Unprocessed holographic data of cryopeg fluids viewed at sub-micron resolution from Alaskan Arctic Coast Permafrost Tunnel and landfast sea ice from May 2017

Website: https://www.bco-dmo.org/dataset/817454
Data Type: Other Field Results
Version: 1
Version Date: 2020-07-01

Project
» Understanding How Virus Infection Affects Gene Flow and Microbial Evolution in Extreme Polar Environments (Arctic Subzero Brines)

Contributors	Affiliation	Role
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Abstract
Unprocessed (raw) holographic data of cryopeg and sea ice brines viewed using a digital holographic microscope at sub-micron resolution. Samples collected from Alaskan Arctic Coast Permafrost Tunnel and landfast sea ice near Utqiagvik in May 2017.

Table of Contents

Coverage

Spatial Extent: **N**:71.473 **E**:-156.5049 **S**:71.2944 **W**:-156.7294
Temporal Extent: 2017-05-06 - 2017-05-10

Dataset Description

Brine samples were collected from both sea ice and cryopeg near Utqiaġvik, Alaska, USA. Snow and ice thickness along with sackhole core depth information are available for sea ice samples. Bacterial and viral abundances along with temperature, pH, salinity, inorganic nutrients, organic nutrients, EPS, and water isotopes were measured for select samples.

Acquisition Description

Sackhole and cryopeg brines were collected according to Cooper et al., 2019 FEMS Environmental Microbiology and inserted into the holographic microscope using a syringe as described in Lindensmith et al., 2016 PLOS One.

Experiments were completed at the sample site or in the field-laboratory using a chemotactic chamber as described in Lindensmith, et al., 2016 PLOS One. Chemical gradients of serine (prepared to 1 molar concentration in self-same salinity solution) or gradients of salinity (established from sample salinity to seawater) were used to stimulate taxis across the chamber, or the a heating block was used to create temperature gradients in a cold room. Motility was observed in the microscope sub-sampling over periods of seconds or hours, according to timestamp data (available in the hologram folder).

Processing Description

BCO-DMO Processing Notes:
- packaged all images into tar gzipped file.

[table of contents | back to top]

Data Files

File	Version
Cryopeg Holographic Microscopy Images filename: images.tar.gz (GZIP (.gz), 29.82 GB) MD5:64834f891e9de0228564641b4546f63c *Unprocessed holographic data of cryopeg fluids viewed at sub-micron resolution. Below is a list of the directories contained in the package with a brief description of the conditions.* *2017.05.06 16-12 Sea ice sackhole brine in situ, (115 ppt)* *2017.05.07 18-54 Cryopeg brine, -6C, diluted 1:100 in seawater* *2017.05.07 19-11 Cryopeg brine, -6C, diluted 1:100 in seawater* *2017.05.07 22-15 Sackhole brine 2, +5c, chemotaxis experiment toward 1 M serine* *2017.05.08 01-06 Permafrost tunnel brine, room temperature* *2017.05.08 01-14 Permafrost tunnel brine, room temperature* *2017.05.08 01-18 Permafrost tunnel brine, room temperature* *2017.05.08 22-46 Cryopeg brine, -6C* *2017.05.08 23-00 Cryopeg brine, 5C* *2017.05.09 01-23 Cryopeg brine, +4C* *2017.05.09 02-53 Cryopeg brine, -1C, halotaxis experiment toward seawater salinity* *2017.05.09 03-10 Cryopeg brine, -1C, thermotaxis experiment toward 32C* *2017.05.09 03-12 Cryopeg brine, -1C, thermotaxis experiment toward 16C* *2017.05.09 03-15 Cryopeg brine, -1C, thermotaxis experiment toward 8C* *2017.05.09 12-39 Cryopeg brine, -1C, chemotaxis experiment toward 1 M serine* *2017.05.10 01-39 Sackhole 2 brine, -1C, haloxtaxis experiment toward seawater salinity*	1

[table of contents | back to top]

Related Publications

Cooper, Z. S., Rapp, J. Z., Carpenter, S. D., Iwahana, G., Eicken, H., & Deming, J. W. (2019). Distinctive microbial communities in subzero hypersaline brines from Arctic coastal sea ice and rarely sampled cryopegs. FEMS Microbiology Ecology, 95(12). doi:10.1093/femsec/fiz166
Methods

Lindensmith, C. A., Rider, S., Bedrossian, M., Wallace, J. K., Serabyn, E., Showalter, G. M., … Nadeau, J. L. (2016). A Submersible, Off-Axis Holographic Microscope for Detection of Microbial Motility and Morphology in Aqueous and Icy Environments. PLOS ONE, 11(1), e0147700. doi:10.1371/journal.pone.0147700
Methods

Wallace, J. K., Rider, S., Serabyn, E., Kühn, J., Liewer, K., Deming, J., … Nadeau, J. (2015). Robust, compact implementation of an off-axis digital holographic microscope. Optics Express, 23(13), 17367.

doi:10.1364/oe.23.017367 https://doi.org/10.1364/OE.23.017367
Methods

[table of contents | back to top]

Parameters

Parameters for this dataset have not yet been identified

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	holographic microscope
Generic Instrument Name	Digital inline holographic microscope
Dataset-specific Description	Sackhole and cryopeg brines were collected according to Cooper et al., 2019 FEMS Environmental Microbiology and inserted into the holographic microscope using a syringe as described in Lindensmith et al., 2016 PLOS One.
Generic Instrument Description	A Digital Inline Holographic Microscope (DIHM) uses coherent (laser) light and a digital camera to image objects with micrometer scale resolution. A portion of the light scattered by illuminated objects interferes with incident light in a predictable manner. The resulting interference patterns projected onto a two-dimensional plane (i.e. digital camera sensor) are recorded as holograms. These digital holograms are then numerically reconstructed to produce an in-focus image at a given distance from the recording plane. A relatively large illuminated volume (>100 mL) can be reconstructed in this manner to produce a single image with an extended depth of field.

[table of contents | back to top]

Project Information

Understanding How Virus Infection Affects Gene Flow and Microbial Evolution in Extreme Polar Environments (Arctic Subzero Brines)

GBMF Summary: In support of developing a virus–bacterium–alga culture system and advancing methods to investigate how virus infection and stress impact gene flow and microbial evolution in cold, highly saline environments.

[table of contents | back to top]

Funding

Funding Source	Award
Gordon and Betty Moore Foundation: Marine Microbiology Initiative (MMI)	GBMF5488

[table of contents | back to top]