Fall 2011 - Sample Processing Log

Website: https://www.bco-dmo.org/dataset/644466
Version: 20 April 2016
Version Date: 2016-04-20

Project
» Collaborative Research: Degrading offshore permafrost as a source of methane on the East Siberian Arctic Shelf (East Siberian Arctic Shelf)

Contributors	Affiliation	Role
Joye, Samantha B.	University of Georgia (UGA)	Lead Principal Investigator, Contact
Meile, Christof	University of Georgia (UGA)	Co-Principal Investigator
Samarkin, Vladimir	University of Georgia (UGA)	Co-Principal Investigator
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Fall 2011 - Sample Processing Log

Methods & Sampling

Fall 2011 - Sample Processing Log

References:

Joye SB, Bowles M.W., Samarkin V.A., Hunter K.S., Niemann H.. 2010. Biogeochemical signatures and microbial activity of different cold seep habitats along the Gulf of Mexico lower slope. Deep Sea Research. 10:doi:10.1016/j.dsr2.2010.06.001.

Joye SB, MacDonald I.R., Leifer I., Asper V.. 2011. Magnitude and oxidation potential of hydrocarbon gases released from the BP blowout. Nature Geoscience. 4:160-164.

Orcutt B.N., Samarkin V., Boetius A., Elvert M., Joye SB. 2005. Molecular biogeochemistry of sulfate reduction, methanogenesis and the anaerobic oxidation of methane at Gulf of Mexico methane seeps. Geochimica et Cosmochimica Acta. 69:4267-4281.

Data Processing Description

BCO-DMO Processing Notes
- Generated from original file "0908788_Joye_Fall 2011_SampleLog.xlsx", Sheet: "sample log" contributed by

Samantha Joye
- Data on sheet spilt into two datasets - Station Information and Sample Processing Log
- Sheet was split because of length of text included in core descriptions and core ids
- Information on sheet extensively reformatted to adhere to data serving requirements
- Parameter names edited to conform to BCO-DMO naming convention found at Choosing Parameter Name
- Lat and Lon converted to decimal degrees
- "nd" (no data) inserted into blank cells
- blank rows removed

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Data Files

File
Fall2011_Processing_Log.csv (Comma Separated Values (.csv), 25.29 KB) MD5:6d55cfe06d6c9f9668fb18a8e064beca Primary data file for dataset ID 644466

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Parameters

Parameter	Description	Units
Site	Site	dimensionless
Date_Collected	Date Collected	YYYYMMDD
Time_Collected	Time Collected	HHMM
Date_Processed	Date Processed	YYYYMMDD
Latitude	Station latitude (South is negative)	decimal degrees
Longitude	Station longitude (West is negative)	decimal degrees
Water_Depth	Water Depth	meters
Temp_Bottom_Water	Temp Bottom Water	degrees C
Temp_Bottom_Sediment	Temp Bottom Sediment	degrees C
Depth	Depth	cm PW/ m WC
ID	ID	dimensionless
Temp	Temp	°C
Salinity	Salinity	‰
Mol_Filter	Mol_Filter	Vol
FISH	FISH	Vol
DIC	DIC	Vol
DIC_iso	DIC iso	Vol
HSminus	HS-	Vol
SO4_Cl	SO4/Cl	Vol
VFA	VFA	Vol
Ac_isotopes	AC isotopes	Vol
Nutz	Nutz	Vol
SiO2	SiO2	Vol
H2O_Isotopes	H2O Isotopes	Vol
pH	pH	PH Units
DMSP	DMSP	(tbd)

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Deployments

ESAS_Fall_2011

Website	https://www.bco-dmo.org/deployment/641549
Platform	shoreside East Siberian Arctic Shelf
Start Date	2011-09-01
End Date	2011-10-31
Description	Siberia Cruise Porewater Samples Collected Sept-Oct, 2011

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Project Information

Collaborative Research: Degrading offshore permafrost as a source of methane on the East Siberian Arctic Shelf (East Siberian Arctic Shelf)

Website: http://www.joyeresearchgroup.uga.edu/research/climate-change/arctic-ecosystems/degrading-offshore-permafrost-source-methane

Coverage: East Siberian Arctic Shelf

From the NSF Award ABSTRACT

The Arctic region contains a huge amount of organic carbon, referred to as the Arctic Carbon Hyper Pool, within the Arctic Ocean sedimentary basin. This area has the highest documented rates of coastal sedimentation with annual accumulation rates of about 10 million metric tons organic C per year, which approximately equals the amount of sediment accumulated over the entire pelagic zone of the World Ocean. Due to the specific features of sedimentation and lithogenesis in this area, much of this organic carbon survives decomposition, and is buried within seabed sediments. These sediments are frozen annually or seasonally, representing a substantial reservoir of potentially labile organic carbon. Global warming in the arctic region is predicted to be substantial, and possibly rapid, in next few decades. Upon the melting of permafrost, old stored carbon will be reintroduced into the modern carbon biogeochemical cycle, possibly acting as a strong source of methane to the overlying water and potentially the atmosphere. Additionally, extremely large amounts of more ancient (Pleistocene) methane are trapped as gas hydrates within and beneath the permafrost. This research aims to elucidate the present and future methane flux potential of sediments and permafrost in regions of the East Siberian Arctic Shelf. As a result of global warming, seafloor permafrost along the East Siberian Arctic Shelf may experience a pronounced change in thermal regime. Increased temperature may affect permafrost in several ways, ultimately leading to its degradation and enhanced CH4 release. An international, interdisciplinary research team will determine the distribution and stability of permafrost on the East Siberian Arctic Shelf and evaluate this area as a methane source to the arctic region. Cores from eleven locations will be obtained using dry drilling techniques. Rates of biological methane production and consumption (oxidation) will be quantified in permafrost and sediments at in situ and elevated temperatures. Natural abundance stable carbon and hydrogen isotope measurements will be used to quantify the age and source of methane collected from different sites and depths. These data will be used as input to numerical models, which will be developed to describe the thermodynamic and biogeochemical aspects of permafrost methane dynamics. Using field data and modeling, the current and future potential release of methane from offshore permafrost will be determined and a methane budget for the East Siberian Arctic Shelf will be constructed.

BOOKS/ONE TIME PROCEEDING

Joye, S.B., V.A. Samarkin, N. Shakova, I. Semiletov, and M.W. Bowles. "Methane dynamics along the East Siberian Arctic Shelf: sources, sinks, and fluxes to the atmosphere", 09/01/2011-08/31/2012, "*Gordon Research Conference on Polar Marine Science*", 2011, "2011 GRC-PMC Ventura California".

Finke, N., S. Baer, and S.B. Joye. "Methane production in marine sea ice in the Chukchi Sea, Barrow, Alaska", 09/01/2011-08/31/2012, "*Meeting Abstracts*", 2012, "NASA AbSciCon, Atlanta GA April".

Samarkin, V.A., I. Semelitov, N. Finke, N. Shakhova, and S. B. Joye. "Methane stable isotope signatures in waters and sediments of the Laptev Sea Shelf", 09/01/2011-08/31/2012, "*Fall AGU meeting 2012*", 2012, "AGU Meeting Abstracts".

Project Summary

Collaborative Research: Degrading offshore permafrost as a current and potential source of atmospheric methane on the East Siberian Arctic Shelf

Intellectual Merit: The Arctic region contains a huge amount of organic carbon, referred to commonly as the “Arctic Carbon Hyper Pool”, within the Arctic Ocean sedimentary basin. The Russian Arctic shelf acts as an estuary of the Great Siberian Rivers. This area has the highest documented rates of coastal sedimentation with annual accumulation rates of about 10×106 t Corg yr-1, which approximately equals the amount of sediment accumulated over the entire pelagic zone of the World Ocean. Due to the specific features of sedimentation and lithogenesis in this area, much of this organic carbon survives decomposition, and is buried within seabed

sediments. Some of these sediments are seasonally or annually frozen (“offshore” permafrost), representing a substantial reservoir of old but potentially labile organic carbon. Global warming in the Arctic region is predicted to be substantial, and possibly rapid, in the next few decades. Upon permafrost melting, the old carbon stored therein will be reintroduced into the modern carbon biogeochemical cycle, possibly acting as a strong source of methane to the overlying water and potentially the atmosphere. Additionally, extremely large amounts of more ancient (Pleistocene) methane are trapped as gas hydrates within and beneath the permafrost. **T**he proposed work aims to elucidate the present and future methane flux potential of sediments and permafrost in regions of the East Siberian Arctic Shelf. As a result of global warming, seafloor permafrost along the East Siberian Arctic Shelf may experience a pronounced change in thermal regime. Increased temperature may affect permafrost in several ways, ultimately leading

to its degradation and enhanced CH4 release. This international, interdisciplinary research team will determine the distribution and stability of permafrost on the East Siberian Arctic Shelf and evaluate this area as a methane source to the Arctic region. Cores from eleven locations will be obtained using dry drilling techniques. Rates of biological methane production and consumption (oxidation) will be quantified in permafrost and sediments at *in situ* and elevated temperatures.

Natural abundance carbon (13C and 14C) and hydrogen isotope measurements will be used to quantify the age and source of methane collected from different sites and depths. These data will be used as input to numerical models, which will be developed to describe the thermodynamic and biogeochemical aspects of permafrost methane dynamics. Using field data and modeling, the current and future potential release of methane from offshore permafrost will be determined and a methane budget for the East Siberian Arctic Shelf will be constructed.

Broader impacts: The proposed work will address a key aspect of the “International Polar Year” request for proposals by advancing the understanding of the coupled physical-geological-biological-chemical system of the Arctic Ocean and providing a predictive model of how the system will respond to environmental change. This work will elucidate the impact of global warming on methane dynamics in the Arctic; in particular, the current and potential capacity of sediments and permafrost to act as a methane source to the overlying water column and atmosphere will be quantified. The scientific team includes PIs with experience working in the Arctic (Semiletov, Shakova, Samarkin) as well as PIs new to this area (Joye, Meile). International collaborators (Grigoriev, Rekant, Kholodov) complete the research team by providing extensive expertise in geology and permafrost drilling in the Arctic. Besides supplying crucial data on CH4 fluxes to global change scientists, this proposal will promote training by supporting students at various levels and by reaching the public and interested scientists through a dedicated website. The project will contribute to the active outreach activities coordinated through the multi-agency Northern Eurasia Earth Science Partnership Initiative (NEESPI). This proposal will also contribute to the collaboration between two major Arctic nations, the United States and Russian Federation. All data generated during this project will be submitted to the BCO-DMO database.

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Funding

Funding Source	Award
NSF Division of Polar Programs (NSF PLR)	PLR-0908788

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