

Numerical model simulating the sea ice and ocean conditions in the Amundsen Sea over the period Jan. 1, 2006 to Dec. 31, 2013

Website: <https://www.bco-dmo.org/dataset/729546>

Data Type: model results

Version: 1

Version Date: 2017-08-30

Project

» [Collaborative Research: Investigating the Role of Mesoscale Processes and Ice Dynamics in Carbon and Iron Fluxes in a Changing Amundsen Sea \(INSPIRE\)](#) (INSPIRE)

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Abstract

Numerous coastal polynyas fringe the Antarctic continent and strongly influence the productivity of Antarctic shelf systems. Of the 46 Antarctic coastal polynyas documented in a recent study, the Amundsen Sea Polynya (ASP) stands out as having the highest net primary production per unit area. Incubation experiments suggest that this productivity is partly controlled by the availability of dissolved iron (dFe). As a first step toward understanding the iron supply of the ASP, we introduce four plausible sources of dFe and simulate their steady spatial distribution using conservative numerical tracers. The modeled distributions replicate important features from observations including dFe maxima at the bottom of deep troughs and enhanced concentrations near the ice shelf fronts. A perturbation experiment with an idealized drawdown mimicking summertime biological uptake and subsequent resupply suggests that glacial meltwater and sediment-derived dFe are the main contributors to the prebloom dFe inventory in the top 100 m of the ASP. The sediment-derived dFe depends strongly on the buoyancy-driven overturning circulation associated with the melting ice shelves (the “meltwater pump”) to add dFe to the upper 300 m of the water column. The results support the view that ice shelf melting plays an important direct and indirect role in the dFe supply and delivery to polynyas such as the ASP. The data are from a numerical model simulating the sea ice and ocean conditions in the Amundsen Sea over the period Jan. 1, 2006 to Dec. 31, 2013. The data files provide the daily averaged model fields during this period. The numerical model and experiment are thoroughly described in St-Laurent et al., J. Geophys. Res. Oceans, doi:10.1002/2017jc013162.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Supplemental Files](#)
- [Related Publications](#)
- [Parameters](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:-71 E:-100 S:-75 W:-130
Temporal Extent: 2006-01-01 - 2013-12-31

Methods & Sampling

The numerical model used in the publication is the Regional Ocean Modeling System (ROMS). This open source model and its documentation are freely available at myroms.org. The model geometry, initial and boundary conditions are provided as part of this dataset.

Location: The study area is the continental shelf of the Amundsen Sea, Antarctica, 71-75S, 100-130W.

This dataset contains NetCDF and matlab files totaling 1.8TB when uncompressed. See "Data Files" section for access. See also the "Supplemental Files" section for further metadata like parameter information, file inventories, and example files.

Data files with the "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data.

Data files with the "mat" extension are in the standard MATLAB format; see <https://www.mathworks.com/products/matlab.html> for more information.

Data Processing Description

BCO-DMO Data Manager Notes:

- * Files were bundled and compressed into tar.gz files and added to the "Data Files" section of this dataset. These are the original, un-edited files as submitted to BCO-DMO by the PIs of this dataset.

- * Supplemental information including parameter information and example files added to "Supplemental Files" section.

[[table of contents](#) | [back to top](#)]

Data Files

File

Other model files

filename: other_data_files.tar.gz

(GZIP (.gz), 11.69 GB)
MD5:df609e6a8156ac9f20a5108fd2b4509e

This tar.gz file bundle contains the following files for this model. For a detailed description of these files and the parameters they contain see the "Data File Parameter List" in the "Supplemental Files" section, and the model's methodology.

Data files with the "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data.

Data files with the "mat" extension are in the standard MATLAB format; see <https://www.mathworks.com/products/matlab.html> for more information.

- | └─ basal_melt_2007_2008.mat
- | └─ cell_transport_dec2010.mat
- | └─ dissolved_iron_inventory_polynya.mat
- | └─ glacial_meltwater_dec2010.mat
- | └─ ice.in
- | └─ melt_flux_sea_ice_ocean_interface.mat
- | └─ melt_flux_sea_ice_ocean_polynya.mat
- | └─ ocean_amundsen_sea.in
- | └─ ocean_bry.nc
- | └─ ocean_clm.nc
- | └─ ocean_frc.nc
- | └─ ocean_grd.nc
- | └─ ocean_ini.nc
- | └─ salinity_temperature_dec2010.mat
- | └─ sea_ice_conc_july2010_june2011.mat
- | └─ tracer_cdw_dec2010.mat
- | └─ tracer_cdw_dec2010_with_nud.mat
- | └─ tracer_sed_dec2010.mat
- | └─ tracer_sed_dec2010_with_nud.mat

Passive tracer NetCDF files 0001-0009

filename: passive_tracers_000.tar.gz

(GZIP (.gz), 57.51 GB)
MD5:2b59893e4b4f0ca4af7bb40e2b209a3d

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0001.nc to passive_tracers_0009.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

File

Passive tracer NetCDF files 0010-0019

filename: passive_tracers_001.tar.gz

(GZIP (.gz), 67.84 GB)
MD5:d33554452cec463b13db879483b162d5

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0010.nc to passive_tracers_0019.nc.

These files have ".nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Passive tracer NetCDF files 0020-0029

filename: passive_tracers_002.tar.gz

(GZIP (.gz), 67.45 GB)
MD5:99272c9919f6f9c26e4a53af9f2df372

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0020.nc to passive_tracers_0029.nc.

These files have ".nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Passive tracer NetCDF files 0030-0039

filename: passive_tracers_003.tar.gz

(GZIP (.gz), 67.25 GB)
MD5:4f52f5e85cec0a6a47780b2bd938aabf

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0030.nc to passive_tracers_0039.nc.

These files have ".nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Passive tracer NetCDF files 0040-0049

filename: passive_tracers_004.tar.gz

(GZIP (.gz), 67.17 GB)
MD5:1700c1838edd34406c543a7c36eb55f6

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0040.nc to passive_tracers_0049.nc.

These files have ".nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

File

Passive tracer NetCDF files 0050-0059

filename: passive_tracers_005.tar.gz

(GZIP (.gz), 67.09 GB)
MD5:a98cba9a86f5f8e9eddc4cfa313fae92

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0050.nc to passive_tracers_0059.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Passive tracer NetCDF files 0060-0069

filename: passive_tracers_006.tar.gz

(GZIP (.gz), 67.07 GB)
MD5:07a6153ce2804e0bf5228efd0afaa458

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0060.nc to passive_tracers_0069.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Passive tracer NetCDF files 0070-0079

filename: passive_tracers_007.tar.gz

(GZIP (.gz), 67.08 GB)
MD5:1380afb72fca2259f104f5b61af124cf

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0070.nc to passive_tracers_0079.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Passive tracer NetCDF files 0080-0089

filename: passive_tracers_008.tar.gz

(GZIP (.gz), 67.06 GB)
MD5:bcf437c344b9f5b1b0ae977d72e7af01

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0080.nc to passive_tracers_0089.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

File

Passive tracer NetCDF files 0090-0098

filename: passive_tracers_009.tar.gz

(GZIP (.gz), 56.34 GB)
MD5:bd3bd0729694cef50c6a61d51172e4af

Passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files passive_tracers_0090.nc to passive_tracers_0098.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0001-0009

filename: physics_000.tar.gz

(GZIP (.gz), 63.15 GB)
MD5:c8b05f04e6228f1efbaefc000a6255a3

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0001.nc to physics_0009.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0010-0019

filename: physics_001.tar.gz

(GZIP (.gz), 70.27 GB)
MD5:3d9ed1934d95aac2eac902b3e10049be

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0010.nc to physics_0019.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0020-0029

filename: physics_002.tar.gz

(GZIP (.gz), 70.18 GB)
MD5:a532b11748555400e70bf97631d8d811

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0020.nc to physics_0029.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

File

Physics NetCDF files 0030-0039

filename: physics_003.tar.gz

(GZIP (.gz), 70.08 GB)
MD5:7b2b7c672258f231b7f57a47fe64aeb2

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0030.nc to physics_0039.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0040-0049

filename: physics_004.tar.gz

(GZIP (.gz), 70.14 GB)
MD5:6b6183e521bc53feb517b4a13c1f9a19

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0040.nc to physics_0049.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0050-0059

filename: physics_005.tar.gz

(GZIP (.gz), 70.14 GB)
MD5:f64cca76e3dcf8e97d466e1d1b08bb5

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0050.nc to physics_0059.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0060-0069

filename: physics_006.tar.gz

(GZIP (.gz), 70.17 GB)
MD5:0148d4aac5987f58c15b2109e5a15b93

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0060.nc to physics_tracers_0069.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

File

Physics NetCDF files 0070-0079

filename: physics_007.tar.gz

(GZIP (.gz), 70.27 GB)
MD5:81becac05b41f368b548589275b14208

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0070.nc to physics_0079.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0080-0089

filename: physics_008.tar.gz

(GZIP (.gz), 70.15 GB)
MD5:6446feb2cce0692987cd8d03838dc57a

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0080.nc to physics_0089.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Physics NetCDF files 0090-0098

filename: physics_009.tar.gz

(GZIP (.gz), 58.87 GB)
MD5:9e5b50d5fc09a93c6f2dabb3a16ac607

Physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in these files along with units for the parameters.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data. This file bundle contains a part of those 98 files, the NetCDF files physics_0090.nc to physics_0098.nc.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

[[table of contents](#) | [back to top](#)]

Supplemental Files

File

Data File Parameter List (as CSV)

filename: parameter_file_inventory.csv

(Comma Separated Values (.csv), 3.48 KB)
MD5:a3c9dadcd3aadd2c35d1c9a7042bcb52

Tabular csv file containing information about the parameters in each file.

The columns in this csv file data table are:

"Param_Name" = The name of the parameter within the data file (e.g. dye_04, temp)

"Description" = The description of the parameter (e.g. "Tracer for sediments", "Water potential temperature").

"Data_file" = The type of file the parameter is in (e.g. "passive_tracers_00xx.nc" which indicates all the passive tracer netCDF files).

"Units" = Units of the parameter (e.g. ppt, C)

File

Data File Parameter List (as XLSX)

filename: parameter_file_inventory.xlsx

(Microsoft Excel, 16.72 KB)
MD5:f0be92e8ca9e240a01ba1195dff0bcf9

Excel (xlsx) file containing information about the parameters in each file. For the same data in a non-proprietary file format, see the CSV version of this file.

The columns in this csv file data table are:

"Param_Name" = The name of the parameter within the data file (e.g. dye_04, temp)

"Description" = The description of the parameter (e.g. "Tracer for sediments", "Water potential temperature").

"Data_file" = The type of file the parameter is in (e.g. "passive_tracers_00xx.nc" which indicates all the passive tracer netCDF files).

"Units" = Units of the parameter (e.g. ppt, C)

Example passive tracer NetCDF file (0001)

filename: passive_tracers_0001.nc

(NetCDF, 9.26 GB)
MD5:27cdec2ab96bccb608f72a4666fcb151

This is the first of the 98 passive tracer netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in this file along with units for the parameters. The full complement of netcdf files are within tar.gz file bundles and can be found in the "Data Files" section.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

Example physics NetCDF file (0001)

filename: physics_0001.nc

(NetCDF, 8.68 GB)
MD5:02773d01dc8b22ccee8008b20e86e318

This is the first of the 98 physics netCDF files. See the "Data File Parameter List" in the "Supplemental Files" section for an explanation of what is in this file along with units for the parameters. The full complement of netcdf files are within tar.gz file bundles and can be found in the "Data Files" section.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data.

These files have "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

File Inventory Tree

filename: file_inventory_tree.txt

(Octet Stream, 9.49 KB)
MD5:6cea3fc4e806a3b95f77c9cf7577edea

File inventory in filetree format. Includes hierarchy of folders, folder sizes, and file sizes.

Data files with the "nc" extension are in the standard self-documented NetCDF format; see <https://www.unidata.ucar.edu/software/netcdf/> for more information.

The model data are divided into 98 files (suffix "0001" to "0098") each representing 30 days of data.

Data files with the "mat" extension are in the standard MATLAB format; see <https://www.mathworks.com/products/matlab.html> for more information.

[[table of contents](#) | [back to top](#)]

Related Publications

St-Laurent, P., Yager, P. L., Sherrell, R. M., Stammerjohn, S. E., & Dinniman, M. S. (2017). Pathways and supply

of dissolved iron in the Amundsen Sea (Antarctica). Journal of Geophysical Research: Oceans, 122(9), 7135–7162. doi:10.1002/2017jc013162 <https://doi.org/10.1002/2017JC013162>

Methods

WikiROMS (2016,Dec) Wiki ROMS: Tools. Accessed November 20th, 2020. Available from

<https://www.myroms.org/wiki/Tools>

Methods

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
dye_01	Tracer for glacial meltwater (data file name = passive_tracers_00xx.nc)	ppt
dye_02	Tra. for gl.meltw. with nudging in cavities (data file name = passive_tracers_00xx.nc)	ppt
dye_04	Tracer for sediments (data file name = passive_tracers_00xx.nc)	ppt
dye_05	Tra. for sed. with nudging in cavities (data file name = passive_tracers_00xx.nc)	ppt
dye_07	Tracer for Circumpolar Deep Water (CDW) (data file name = passive_tracers_00xx.nc)	ppt
dye_08	Tr. for CDW with nudging in cavities (data file name = passive_tracers_00xx.nc)	ppt
zeta	Sea surface height (data file name = physics_00xx.nc)	m
w	Water vertical velocity (data file name = physics_00xx.nc)	m/s
temp	Climatological temperature for relax. at OB (data file name = ocean_clm.nc)	C
salt	Climatological salinity for relaxation at OB (data file name = ocean_clm.nc)	PSU
Huon	Mean zonal water transport Dec. 2010 (data file name = cell_transport_dec2010.mat)	m ³ /s
Hvom	Mean merid. water transport Dec. 2010 (data file name = cell_transport_dec2010.mat)	m ³ /s
AKt	Vertical eddy diffusivity (data file name = physics_00xx.nc)	m ² /s
shflux	Net surface heat flux (data file name = physics_00xx.nc)	W/m ²
ssflux	Net surface evapo-precip. flux (data file name = physics_00xx.nc)	m/s
latent	Net latent heat flux (data file name = physics_00xx.nc)	W/m ²
sensible	Net sensible heat flux (data file name = physics_00xx.nc)	W/m ²
lwrad	Net longwave radiation flux (data file name = physics_00xx.nc)	W/m ²
swrad	Solar shortwave radiation flux (data file name = physics_00xx.nc)	W/m ²
uice	Zonal ice velocity (data file name = physics_00xx.nc)	m/s
vice	Meridional ice velocity (data file name = physics_00xx.nc)	m/s
aice	Monthly sea ice concentration (data file name = sea_ice_conc_july2010_june2011.mat)	unitless
hice	Sea ice thickness (data file name = physics_00xx.nc)	m
snow_thick	Snow thickness on ice (data file name = physics_00xx.nc)	m
iomflx	Ice-ocean mass flux (data file name = physics_00xx.nc)	m/s
bmel	Mean basal melt 2007-2008 (data file name = basal_melt_2007_2008.mat)	kg m ⁻² yr ⁻¹
thet	Mean temperature Dec. 2010 (data file name = salinity_temperature_dec2010.mat)	C
gmwc	Steady tracer for glacial meltwater (data file name = glacial_meltwater_dec2010.mat)	ppt
cdwc	Steady tracer for CDW with nudging (data file name = tracer_cdw_dec2010_with_nud.mat)	ppt
sedc	Steady tracer for sed. with nudging (data file name = tracer_sed_dec2010_with_nud.mat)	ppt

melt	Mean meltwater flux Jan.2006-2013 (data file name = melt_flux_sea_ice_ocean_interface.mat)	m
tser	Monthly meltwater flux over polynya (data file name = melt_flux_sea_ice_ocean_polynya.mat)	m
cdwi	Daily iron from CDW in upper 100m polynya (data file name = dissolved_iron_inventory_polynya.mat)	nM
gmwi	Daily iron from glacial ice upper 100m polynya (data file name = dissolved_iron_inventory_polynya.mat)	nM
sedi	Daily iron from sediments upper 100m polynya (data file name = dissolved_iron_inventory_polynya.mat)	nM
h	Model bathymetry (data file name = ocean_grd.nc)	m
zice	Ice shelf draft (data file name = ocean_grd.nc)	m
lon_rho	Longitude of model grid points (data file name = ocean_grd.nc)	Degrees
lat_rho	Latitude of model grid points (data file name = ocean_grd.nc)	Degrees
Uwind	Daily zonal winds at 10m height (data file name = ocean_frc.nc)	m/s
Vwind	Daily meridional winds at 10m height (data file name = ocean_frc.nc)	m/s
salt_*	Open Boundary (OB) condition for salinity [the * can be replaced with north;south;east;or west] (data file name = ocean_bry.nc)	PSU
temp_*	Open Boundary (OB) condition for temperature [the * can be replaced with north;south;east;or west] (data file name = ocean_bry.nc)	C
cdiw	Ice-water bulk drag coefficient (data file name = ice.in)	unitless
cdai	Air-ice bulk drag coefficient (data file name = ice.in)	unitless
TNU2	Harmonic horizontal diffusion of tracers (data file name = ocean_amundsen_sea.in)	m ² /s

[[table of contents](#) | [back to top](#)]

Project Information

Collaborative Research: Investigating the Role of Mesoscale Processes and Ice Dynamics in Carbon and Iron Fluxes in a Changing Amundsen Sea (INSPIRE) (INSPIRE)

Coverage: The study area is the continental shelf of the Amundsen Sea, Antarctica, 71-75S, 100-130W.

The Amundsen Sea, in the remote Pacific sector of the Southern Ocean, is one of the least well studied Antarctic continental shelf regions. It shares characteristics in common with other Antarctic ice shelf regions, but exhibits unique aspects also. The Amundsen Sea Polynya (ASP), an open region at the base of several of the terminal glaciers draining the West Antarctic Ice sheet exhibits: 1) large intrusions of heat delivered from the warming modified circumpolar deep water (mCDW) rising up onto the continental shelf, 2) the fastest melting ice sheets in Antarctica, 3) the most productive coastal polynya (161 g C m⁻²) together with a significant atmospheric CO₂ sink, and 4) some of the most rapidly declining regions of seasonal off-shore sea ice on Earth.

Following on from an earlier oceanographic field program, the Amundsen Sea Polynya International Research Expedition (ASPIRE; 2011), this study seeks to better synthesize and model the relative contributions of both physical ocean-ice linkages and biological production and carbon export terms and to compare these with other circumpolar Antarctic regions. A central feature will be the use of a regionally coupled physical-biogeochemical model to follow the dynamics of the large phytoplankton blooms that occur annually in the Amundsen Sea Polynya. This study will provide a means to locate the Amundsen Sea properties along the continuum of Antarctic ice shelf systems, and to understand how these system might change in response to climate change.

Pedagogical techniques will be used to provide educational outreach for three distinct target populations:

secondary students, pre-service science teachers, and in-service science teachers. Partnerships will be developed with science teacher educators to implement the STEM career-development lessons in undergraduate and graduate level science teacher education courses.

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1443657
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1443604
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1443315
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1443569

[[table of contents](#) | [back to top](#)]