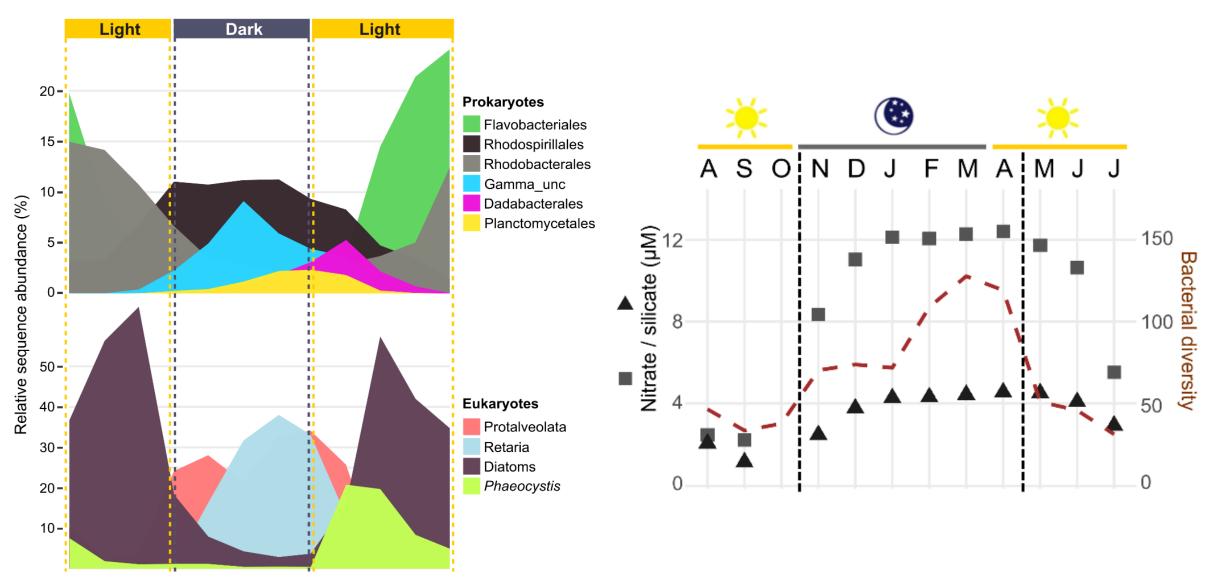


Remote Access Sampler

100 83°I 90 82°N (80 70 60 1°08 50 79°N 40 78°N 30 77°N 20 Greenland Svalbard 76°N 10 75°N 15°W 10°W 5°W 20°W 0° 5°E 10°E 15°E 20°E

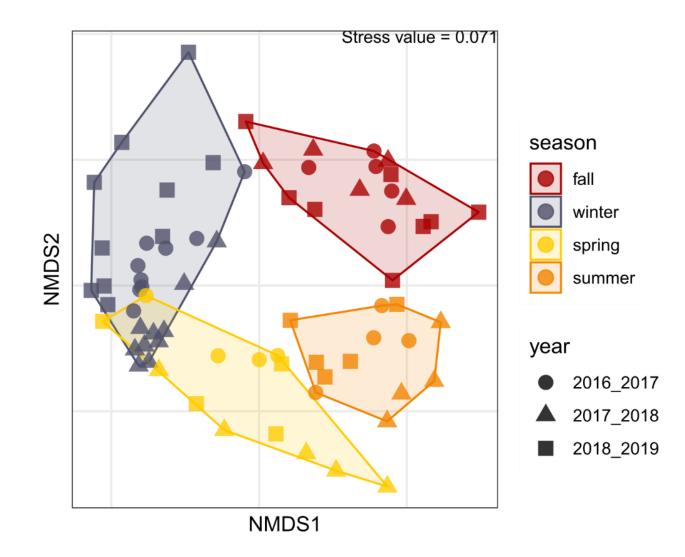
Dynamics and drivers of Arctic microbiomes Amplicon and metagenome sequencing Context with nutrients & oceanography

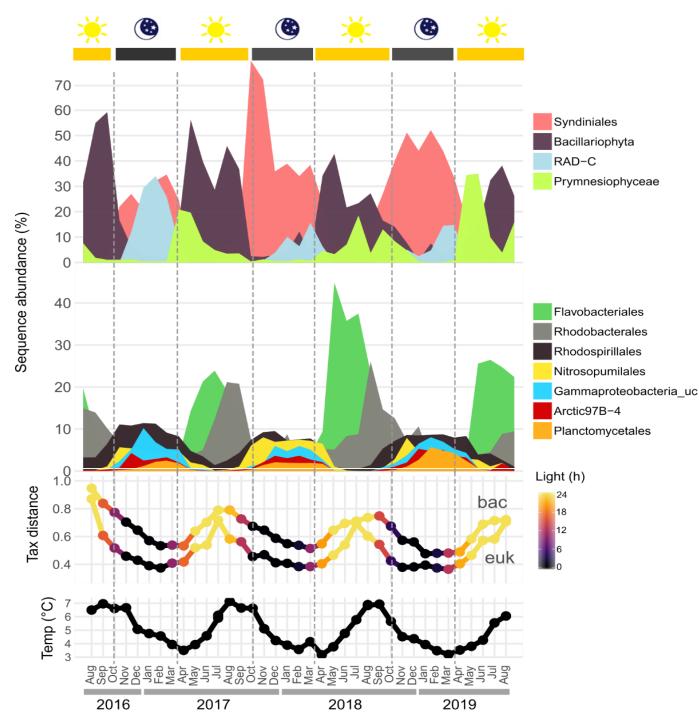
Annual oscillations in microbes & nutrients



Wietz et al. doi: 10.1101/2021.04.08.436999

Three annual cycles: consistent seasonal boundaries

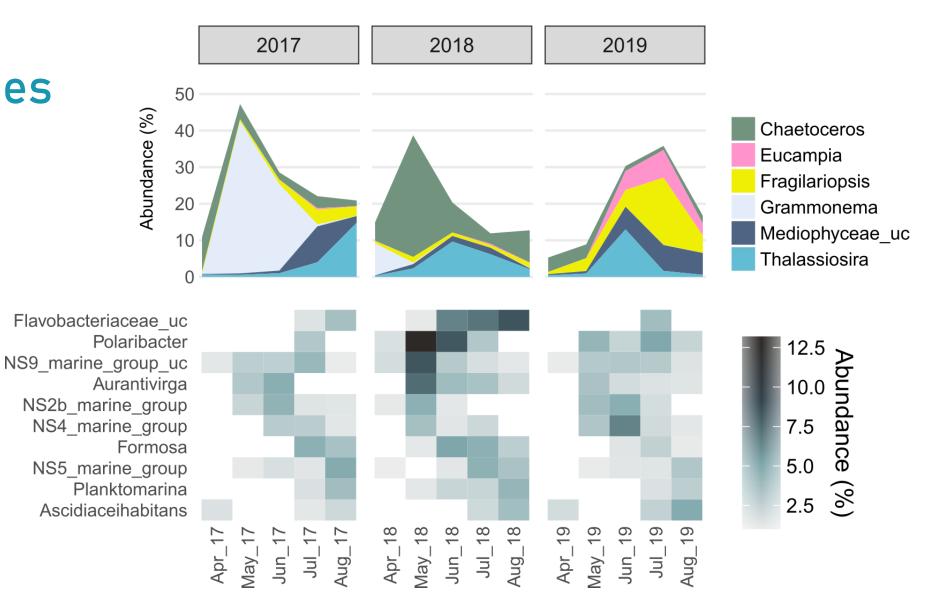




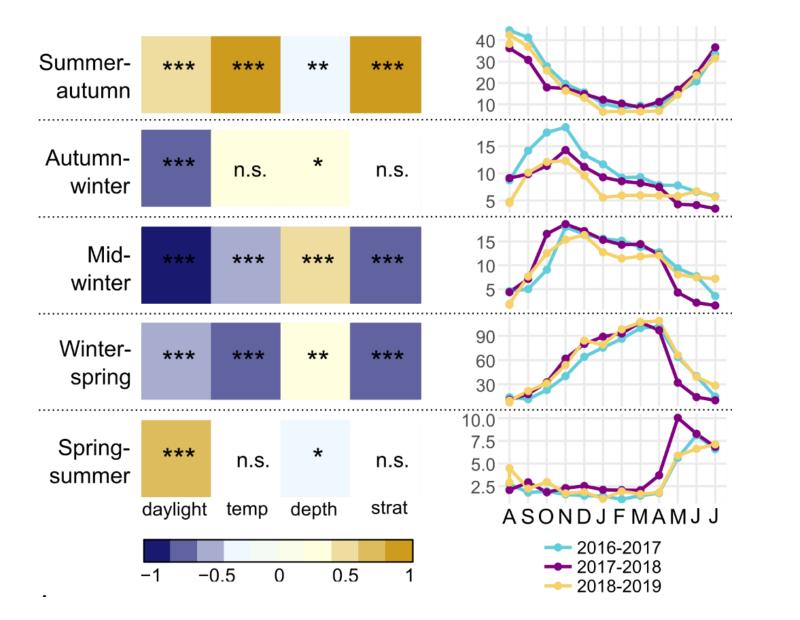
Recurrent patterns in major planktonic microbes

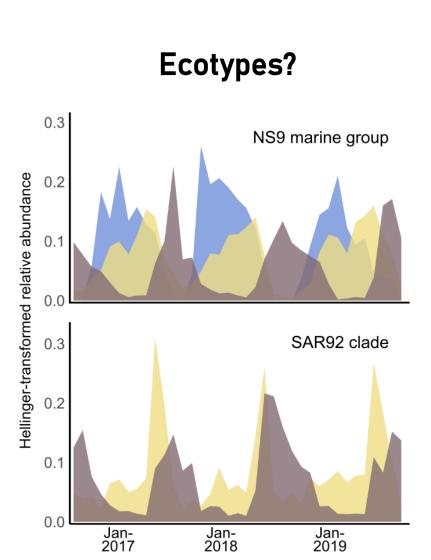
However:

bloom phenologies differ

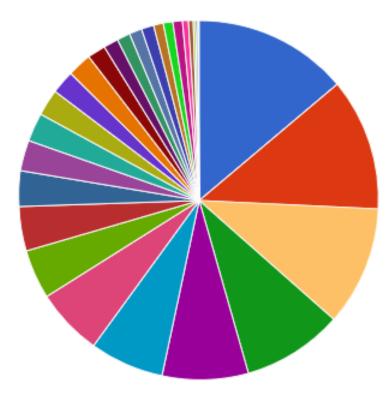


Microbial modules and their drivers





Functional seasonality: metagenomes from polar night



- Carbohydrates 146,419 (11.90%)
- Amino Acids and Derivatives 131,952 (10.73%)
- Miscellaneous 110,672 (9.00%)
- Protein Metabolism 94,607 (7.69%)
- Cofactors, Vitamins, Prosthetic Groups, Pigments 82,56
- RNA Metabolism 73,391 (5.97%)
- Fatty Acids, Lipids, and Isoprenoids 55,541 (4.52%)
- Cell Wall and Capsule 49,002 (3.98%)
- DNA Metabolism 38,808 (3.16%)
- Stress Response 34,403 (2.80%)

Perspectives

- Towards a system-level understanding of (temporal) ecosystem structuring
- Functional capacities in context of the Biological Carbon Pump
- Define community indicators for specific times and conditions
- Baseline for modelling the future Arctic Ocean microbiome





