

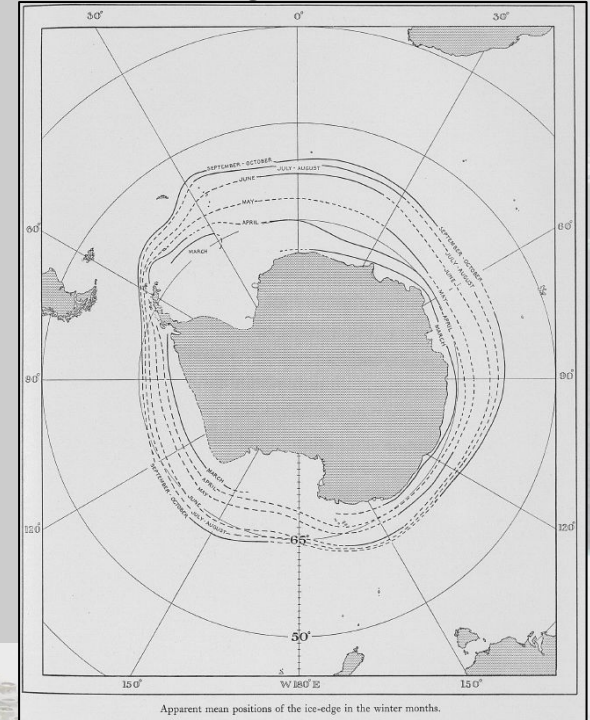
# Ship-based Sea Ice Observations in Antarctica

*Penelope Wagner*  
*Norwegian Ice Service*



# Historical Ice Extent Data

- Mackintosh and Herdman (1940) first compilation of sea ice edge and extent observations from ships based on whaling records
- Later updated with Mackintosh (1972)
- Coarse mean monthly ice edge position



Apparent mean positions of the ice-edge in the winter months.

(Mackintosh, N. A. & Herdman, H. F. P. 1940: *Distribution of the pack-ice in the Southern Ocean*. *Discovery Rep.* 19, 285–296.)

# Historical Ice Extent Data

Winter (March  
- Oct)

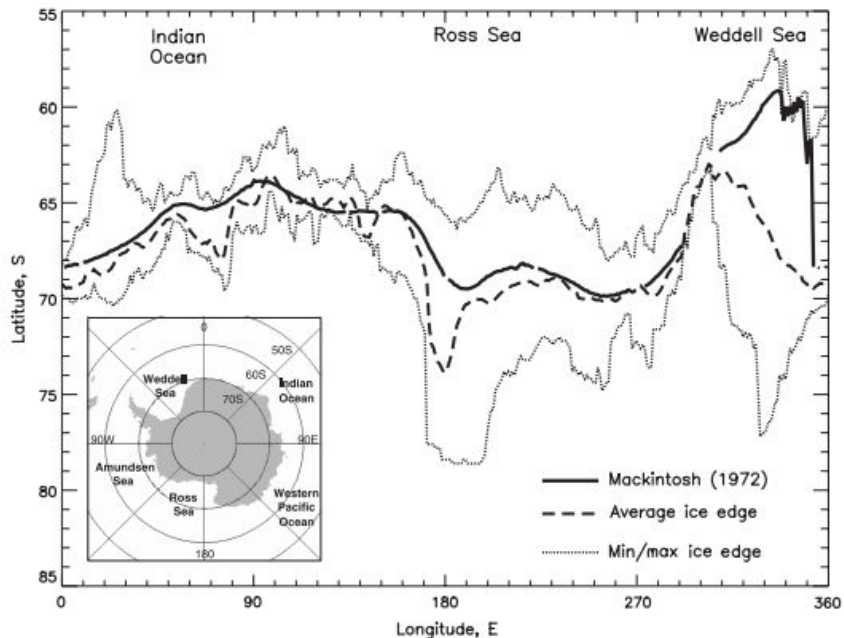
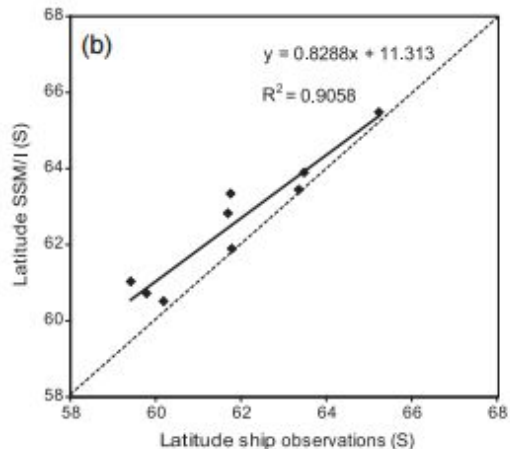
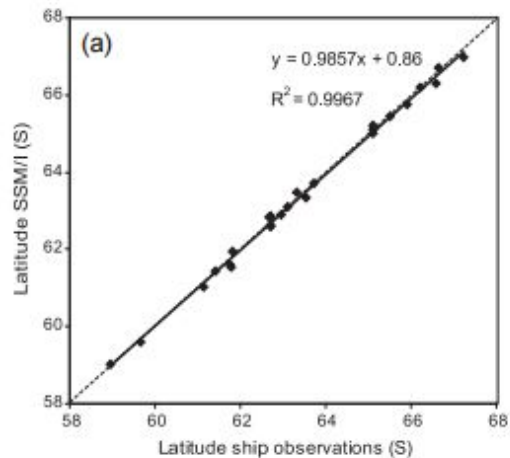


Fig. 2. Data digitized from the maps Mackintosh (1972) compiled from direct sea ice observations in the 1920s and 1930s, and mean, maximum and minimum sea ice extents for January (1979–1998) satellite passive microwave data.

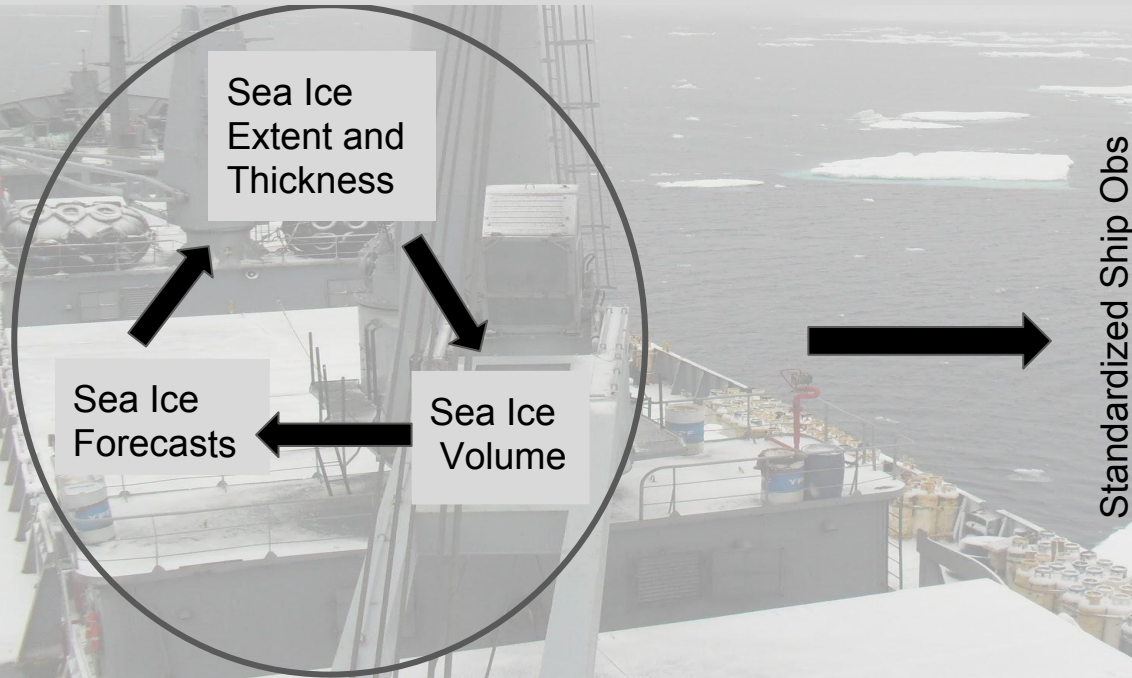
Summer (Nov  
- Dec)





# Importance of ship-based sea ice observations

- Historical records indicate extent and edge location but no sea ice thickness information is available



# Antarctic Sea Ice Processes and Climate (ASPeCt)

*The overall aim of ASPeCt is to understand and model the role of Antarctic sea ice in the coupled atmosphere-ice-ocean system by providing a collection of sea ice data recorded from systematic ship-based observations*

- Designed specifically for Antarctic sea ice conditions
- Established protocol to be followed when conducting ship-based observations
- Compatible with Windows, Mac OSX, and Linux
- Overview and training documents accessed at: <http://aspect.antarctica.gov.au/>
- Version 3 can be downloaded at: <http://aspect-distribution.fullandbydesign.com.au/>

For further information including access to the prototype version please contact **Petra Heil** ([Petra.Heil@utas.edu.au](mailto:Petra.Heil@utas.edu.au))



ANTARCTIC CLIMATE & ECOSYSTEMS  
COOPERATIVE RESEARCH CENTRE



# ASPeCt Background

- Developed to determine the distribution and thickness of different ice types within the pack ice
- Ice types and relevant sea ice codes from World Meteorological Organization (WMO) designations used for sea ice stage of development and ice form (1970)
- Include the ship's position, total ice concentration and an estimate of the areal coverage, thickness, floe size, topography, and snow cover characteristics of the three dominant ice thickness categories within a radius of approximately 1 km around the ship.

# ASPeCt Interface

ASPeCt Ice Observation Software

Cruises

Import

Documentation

Logged in as petrahell

Connected

## Ice Observation Cruises

**For Observations:** Click on a cruise title to see it in detail.

Start New Cruise

Cruise Name	Voyage Leader	Started	Ended	Sync Status	Actions
<a href="#">Ice Analysts Workshop</a>	Penelope Wagner	May 1 2016	Jul 10 2016	Synced	<a href="#">Archive</a>   <a href="#">Export</a>

## Archived Cruises

aad2014 [Unarchive](#)  
Sandra Test Cruise [Unarchive](#)  
SIPEX 2007 [Unarchive](#)  
SIPEX Complete [Unarchive](#)  
Imported Cruise [Unarchive](#)  
Imported Cruise [Unarchive](#)  
V2 2014/15 [Unarchive](#)  
Test Creation [Unarchive](#)  
sip [Unarchive](#)  
Standard Cruise [Unarchive](#)  
PIP [Unarchive](#)

### Create A Cruise

Click 'Create a Cruise' to make your first Observation set.

# Start New Cruise

## Voyage Details

Cruise Name:

Voyage Leader:

Captain:

Start Date:

Return Date:

Measurement Reference:

Create Cruise

## Observation Roster

UTC	Name	Contact
0	<input type="text"/>	<input type="text"/>
1	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>
11	<input type="text"/>	<input type="text"/>
12	<input type="text"/>	<input type="text"/>
13	<input type="text"/>	<input type="text"/>
14	<input type="text"/>	<input type="text"/>

## Creating a Cruise

Enter in all the base details for a Cruise. You may also establish an observation roster.





# Ice Analysts Workshop

VL: Penelope Wagner - Captain: Yukon Hughes

[Edit Cruise Details](#) - [Observations](#) - [Roster](#)

11 May - 14:35 UTC

Observer This Hour: None Rostered

## Observation Calendar

[Go to Today](#)

No observations loaded.

### Create A Cruise

Click 'Create a Cruise' to make your first Observation set.

02/08/2018

# Ice Analysts Workshop

VL: Penelope Wagner - Captain: Yukon Hughes

[Edit Cruise Details](#) - [Observations](#) - [Roster](#)

11 May - 14:36 UTC

Observer This Hour: None Rostered

May 11 2016

[Go to Calendar](#) [Previous Day](#) [Go to Today](#) [Next Day](#)

Position			Sea Ice Observations																										
Hr	Latitude	Longitude	Conc.	Primary Ice												Secondary Ice												Tertiary Ice	
[Z]	dd°mm'[N/S]	dd°mm'[E/W]	[tenths]	c	ty	z	f	t	s	sz	bi	mc	mz	ml1	ml2	c	ty	z	f	t	s	sz	bi	mc	mz	ml1	ml2	c	ty
0																~~ missed entry, click to back fill ~~													
1																~~ missed entry, click to back fill ~~													
2																~~ missed entry, click to back fill ~~													
3																~~ missed entry, click to back fill ~~													
4																~~ missed entry, click to back fill ~~													
5																~~ missed entry, click to back fill ~~													
6																~~ missed entry, click to back fill ~~													
7																~~ missed entry, click to back fill ~~													
8																~~ missed entry, click to back fill ~~													

Create A Cruise

Click 'Create a Cruise' to add your first Observation

## Create A Cruise

Click 'Create a Cruise' to make your first Observation set.

Position		Sea Ice Observations															Meteorological Observations					
Hr	Latitude	Longitude	Conc.	Ice							B Ice		Melt Ponds				Twater	Tair	Wind	Wind		
[Z]	dd°mm.sss'[S]	dd°mm.sss'[E/W]	[tenths]	c	ty	z [cm]	f	t	s	sz [cm]	smb	c [%]	mz [cm]	I1 [m]	I2 [m]	O/W	[°C]	[°C]	Speed [m/s]	Dir. [°]	Cl	
0	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

• This entry is not for the current time. Make sure you're only backfilling or correcting old entries.

Not enough data

## Create A Cruise

Click 'Create a Cruise' to make your first Observation set.

Position			Sea Ice Observations														Meteorological Observations					
Hr	Latitude	Longitude	Conc.	Ice							B Ice		Melt Ponds				Twater	Tair	Wind Speed	Wind Dir.	Clo	
[Z]	dd°mm.sss'[S]	dd°mm.sss'[E/W]	[tenths]	c	ty	z [cm]	f	t	s	sz [cm]	smb	c [%]	mz [cm]	l1 [m]	l2 [m]	O/W	[°C]	[°C]	[m/s]	[°]	[/k]	
0	<input type="text" value="65°55'"/>	<input type="text" value="S"/>	<input type="text" value="180°55'"/>	<input type="text" value="E"/>	<input type="text" value="9"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

- This entry is not for the current time. Make sure you're only backfilling or correcting old entries.

## Total Ice Concentration

Total visible concentration of ice, as tenths of the visible ocean. This is required.

[Save Obs.](#)

## Create A Cruise

Click 'Create a Cruise' to make your first Observation set.



Position			Sea Ice Observations														Meteorological Observations						
Hr	Latitude	Longitude	Conc.	Ice										B Ice		Melt Ponds			Twater	Tair	Wind Speed	Wind Dir.	C
[Z]	dd°mm.sss'[S]	dd°mm.sss'[E/W]	[tenths]	c	ty	z [cm]	f	t	s	sz [cm]	smb	c [%]	mz [cm]	l1 [m]	l2 [m]	O/W	[°C]	[°C]	[m/s]	[°]	[L]		
0	65°55'	S	180°55'	E	9	8																	

- This entry is not for the current time. Make sure you're only backfilling or correcting old entries.

## Ice Type

- 0 No Ice Type
- 10 Frazil
- 11 Shuga
- 12 Grease

[Save Obs.](#)

## Create A Cruise

Click 'Create a Cruise' to make your first Observation set.

Position			Sea Ice Observations														Meteorological Observations					
Hr	Latitude	Longitude	Conc.	Ice																		
[Z]	dd°mm.sss'[S]	dd°mm.sss'[E/W]	[tenths]	c	ty	z [cm]	f	t	s	sz [cm]	smb	c [%]	mz [cm]	l1 [m]	l2 [m]	O/W	Twater [°C]	Tair [°C]	Wind Speed [m/s]	Wind Dir. [°]	Cl	
0	65°55'	S 180°55'	E	9	8	30	20															

- This entry is not for the current time. Make sure you're only backfilling or correcting old entries.

## Floe Size

- 0 No Floe Size
- 100 Pancakes
- 200 New sheet ice
- 300 Brash/broken ice

Save Obs.

## Create A Cruise

Click 'Create a Cruise' to make your first Observation set.

# Ice Analysts Workshop

VL: Penelope Wagner - Captain: Yukon Hughes

[Edit Cruise Details](#) - [Observations](#) - [Roster](#)

## 11 May - 14:45 UTC

Observer This Hour: None Rostered

May 11 2016

[Go to Calendar](#)

[Previous Day](#)

[Go to Today](#)

[Next Day](#)

Position			Sea Ice Observations																									
Hr	Latitude	Longitude	Conc.	Primary Ice												Secondary Ice												Te
[Z]	dd°mm'[N/S]	dd°mm'[E/W]	[tenths]	c	ty	z	f	t	s	sz	bi	mc	mz	ml1	ml2	c	ty	z	f	t	s	sz	bi	mc	mz	ml1	ml2	c
X 0	65°55.000'S	180°55.000'E	9	8	30	20																						
1																												
2																												
3																												
4																												
5																												
6																												
7																												

Create A Cr

Click 'Create a Cr

first Observation s

### Create A Cruise

Click 'Create a Cruise' to make your first Observation set.

# Ice Observation Cruises

**For Observations:** Click on a cruise to view details and add observations.

Cruise Name	Status	Actions
<a href="#">Ice Analysts Workshop</a>	<span></span>	<a href="#">Archive</a>   <a href="#">Export</a>

Start New Cruise

## Archived Cruises

- Sandra Test Cruise [Unarchive](#)
- SIPEX 2007 [Unarchive](#)
- aad2014 [Unarchive](#)
- SIPEX Complete [Unarchive](#)
- Imported Cruise [Unarchive](#)
- Imported Cruise [Unarchive](#)
- V2 2014/15 [Unarchive](#)
- Test Creation [Unarchive](#)
- sip [Unarchive](#)
- Standard Cruise [Unarchive](#)
- PIP [Unarchive](#)

Create A Cruise

Click 'Create a Cruise' to make your first Observation set.



# Arctic Shipborne Sea Ice Standardization Tool (ASSIST)

ASSIST and the Ice Watch campaign debuted in summer 2012 where Ice Watch is coordinating the collection and archival of visual sea ice observations recorded on ships in the Arctic, and can also be collected in the Southern Hemisphere.

- Observations recorded with ASSIST for the Antarctic will be sent to the Australian Antarctic Division database for ASPeCt observations.
- Near real-time observations of ice concentration, ice type, and distribution of multi-year ice
- Compatible with Windows, Mac OSX, and Linux
- Overview, software and training docs accessed at: <https://sites.google.com/a/alaska.edu/ice-watch/>



For further information including access to the prototype version please contact :

**Jenny Hutchings** ([jhutchings@coas.oregonstate.edu](mailto:jhutchings@coas.oregonstate.edu))



# Welcome to the Arctic Shipborne Sea Ice Standardization Tool

[Start Observation](#)

## Export without photos

Use this when sending data from ship

[All Observations](#)[Selected Observations](#)

## Export with photos

It is recommended to not export with photos until returning to port and sufficient bandwidth is available.

[All Observations](#)[Selected Observations](#)

## View Cruise as

[CSV](#)[JSON](#)

























## Import

[From CSV](#)

## Cruise

[Edit](#)

## Polar Star Operation Deep Freeze 2015-16: 2015-12-30 00:00:00 UTC - 2016-02-20 00:00:00 UTC

All / None	Observation Date	Last Modified	Total Ice Concentration	Primary Observer	Additional Observers		
<input type="checkbox"/>	2016-01-02 01:41:00 UTC	2016-01-02 01:53:24 UTC	0	Christopher Readinger	Pablo		
<input type="checkbox"/>	2016-01-03 20:00:00 UTC	2016-01-05 02:01:36 UTC	4	Christopher Readinger			
<input type="checkbox"/>	2016-01-03 21:00:00 UTC	2016-01-05 02:01:53 UTC	4	Christopher Readinger			
<input type="checkbox"/>	2016-01-03 22:00:00 UTC	2016-01-05 02:01:07 UTC	4	Christopher Readinger			
<input type="checkbox"/>	2016-01-03 23:00:00 UTC	2016-01-05 02:13:20 UTC	4	Christopher Readinger			
<input type="checkbox"/>	2016-01-04 06:00:00 UTC	2016-01-08 20:56:32 UTC	1	Christopher Readinger			
<input type="checkbox"/>	2016-01-04 07:00:00 UTC	2016-01-08 21:01:23 UTC	3	Christopher Readinger			
<input type="checkbox"/>	2016-01-04 08:00:00 UTC	2016-01-08 21:05:30 UTC	2	Christopher Readinger			
<input type="checkbox"/>	2016-01-04 09:00:00 UTC	2016-01-08 21:09:03 UTC	1	Christopher Readinger			
<input type="checkbox"/>	2016-01-04 10:00:00 UTC	2016-01-08 21:12:33 UTC	1	Christopher Readinger			
<input type="checkbox"/>	2016-01-04 11:00:00 UTC	2016-01-08 21:17:32 UTC	1	Christopher Readinger			
<input type="checkbox"/>	2016-01-04 22:00:00 UTC	2016-01-08 21:21:06 UTC	2	Christopher Readinger			



Add Comment

Observation

Ship

Fauna

Notes

Heading (degrees)

135

Power

Not specified

Speed (nearest knot)

7

Ship Activity

10 :: Travelling in leads

General

Ice

Meteorology

Photos

Comments

Save

Save and Exit

Exit without Saving



02/03/2015

[Add Comment](#)
[General](#)
[Ice](#)
[Meteorology](#)
[Photos](#)
[Comments](#)
[Save](#)
[Save and Exit](#)
[Exit without Saving](#)
[Observation](#)
[Ship](#)
[Fauna](#)
[Notes](#)
**Primary Observer**

**Additional Observers**


Separate observers with ","

**Observation Date and Time (current computer time)**


YYYY-mm-dd HH:MM

**Latitude**


DMS: 68 46 12

**Longitude**


DMS: 172 27 24

02/03/2015



Add Comment

General

Ice

Meteorology

Photos

Comments

Save

Save and Exit

Exit without Saving

## Total Concentration (tenths)

3

## Open Water

No Observation

Ice

Snow

Topography

Melt

Other

## Primary

## Partial Concentration (tenths)

3

Total Concentration: 3/10

## Ice Type

70 :: First year 70-120cm

30 :: Pancakes

40 :: Young Grey Ice 10-15cm

50 :: Young Grey-White Ice 15-30cm

60 :: First year &lt; 70cm

70 :: First year 70-120cm

75 :: Second year

80 :: First year &gt; 120cm

85 :: Multivear

## Secondary

## Partial Concentration (tenths)

No Observation

Total Concentration: 3/10

## Ice Type

No Observation

## Thickness (cm)

## Floe Size

No Observation

## Tertiary

## Partial Concentration (tenths)

No Observation

Total Concentration: 3/10

## Ice Type

No Observation

## Thickness (cm)

## Floe Size

No Observation

Add Comment

General

Ice

Meteorology

Photos

Comments

Save

Save and Exit

Exit without Saving

Meteorology

Visibility (m-km)

96 :: 4-10km

Wind Speed (nearest knot)

25

Air Temperature (nearest degree C)

Relative Humidity (nearest %)

Weather

26 :: Showers of snow, or of rain and snow

20 :: Drizzle not freezing or snow grains

21 :: Rain not freezing or snow grains

22 :: Snow not freezing or snow grains

23 :: Rain and snow or ice pellets

24 :: Drizzle or rain, freezing

25 :: Showers of rain

26 :: Showers of snow, or of rain and snow

Cloud

Total Cloud Cover (eighths)

8

C)

02/03/2015

Add Comment



DSC\_0241.JPG

Taken From

forward

Delete



DSC\_0248.JPG

Taken From

Not Specified

Delete

Add Additional Photo

General

Ice

Meteorology

Photos

Comments

Save

Save and Exit

Exit without Saving

02/03/2015



Welcome to the  
Arctic Shipborne Sea Ice Standardization Tool

Start Observation

Export without photos

Use this when sending data from ship

All Observations

Selected Observations

Export with photos

It is recommended to not export with photos until returning to port and sufficient bandwidth is available.

All Observations

Selected Observations

View Cruise as

CSV

JSON

Import

From CSV

Cruise

Edit

Delete

All Observations

Polar Star Operation Deep Freeze 2015-16: 2015-12-30 00:00:00 UTC - 2016-02-20 00:00:00 UTC

All / None	Observation Date	Last Modified	Total Ice Concentration	Primary Observer	Additional Observers
<input checked="" type="checkbox"/>	2016-01-02 01:41:00 UTC	2016-01-02 01:53:24 UTC	0	Christopher Readinger	Pablo
<input type="checkbox"/>	2016-01-03 20:00:00 UTC	2016-01-05 02:01:36 UTC	4	Christopher Readinger	
<input type="checkbox"/>	2016-01-03 21:00:00 UTC	2016-01-05 02:01:53 UTC	4	Christopher Readinger	
<input type="checkbox"/>	2016-01-03 22:00:00 UTC	2016-01-05 02:01:07 UTC	4	Christopher Readinger	
<input type="checkbox"/>	2016-01-03 23:00:00 UTC	2016-01-05 02:13:20 UTC	4	C	
<input type="checkbox"/>	2016-01-04 06:00:00 UTC	2016-01-08 20:56:32 UTC	1	C	
<input type="checkbox"/>	2016-01-04 07:00:00 UTC	2016-01-08 21:01:23 UTC	3	C	
<input type="checkbox"/>	2016-01-04 08:00:00 UTC	2016-01-08 21:05:30 UTC	2	C	
<input type="checkbox"/>	2016-01-04 09:00:00 UTC	2016-01-08 21:09:03 UTC	1	C	
<input type="checkbox"/>	2016-01-04 10:00:00 UTC	2016-01-08 21:12:33 UTC	1	C	
<input type="checkbox"/>	2016-01-04 11:00:00 UTC	2016-01-08 21:17:32 UTC	1	C	
<input type="checkbox"/>	2016-01-04 22:00:00 UTC	2016-01-08 21:21:06 UTC	2	C	

Export with photos

It is recommended to not export with photos until returning to port and sufficient bandwidth is available.

All Observations

Selected Observations

# Differences with ASPeCt and ASSIST

## ASSIST:

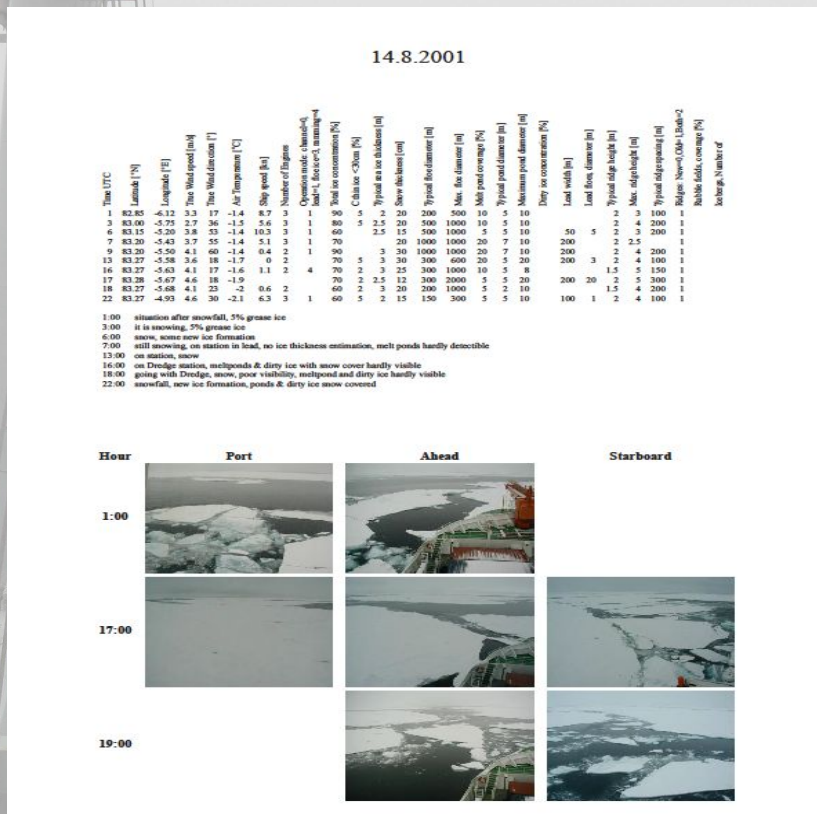
- a)** Additional fields in ASSIST to characterize ice conditions more typically found in the Arctic include:
  - *sediment and algae in ice*
  - *fauna additional ice types*
  - *meteorological fields*
- b)** ASSIST is SIGRID-3 compatible

## ASPeCt:

- a)** Has a longer record, particularly in the Antarctic
- b)** Includes large post-processing module to extract long-term or regional averages for level or ridged/deformed ice and ice volume in ridges etc etc.



# Automation to connect ship-based obs with Icecam



Haas, C. and Lieser, J. L. (2003): Sea ice conditions in the transpolar drift in August/September 2001 : observations during POLARSTERN cruise ARKTIS XVII/2 ,Berichte zur Polar- und Meeresforschung (Reports on Polar and Marine Research), Bremerhaven, Alfred Wegener Institute for Polar and Marine Research, 441 , 123 p.

# Questions and Discussion

- 1) Preferred ship-based observation protocol?
- 2) Similar input format but problematic to have several databases?
- 3) Central location needed for all ship observations
- 4) Need to get ship-based obs from all ships including logistic vessels (base resupply), tourist, research...etc.

02/03/2015