Eurofleets 2

New operational steps towards an alliance of European research fleets

Flagship Initiative for Polar Access NA2

WP3: Report on the feasibility of year round, regular research operations in ice-covered areas

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EUROFLEETS2 WP3, BARCELONA 20th 21st January 2015

D.3.2. Report on the feasibility of year round, regular research operations in ice-covered areas: Objectives

Related to :

Task 3.1

Determination on the available capacities for PRV´s acces and Scientific Demand (Completed M16). Summary & Conclusion

Task 3.2

Determination of the scientific demand for PRV´s

Summary & Conclusions of D 3.1

Status and foreseeable evolution of the European and International Polar Research Fleets & equipment

Compilation of PRV´s

- **Characteristics of Full Range Icebreakers (Artic & Antarctic)**
  Ship Capabilities

- **Characteristics of Ice Classified Vessels (Artic & Antarctic)**
  Ship Capabilities

- **Access to PRV´s**
- **New technological & equipment requirements from the science community, Challenges and Possibilities**
- **Actions:** ***Presented at GA2-Rome, Report, Eurocean, COMNAP***

Compilation Characteristics of Full Range Icebreakers

	Ship Name	Picture	Country	Length	Built year	Operator	Ice Class	Operating area		Underwater Vehicles supporting	Heli deck/ han	Heli	Supply to station	Major Refit
Full range Icebreakers	**Agulhas II,**		Souht Africa	134	2012	SANAP	PC5	Antarctic		no	yes/yes	2	yes	
	Akademik Federov		Russia	141	1987	AARI	KM * ULA [2]A2	Antarctic	Arctic	Saab Seaeye Falcon 300 m	yes/yes	2	yes	
	Akademik Tryoshnikov		Russia	134	2011	AARI	PC4-PC5	Antarctic	Arctic	no	yes/yes	2	yes	
	Almirante Irizar		Argentina	121	1978	Argentina Navy	1m thick	Antarctic		no	yes/yes	2	yes	underway
	Amundsen		Canada	98	1979	CCG	100 A3		Arctic	ROV SuperMohawk	yes/yes	1	yes	2003
	Araon		South Korea	110	2009	KOPRI	PC5	Antarctic	Arctic	yes	yes/yes	1	yes	
	Aurora Australis		Australia	95	1989	P & O / ADD	A1	Antarctic		no	yes/yes	2	yes	2013
	Healy		USA	128	1997	USACGC	PC3 ?	Antarctic	Arctic	yes (AUVS)	yes/yes	1	eventually	
	Louis S. St-Laurent		Canada	120	1969	CCG	A4		Arctic	yes (AUVS)	yes/yes	2	yes	decommisi soned 2017
	Nathaniel B. Palmer		USA	94	1992	USAP	A2	Antarctic		no	yes/yes	2	yes	
	Oden		Sweden	108	1988	SMA	DNV-Polar 20		Arctic	no	yes/yes	1	yes	
	Polarstern		Germany	118	1982	AWI	100 A5	Antarctic	Arctic	ROV till 6000 m	yes/yes	2	yes	2002
	Shirase II		Japan	138	2008	Ministry of Defence & JARE	PC5	Antarctic		no ?	yes/yes	3	yes	
	Xue Long		China	167	1993	CAA	CCS B1	Antarctic	Artic	Artic class AUVS	yes/yes	2	yes	2013

Ship Capabilities of Full Range Icebreakers

Full range icebreakers	Ship Name	Dimensions			People		Labs		Cargo		A-Frames	Cranes	Winches (Scientific, Others)	Moon-pool	Broad-band	DP
		Length	Draft	GRT	Crew	Scientifics+ Technicians	Area Wetlab (m2)	Area Drylab (m2)	Capacity Dry Cargo Area (m3)	Capacity cargo container (nº)	No. Capacity	Crane	No/Type/length (m)		yes	DPS1
	Agulhas II,	134	7,7	12897	45	100	8 fix labs; 6 Lab Cont - 800 m2		4000	40 TEU	2)	35 T, 3 of 10 T	CTD/6000/	Open		DPS1
	Akademic Federov	141	8,5	12660	80	160			8595					yes ?		
	Akademik Tryoshnikov	134	8,5	12711	60	80										
	Almirante Irizar	121	9,5	14899	135	45			1800							
	Amundsen	98	7,2	5911	30/40	43				190	7 TEU	2)		5	yes	yes	DPS1
	Araon	110	9,9	6970	25	60	yes	yes	15 TEU		31 TEU	2)	25T;10T; 3T	2		yes	DPS2
	Aurora Australis	95	7,8	6574	24	116		8 fix Labs	1700		18 TEU	0	3 Cra.; 25/321; 7/13 & 2 T	2) Oceanograhic/6000		yes	no
	Healy	128	8,9	16000	12+63	50	36	14,2	567			2) Aft & starboard		3) 2-Ocean/ Elect-mec 10000 (3/8"); 12000 (0,332"); 14000(1/4")	no		
	Louis S. St-Laurent	120	9,9	11345	42	57	80	100 ?	8 TEU			3)	1-12 T; 2-8 T		yes		
	Nathaniel B. Palmer	94	6,8	6900	27	39					20 TEU	3) 20 T	1-2T, 1 -10T, 1-23T	Mech./Coax./Cond. EM: 10000;10000;10000	yes		
	Oden	108	7-8,5	9438	23	50	92		4000		12 TEU	2) Aft 20 T		CTD/6000	yes		
	Polarstern	118	11,2	12640	29	55	177	182	8 TEU		54 TEU	1)	1-15T; 1-25T	11		yes	DPS1
	Shirase II	138	7,35	4028	179	80											
	Xue Long	167	9	14997	34	128	500					1)					

Full range icebreakers	Ship Name	Acoustics		Geophysics		Coring			Seismic			Sampling			Water column			
		Multibeam	Parametric	Grav.	Magne.	Gravity	Piston	Multi	Navigation	Streamer	Air Guns	Nets	Multinets	Dredge	CTD	Radiom.	LADCP	ADCP
	Agulhas II,	no	no	no	no	yes	yes		no	no	no				yes			
	Akademic Federov																	
	Akademik Tryoshnikov	EM3020																
	Almirante Irizar																	
	Amundsen	EM302		yes				yes	no	no	no	yes	yes	yes	yes	yes		yes
	Araon	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	Aurora Australis	yes	no	no	no	no	no	no	no	no	no	yes			yes		yes	yes
	Healy	EM122	chirp, 3,5 kHz	yes		yes	yes	yes							yes	yes		yes
	Louis S. St-Laurent	no	no	no	no				yes	yes	yes				yes			
	Nathaniel B. Palmer	EM120	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	Oden	EM122	SBP120		no	yes	yes	yes	yes	yes	yes	yes			yes			
	Polarstern	Hydrosweep DS II	Parasound DS III	KSS31		yes	yes	yes	no	yes	yes	yes	yes	yes	yes		yes	yes
	Shirase II																	
	Xue Long					yes ?	yes ?								yes			yes

Access to Polar Research Vessels

Access to research vessels,

Icebreakers or ice classed ships is relatively well regulated in most countries.

Most national R & D programs have regular marine research project calls providing access to large marine infrastructures.

The application follows in most countries similar procedure of quality control and peer review.

However, for a research group to gain access to an entire vessel belonging to a different country is only possible under very special circumstances further elaborated upon below.

EUROFLEETS-ACCESS TO RV´S

73 funded days of ship time on 8 Global/Ocean class RV´s

127 days of ship time on 14 Regional class Rv´s

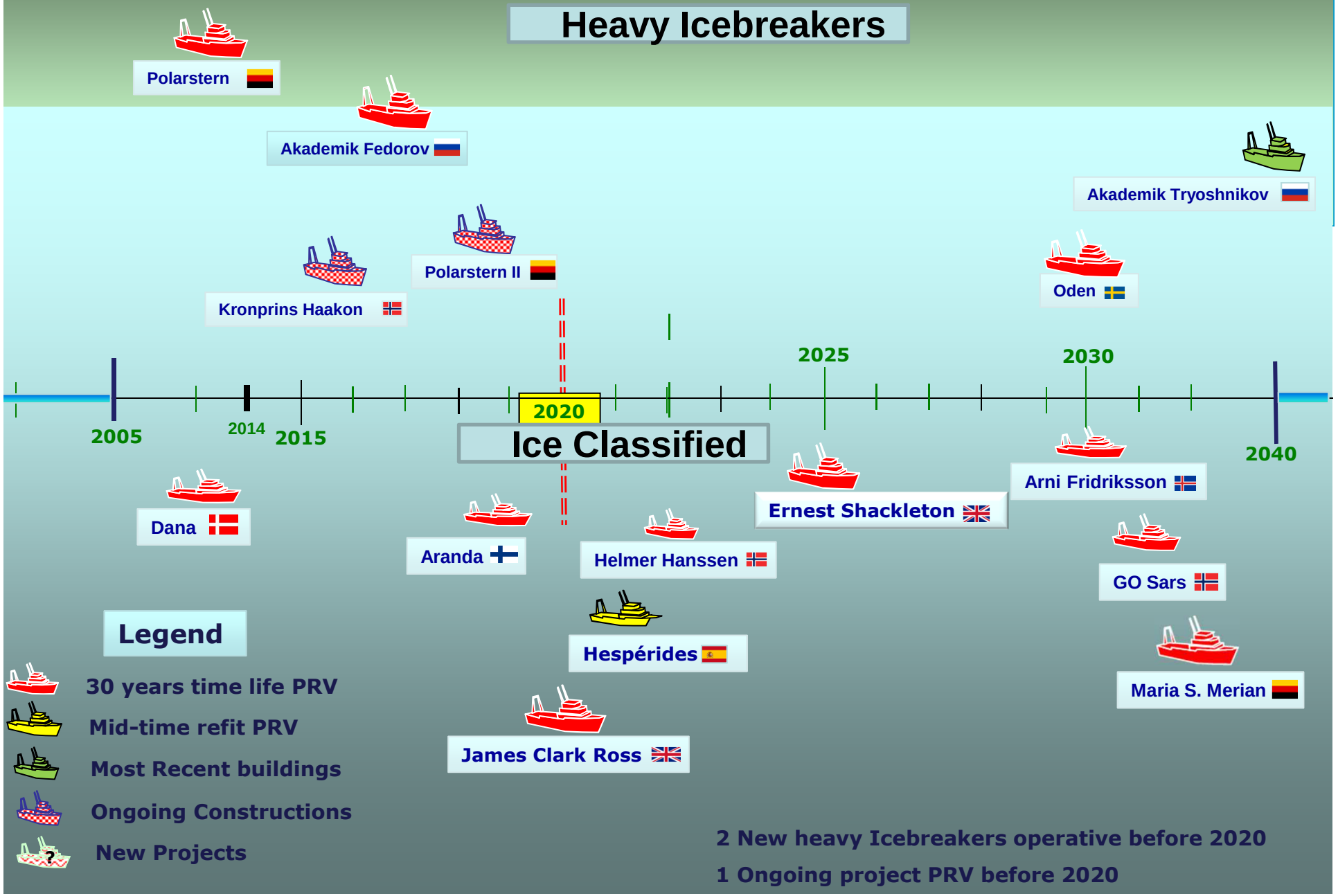
Including large equipment such as ROVs and submersibles.

EUROFLEETS2 provides for the first time 104 funded days of marine equipment-time to carry out ship-based research activities within any field of marine science.

Opportunities exists through EUROFLEETS project

: http://www.eurofleets.eu/np4/57

Polar Research Vessels Perspective at Horizon 2020



New requirements from the science community regarding equipment and capabilities aboard PRVs

Fundamentals of hull design

Multifunctional, with modular components easily interchanged → Capacity to **operate in winter ice** with pressure ridges and multi-year ice. → Centerline **moon pool** to facilitate sampling under extreme conditions and to deploy submarine vehicles (AUV´s, ROV, etc.) → An optimized **hull design for noise** reduction level (ringing, reverberation, acoustic blocking, etc.) as well as for transit in open water (being in heavy seas, resistance, energy efficiency etc.).

Fundamentals of Scientific Equipment

Powerful and versatile winch and crane arrangements are key elements → **Remote sensing instruments** based on laser and microwave technologies (suggested by ARVOC, USA) → Unmanned aerial drones for use in the atmosphere, sea ice, and studies of glacier ice remote areas → **Acoustic** are crucial to both physical and biological marine research. These include MB sonars mapping, SBP, ACDP, fisheries acoustics, and acoustic underwater positioning and navigation systems

D 3.2 Report on the feasibility of year round, regular research operations in ice-covered areas

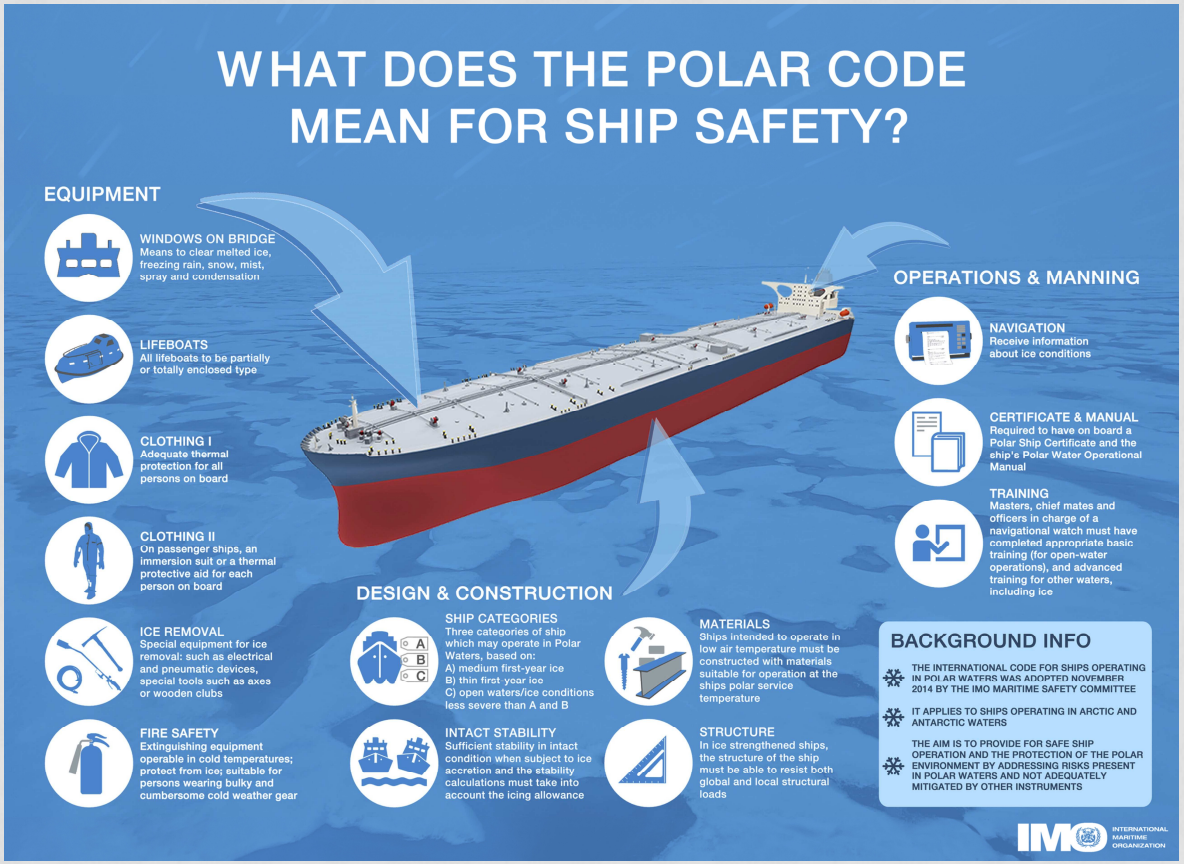
TOPICS TO DISCUSS

- PRV´S Operations within the last 5 years
- Areas of Research
- Ice Type/ PRV´s
- Season (winter, summer)
- Ship´s Technical Capabilities

POLAR CLASS	GENERAL DESCRIPTION
PC 1	Year-round operation in all Polar waters
PC 2	Year-round operation in moderate multi-year ice conditions
PC 3	Year-round operation in second-year ice which may include multi-year ice inclusions
PC 4	Year-round operation in thick first-year ice which may include old ice inclusions
PC 5	Year-round operation in medium first-year ice which may include old ice inclusions
PC 6	Summer/autumn operation in medium first-year ice which may include old ice inclusions
PC 7	Summer/autumn operation in thin first-year ice which may include old ice inclusions

D 3.2 Report on the feasibility of year round, regular research operations in ice-covered areas

Adopted by IMO in november 2014



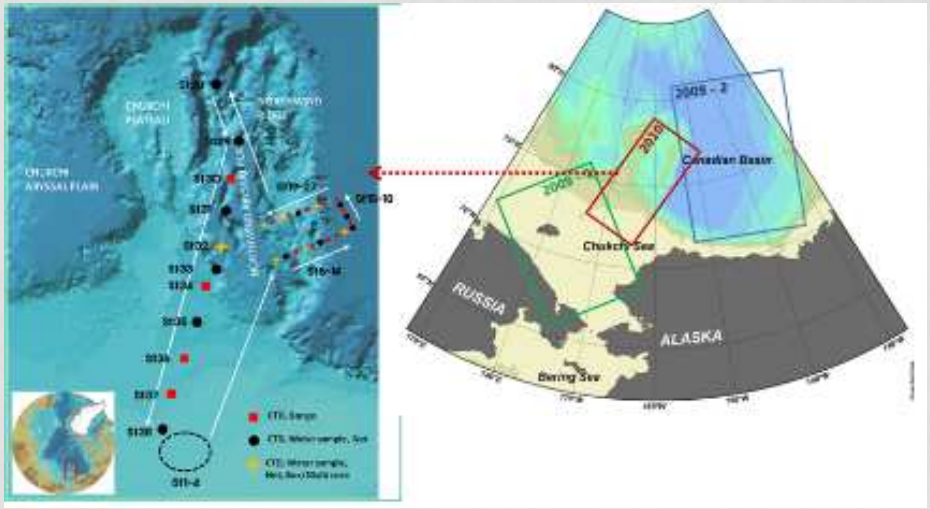
EUROFLEETS2 WP3, BARCELONA 20th 21st January 2015

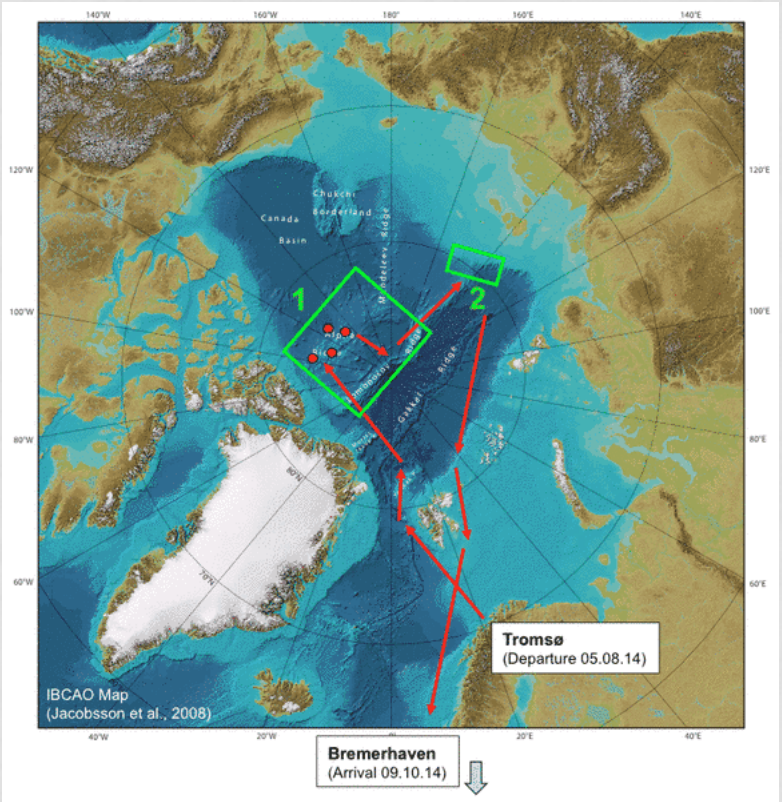
Icebreakers & Ice Classified RV´s for research Polar Regions

D 3.2 **Overview of the Polar Research Operations in the last 5 years**

COUNTRY	R/V	Area of study						
			2009	2010	2011	2012	2013	2014
RUSIA	Akademik Federov							
	Akademik Tryoshnikov							
GERMANY http://eumetrain.org/polarstern/archive.html	Polarstern		Antarctic	Antarctic	Antarctic	Antarctic	Antarctic	Artic
			Arctic	Arctic	Arctic	Arctic	Antarctic (Winter)	Antarctic
SWEDEN http://polar.se/en/expedition/swerus-c3/	Oden		Arctic	Arctic	Arctic	Arctic	Arctic	Arctic
			Antarctic	Antarctic				
USA http://www.rvdata.us/catalog	Healy		Arctic	Arctic	Arctic	Arctic	Arctic	Arctic
	Nathaniel B. Palmer		Antarctic	Antarctic	Antarctic	Antarctic	Antarctic	Antarctic
CANADA http://www.rvdata.us/catalog/Healy	Louis S. St-Laurent							
	Amundsen							
SOUTH KOREA	Araon			Antarctic	Antarctic	Antarctic	Antarctic	
				Arctic	Arctic	Arctic	Arctic	
CHINA	Xue Long							

D 3.2 About the cruises and research





D 3.2 About the type ice-covered areas ARCTIC

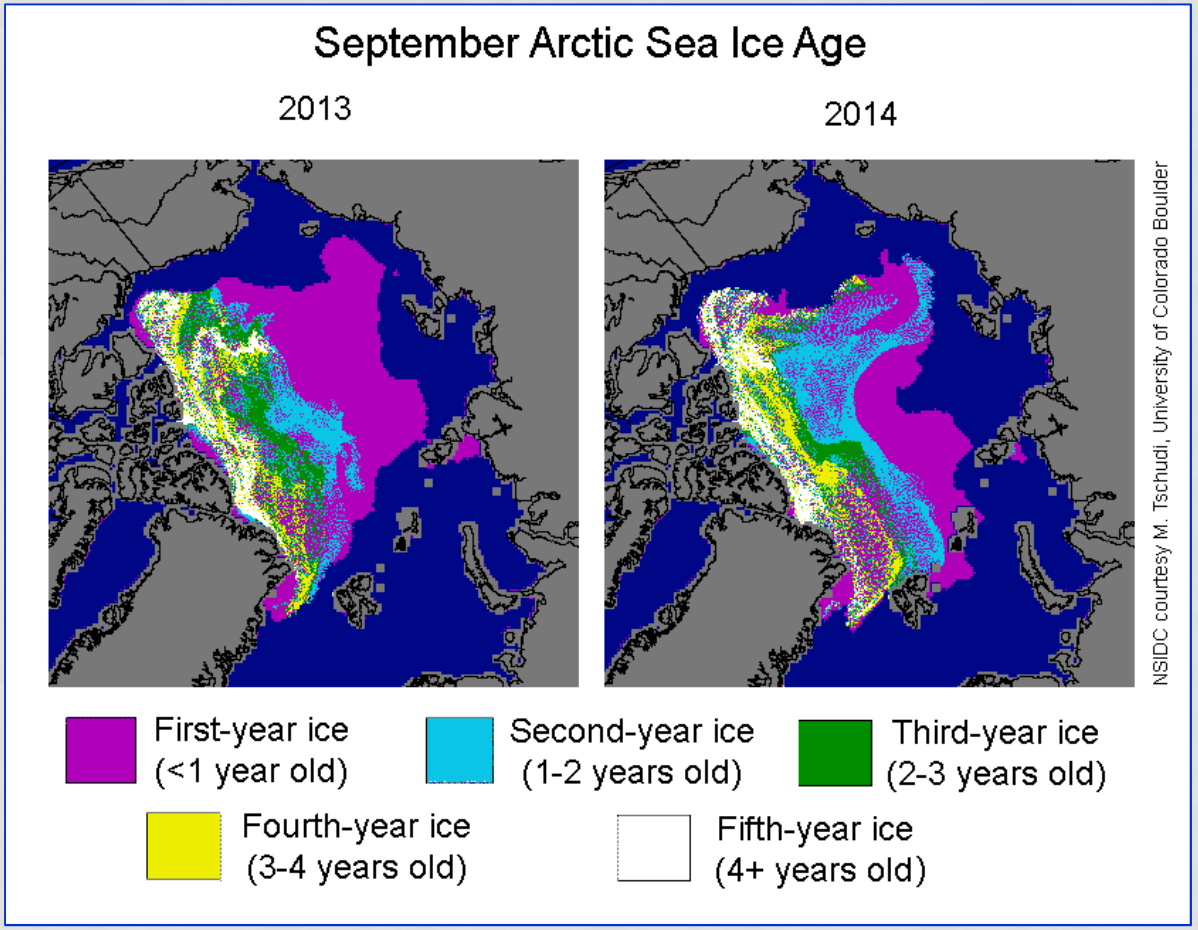
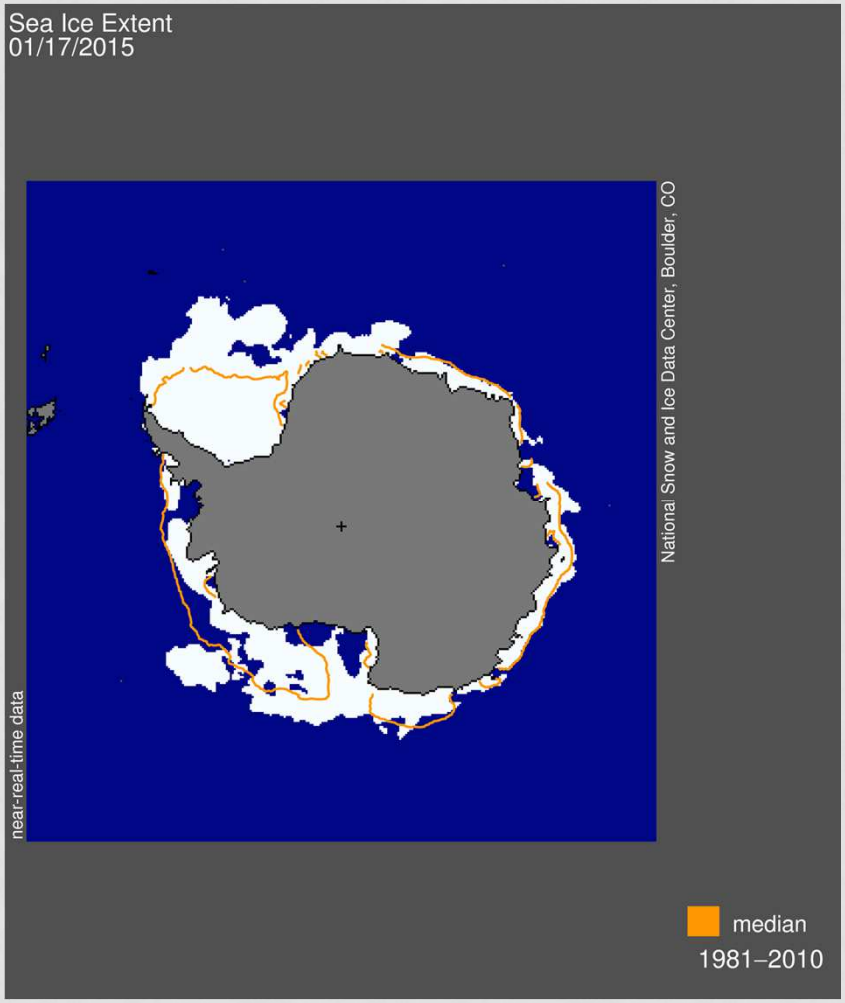
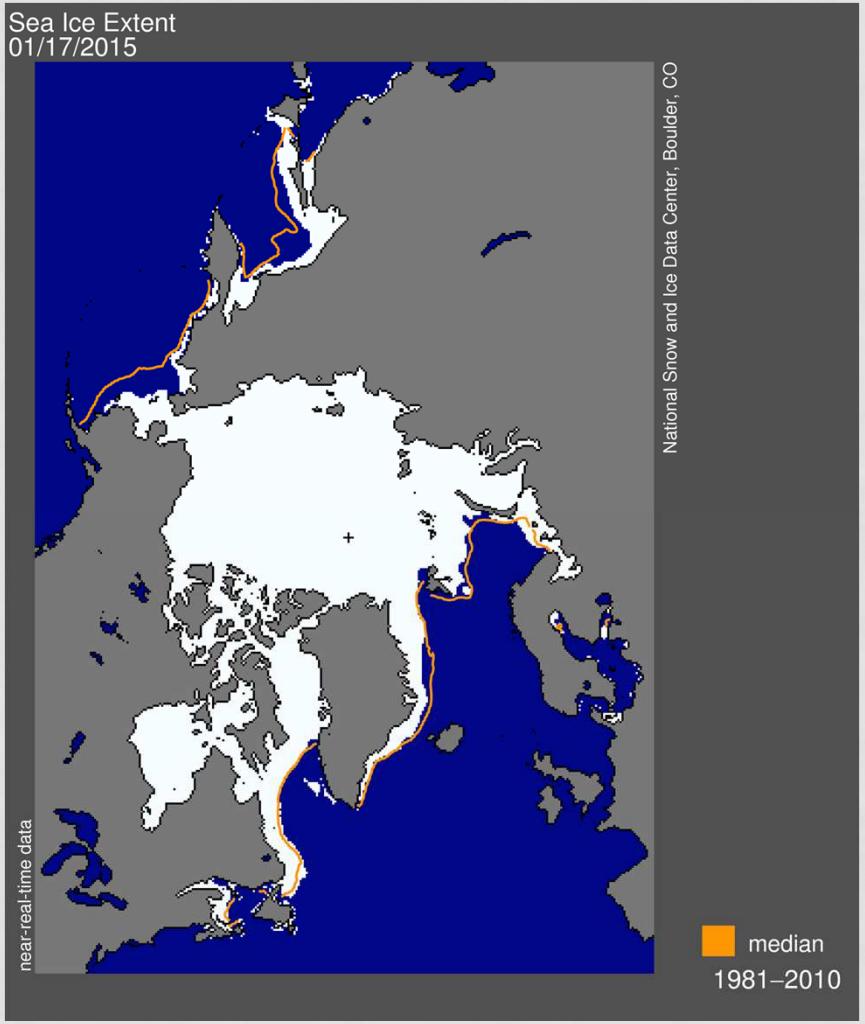
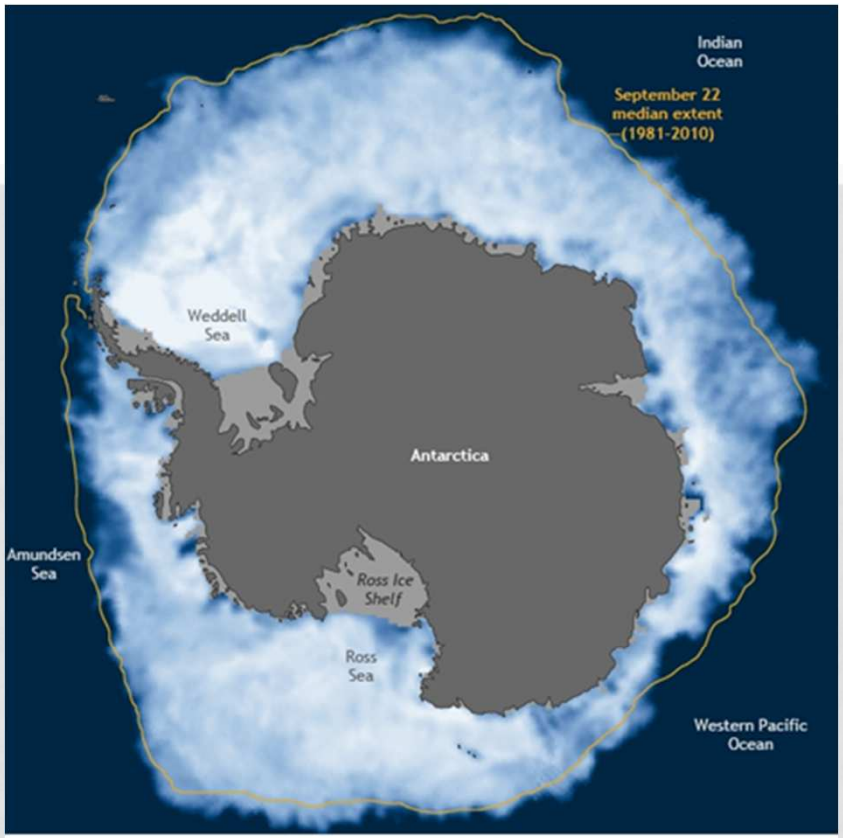


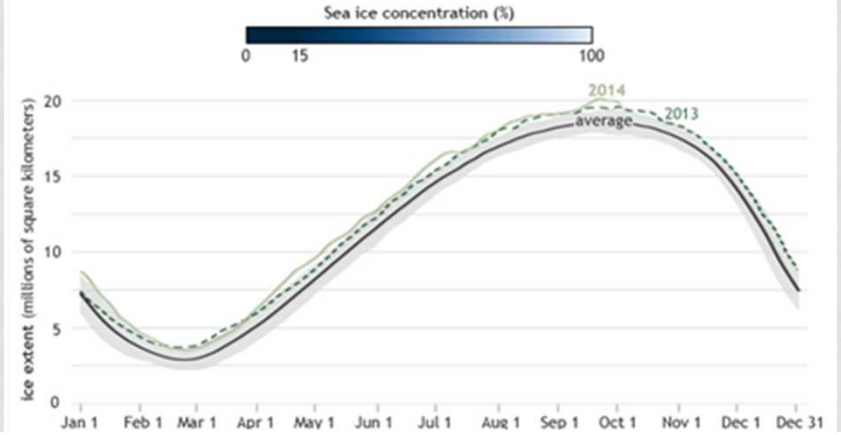
Figure. These images show the ages of ice in the Arctic at the end of September 2013 and 2014. Credit: NSIDC courtesy M. Tschudi, University of Colorado

D 3.2 SEA ICE EXTENT FOR BOTH POLES






Indian Ocean
September 22 median extent (1981-2010)
Weddell Sea
Antarctica
Amundsen Sea
Ross Ice Shelf
Ross Sea
Western Pacific Ocean


Sea ice concentration (%)
0
15
100
2014
2013
average
Ice extent (millions of square kilometers)
20
15
10
5
0
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Dec 31

D 3.2 Ship´s Technical Capabilities and availability

ESTA INFORMACION SALE DE LA COMPILACION REALIZADA EN DELIVERY 3.1