CTD casts associated with IFCB sampling events taken at Palmer Deep Station on February 8 and March 7 2020.

Website: https://www.bco-dmo.org/dataset/865030
Data Type: Other Field Results
Version: 1
Version Date: 2021-12-03

Project
» Collaborative Research: Physical Mechanisms Driving Food Web Focusing in Antarctic Biological Hotspots (Project SWARM)

Contributors	Affiliation	Role
Oliver, Matthew	University of Delaware	Principal Investigator
Kohut, Joshua	Rutgers University	Co-Principal Investigator
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Abstract
CTD casts associated with IFCB (Image Flow CytoBot) sampling events taken at Palmer Deep Station on February 8 and March 7 2020.

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Coverage

Spatial Extent: **N**:-64.8423 **E**:-64.1117 **S**:-64.9321 **W**:-64.2717
Temporal Extent: 2020-02-08 - 2020-03-07

Methods & Sampling

The IFCB (Image Flow CytoBot) sampling occurred on February 8 and March 7 2020 at three stations over Palmer Deep Canyon (see Hudson et al., 2021 for station locations). Water samples for the IFCB were collected with a SeaBird SBE-19 Plus V2 CTD and 6 Niskin bottles, which fired at 5, 35, 75, 100, 150, and 200 m on the upcasts.

Sampling was done at 3 stations over Palmer Deep Canyon, with H5 being over the canyon and H1 as the most inshore station.

Data Processing Description

CTD data files were processed using the *read.ctd* function in the R *oce* package. Only the downcasts were

considered.

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Data Files

File
ifcb_ctd.csv(Comma Separated Values (.csv), 1.30 MB) MD5:a7327137d4a80b531baf7aea8ecbb6fb Primary data file for dataset ID 865030

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Related Publications

Hudson, K., Oliver, M. J., Kohut, J., Dinniman, M. S., Klinck, J. M., Moffat, C., … Fraser, W. (2021). A Recirculating Eddy Promotes Subsurface Particle Retention in an Antarctic Biological Hotspot. Journal of Geophysical Research: Oceans, 126(11). doi:10.1029/2021jc017304 https://doi.org/10.1029/2021JC017304
Results

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Related Datasets

IsRelatedTo

Oliver, M., Kohut, J., Hudson, K. (2021) **Image data taken by an Imaging Flow CytoBot (IFCB) over Palmer Deep Canyon in February and March 2020.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-12-07 doi:10.26008/1912/bco-dmo.865002.1 [view at BCO-DMO]
Relationship Description: Image Flow CytoBot CTD data taken at the same time.

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Parameters

Parameter	Description	Units
date	Date of CTD cast	NA
station	Location of CTD cast	NA
latitude	Latitude of CTD cast	Decimal degrees
longitude	Longitude of CTD cast	Decimal degrees
temperature	Water temperature	Degrees Celsius
conductivity	Water conductivity	Siemens meter-1
pressure	Water pressure	Decibar
fluorescence	Water fluorescence	ug L-1
beamTransmission	Light beam transmission in the water	Percent
salinity	Water salinity	NA
depth	Water depth	Meters
density	Water density	kg m -3

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Instruments

Dataset-specific Instrument Name	SeaBird SBE-19 Plus V2 CTD
Generic Instrument Name	CTD Sea-Bird SBE SEACAT 19plus
Dataset-specific Description	SeaBird SBE-19 Plus V2 CTD, factory calibrated July 2019, SN 156.
Generic Instrument Description	Self contained self powered CTD profiler. Measures conductivity, temperature and pressure in both profiling (samples at 4 scans/sec) and moored (sample rates of once every 5 seconds to once every 9 hours) mode. Available in plastic or titanium housing with depth ranges of 600m and 7000m respectively. Minature submersible pump provides water to conductivity cell.

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Project Information

Collaborative Research: Physical Mechanisms Driving Food Web Focusing in Antarctic Biological Hotspots (Project SWARM)

Coverage: West Antarctic Peninsula

NSF Award Abstract:
Undersea canyons play disproportionately important roles as oceanic biological hotspots and are critical for our understanding of many coastal ecosystems. Canyon-associated biological hotspots have persisted for thousands of years Along the Western Antarctic Peninsula, despite significant climate variability. Observations of currents over Palmer Deep canyon, a representative hotspot along the Western Antarctic Peninsula, indicate that surface phytoplankton blooms enter and exit the local hotspot on scales of ~1-2 days. This time of residence is in conflict with the prevailing idea that canyon associated hotspots are primarily maintained by phytoplankton that are locally grown in association with these features by the upwelling of deep waters rich with nutrients that fuel the phytoplankton growth. Instead, the implication is that horizontal ocean circulation is likely more important to maintaining these biological hotspots than local upwelling through its physical concentrating effects. This project seeks to better resolve the factors that create and maintain focused areas of biological activity at canyons along the Western Antarctic Peninsula and create local foraging areas for marine mammals and birds. The project focus is in the analysis of the ocean transport and concentration mechanisms that sustain these biological hotspots, connecting oceanography to phytoplankton and krill, up through the food web to one of the resident predators, penguins. In addition, the research will engage with teachers from school districts serving underrepresented and underserved students by integrating the instructors and their students completely with the science team. Students will conduct their own research with the same data over the same time as researchers on the project. Revealing the fundamental mechanisms that sustain these known hotspots will significantly advance our understanding of the observed connection between submarine canyons and persistent penguin population hotspots over ecological time, and provide a new model for how Antarctic hotspots function.

To understand the physical mechanisms that support persistent hotspots along the Western Antarctic Peninsula (WAP), this project will integrate a modeling and field program that will target the processes responsible for transporting and concentrating phytoplankton and krill biomass to known penguin foraging locations. Within the Palmer Deep canyon, a representative hotspot, the team will deploy a High Frequency Radar (HFR) coastal surface current mapping network, uniquely equipped to identify the eddies and frontal regions that concentrate phytoplankton and krill. The field program, centered on surface features identified by the HFR, will include (i) a coordinated fleet of gliders to survey hydrography, chlorophyll fluorescence, optical backscatter, and active acoustics at the scale of the targeted convergent features; (ii) precise penguin tracking with GPS-linked satellite telemetry and time-depth recorders (TDRs); (iii) and weekly small boat surveys that adaptively target and track convergent features to measure phytoplankton, krill, and hydrography. A high resolution physical model will generalize our field measurements to other known hotspots along the WAP through simulation and determine which physical mechanisms lead to the maintenance of these hotspots. The project will also engage educators, students, and members of the general public in Antarctic research and data analysis with an education program that will advance teaching and learning as well as broadening participation of under-represented groups. This engagement includes professional development workshops, live connections to the public and classrooms, student research symposia, and program evaluation. Together the integrated research and engagement will advance our understanding of the role regional transport pathways and local depth dependent concentrating physical mechanisms play in sustaining these biological hotspots.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1745009
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1744884
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1745011
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1745018
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1745023
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1745081

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