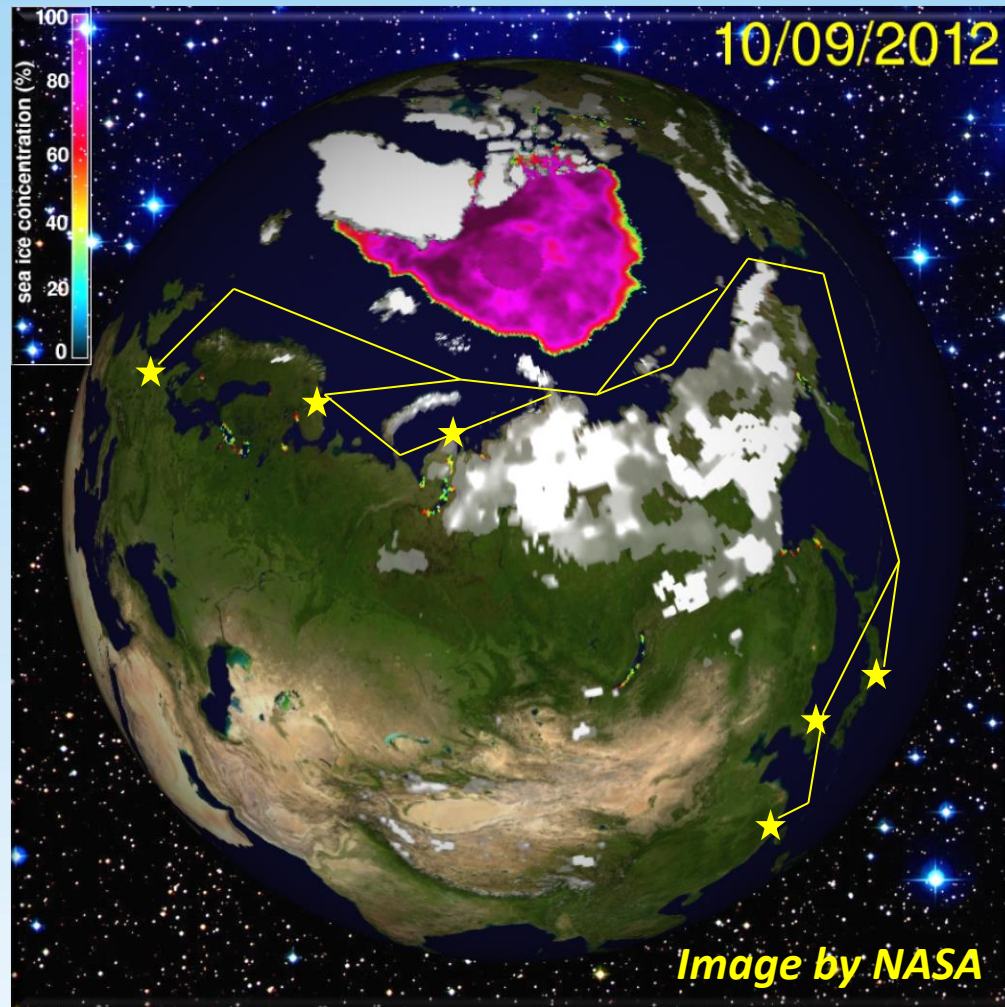


ROSATOMFLOT



**The Navigation on the Northern Sea Route
Today & in the Future**

Northern Sea Route is the highway to European and Asian markets

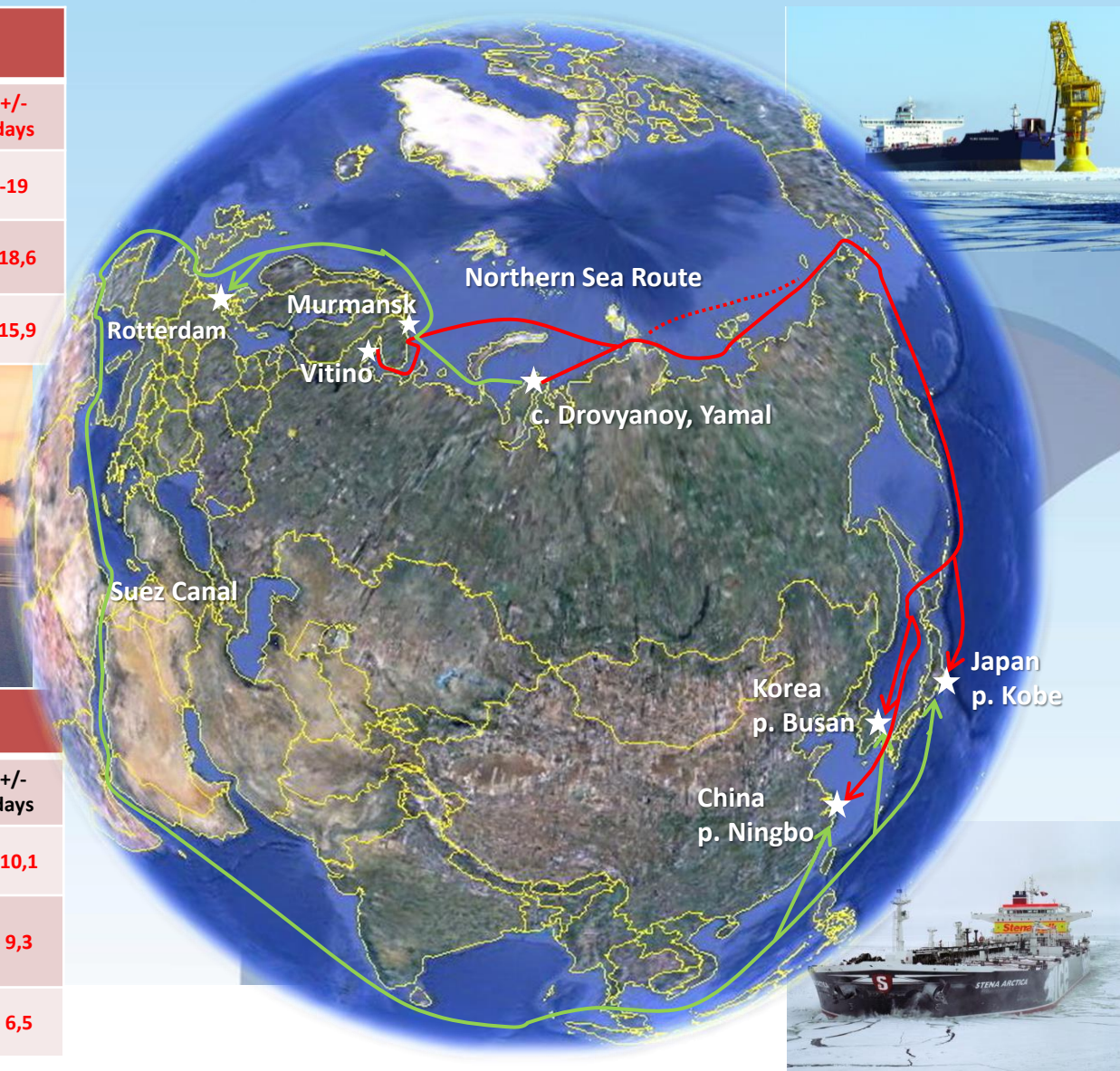
Oil and Gas from Murmansk

State	through Suez Canal		through NSR		+/- days
Japan (p. Kobe)	12291 miles	37,1 days	6010 miles	18,1 days	-19
Korea (p. Busan)	12266 miles	37 days	6097 miles	18,4 days	-18,6
China (p. Ningbo)	11848 miles	35,8 days	6577 miles	19,9 days	-15,9



From Rotterdam to the Asian markets

State	through Suez Canal		through NSR		+/- days
Japan (p. Kobe)	10969 miles	33,1 days	7610 miles	23 days	- 10,1
Korea (p. Busan)	10754 miles	32,5 days	7697 miles	23,2 days	- 9,3
China (p. Ningbo)	10336 miles	31,2 days	8177 miles	24,7 days	- 6,5





**First Commercial Transit Voyage of a non-Russian flag vessel via
the Northern Sea Route
mv Beluga Fraternity & mv Beluga Foresight in 2009
Saved more than 3000 miles and 10 days compared to the Suez Canal**



1. 21.08.2009 – left p. Vladivostok, Russia
2. 31.08.2009 – meeting with ib 50 Let Pobedy
3. 03.09.2009 – ib Russia joined the convoy
4. 07-11.2009 – offshore discharging in Noviy Port / port of Yamburg
5. 16.09.2009 – exit from the NSR in the West

Transit Voyages 2010



SCF Baltica:

NSR period: 16.08 – 27.08.2010

(10,5 days)

Tanker deadweight: 117000 tons

Cargo: 70000 tons of gas condensate



Nordic Barents:

NSR period: 8 days

Bulker deadweight: 43372 tons

Cargo: 41000 tons of iron concentrate

4 transit voyages were done in 2010
Total amount of transit cargo: 111 000 tons
In ballast: 2 voyages

The Latest Transit via NSR

December 16-25, 2010



The voyage by Swedish supply icebreaker Tor Viking II piloted by atomic icebreaker Rossiya was done a month after the official completion of summer-to-autumn navigation on the NSR. This successful transit voyage done in late December proved that it is possible to increase the period of Arctic navigation on the NSR in winter months.

Pilotage of mt Perseverance on the NSR in 2011



Eastbound Voyage:

Tanker deadweight: 75000 tons

Cargo: 61000 tons gas condensate

NSR navigation period: 30.06 – 15.07.2011

(14,9 days)

Average speed: **7,6 knots**

Return Voyage:

Tanker deadweight: 75000 tons

Cargo: 64000 tons jet fuel

NSR navigation period: 09.09 – 16.09.2011

(8 days)

Average speed: **13,7 knots**

Pilotage of mt Vladimir Tikhonov on the NSR

The Largest Vessel that Transited NSR



Tanker deadweight: 160 000 tons (Suezmax)

Cargo: 120 000 tons gas condensate of JSC NOVATEK

NSR navigation period: 23.08 – 30.08.2011

Average speed: 14,0 knots

Pilotage of mv Sanko Odyssey on the NSR

The First Panamax Bulk Carrier that Transited NSR



Bulker deadweight: 75 000 tons (Panamax)
Cargo: 66 500 tons of iron ore by JSC EUROCHEM
NSR navigation period: 03.09.2011 – 10.09.2011
Average speed: - 13,7 knots

LNG Ob River in Transit via NSR

LNG Ob River

Ice Class 1A (Arc 4)

Displacement 116 325 t

Cargo Capacity: 149 755 cmb

Flag: Marshall Islands



Ballast:

Westbound 08-16.10.2012

Laden:

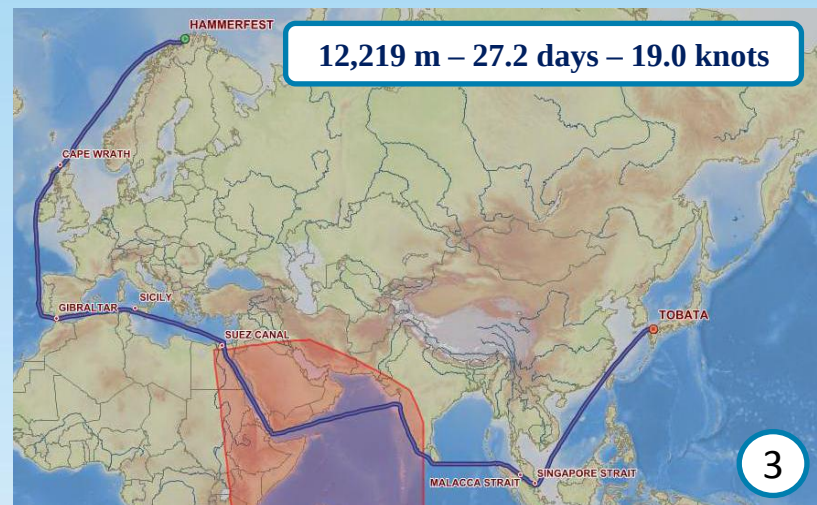
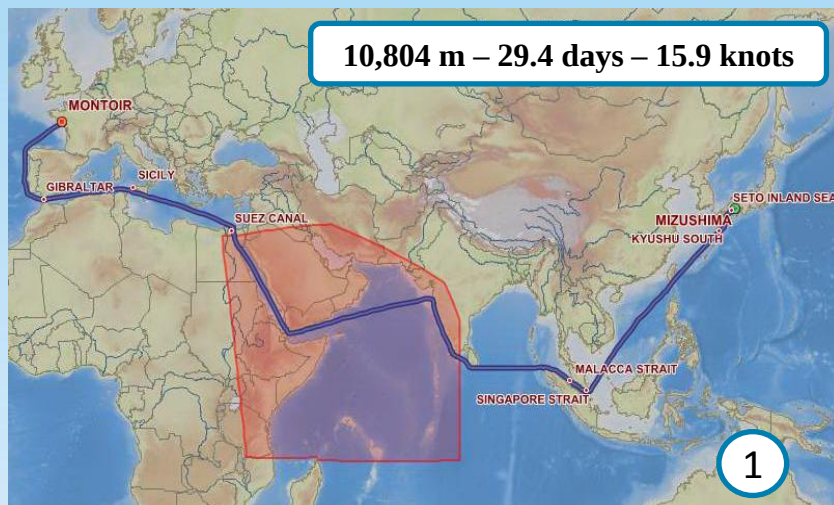
Eastbound 09-18.11.2012

134 738 cbm LNG

Charts of transits via the Suez Canal and the Northern Sea Route

Ballast voyages Mizushima - Montoir

via Suez Canal

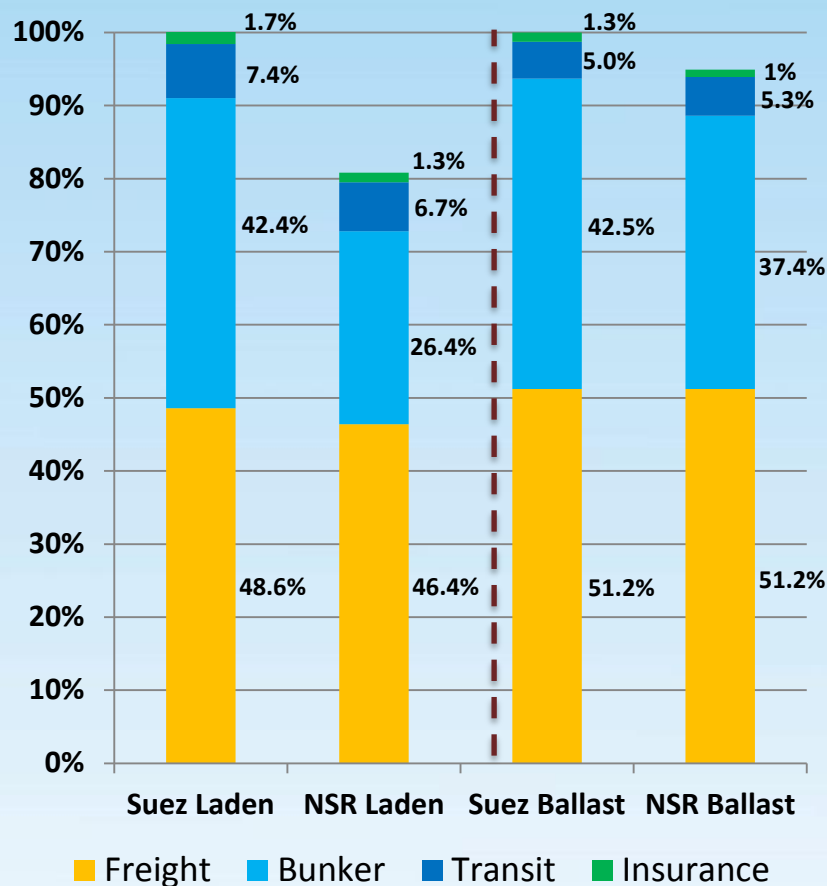


via NSR

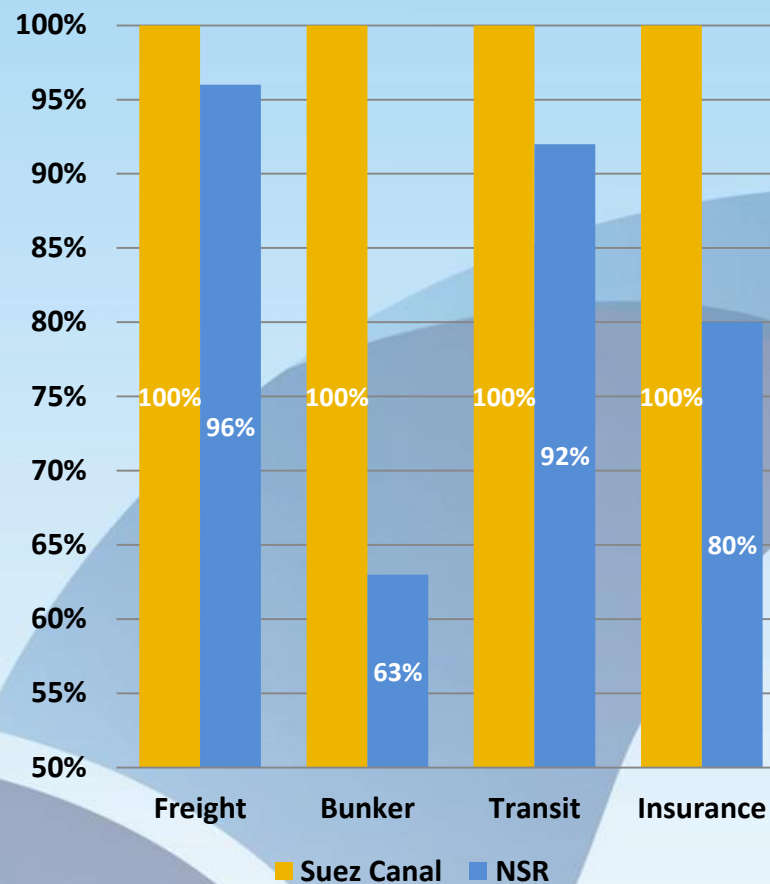


This slide is provided by Gazprom Marketing & Trading

Comparative Analysis of Cost Efficiency for NSR and Suez Canal Transit



Cost Efficiency of LNG tanker “Ob River” laden voyage via NSR



This slide is provided by Gazprom Marketing & Trading

Estimated Economic Efficiency for LNG tanker voyage via the Northern Sea Route

Hammerfest -Tobata	Suez	NSR	Difference
Distance	12100 m	6100 m	50%
Time (maximum speed)*	26 days	17 days	35%
Time (optimal speed)**	39 days	21 days	54%

Fuel Consumption	Cost Efficiency***
Maximum Speed*	53%
Optimal Speed****	55%

Remarks:

* For the purpose of evaluation the average speed of 19.5 knots was used, except for the voyage via NSR (2450 m), where the average speed was 12 knots.

** For the purpose of evaluation the average speed of 19.5 knots was used, except for the voyage via NSR (2450 m), where the average speed was 12 knots.

*** Estimated economic efficiency for the transit via NSR compared to the transit via Suez Canal

**** For the purpose of Suez Canal transit evaluation maximum speed of 19,5 knots was used. For the purpose of NSR transit th optimal speed of 13 knots was used.

This slide is provided by Gazprom Marketing & Trading

NSR Caravan Piloting

July 2012



**Mv Nordic Odyssey, ttb Vengeri, mt Marilee, mv Kapitan Danilkin
ice-piloted by ib Yamal and Vaygach July 12 – 22, 2012**

NSR Caravan Piloting July 2013 Eastbound



Mt Two Million Ways with 61 000 tons of gas condensate is the part of the caravan piloted by ib Vaygach and Taimyr

Pilot Voyages 2013



Mv Yong Sheng:



NSR period: 26.08 – 03.09.2013

(7,5 days)

Deadweight: 16651 tons

Cargo: general cargo & equipment

Owner: COSCO Shipping



Stena Polaris:



NSR period: **leaves Ust-Luga 17.09.13**

Tanker deadweight: 75 000 tons

Cargo: naphtha from Ust-Luga

Owner: Stena Shipping

Sponsored: Ministry of Ocean & Fisheries
of the Republic of Korea

Charterer: Hyundai Glovis Co

Icebreaking pilotage of Northern Navy Fleet ships headed by heavy atomic missile cruiser Petr Velikiy



**September 08-10, 2013 through Vilkitskiy Strait eastbound
Ships have NO ice class**

Total of Transit Voyages in 2010-2013

	2010	2011	2012	2013*
Total Volume of Transit Cargo, t	111 000	820 789	1 261 545	489 653*
Total Number of Transit Voyages	4 (2 of them in ballast)	34 (10 of them in ballast)	46 (13 of them in ballast)	31* (11 of them in ballast)

NSR Transit 2012 Cargo

Cargo Type	Number of Vessels	Volume, t	Displacement, t	Cargo Volume Eastbound, t	Cargo Volume Westbound
Liquid	26	894 079		661 326	232 753
Bulk	6	359 201		262 263	96 938
Frozen Fish	1	8 265			8 265
Ballast	6		472 075		
Repositioning	7		78 351		
Total:	46	1 261 545	550 426	923 589	337 956



* As per September 17, 2013

The Gulf of Finland



2011

i/b Vaygach

Freight period: 19.02 – 16.04.2011

Total vessels piloted: 258

2012

i/b 50 Let Pobedy 27.01 – 09.03.2012

i/b Rossiya 09.03 – 18.04.2012

Total vessels piloted: 332

2013

i/b Rossiya

Frigh period 16.01 – 15.04.2013

Total vessels piloted: 355

White Sea (Vitino Port Operations)



What's next?



I. Cargo base for the Northern Sea Route



West-East	East-West
LNG(p. Sabetta, Hammerfest) Iron Ore (Murmansk, Narvik) Crude Oil (Primorsk) Gas condensate (Ust-Luga, p. Vitino)	Coal (Prince Rupert, Vancouver) Fish (Petropavlovsk-Kamchatsky, Hokkaido) Light oil products (Busan, Inchon) Seasonal container cargoes (Busan, Hokkaido)
Total: 15 mln. transit tons per year + 15 mln. LNG from p. Sabetta + 10 mln. tons of oil from Noviy Port	

Yamal LNG

Port Sabetta Construction Site





Suez Canal Characteristics:

Length – 193,30 km

Bypasses Length – 80,5 km

Width at 11m draught – 205/225 m

Water Depth – 24 m

Max Draught – 20,12 m (66 feet)

Max Deadweight – 240 000 t

Suez Canal Cargo Traffic in 2011-2012

	2011	2012	
Net Tonnage, mln. tons	928,9	928,5	↓
Total Cargo transited, mln. tons	691,8	739,9	↑
Total Number of Vessels	17799	17225	↓
Average Number of Vessels/Day	48,8	47,2	↓

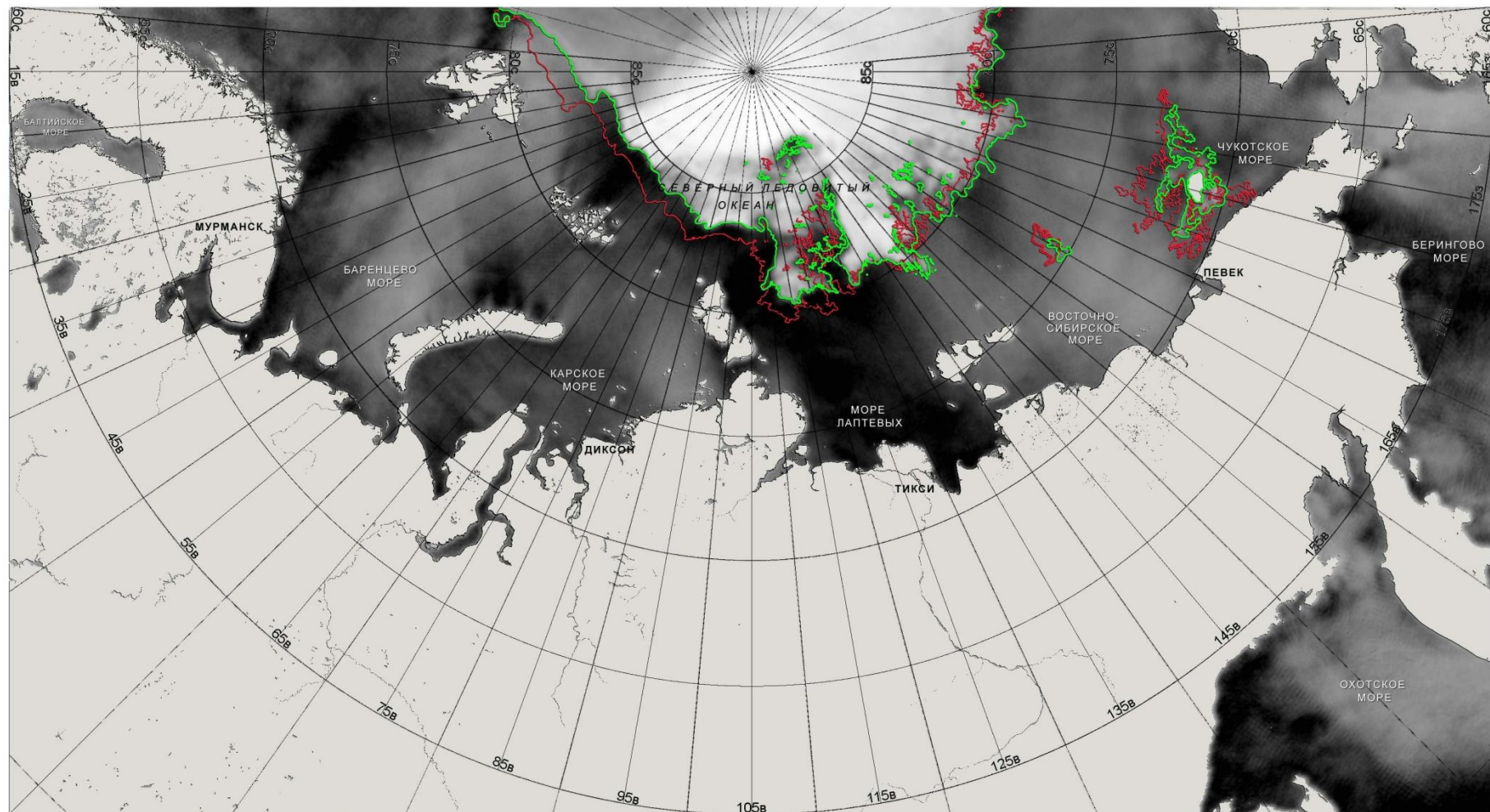
Export-Import of North-West Europe Ports through the Suez Canal, mln. tons in 2012

Export	Import	
85,487	123,518	
Including:		
Type of Cargo	Export	Import
Oil Products	5,286	29,658
LNG	-	12,480
Coal	-	-
Metal & Iron Ore	2,808	-
Other	77,570	74,094

II. Ice Conditions in the Russian Arctic

Satellite Image of Ice Conditions in the Russian sector of Arctic dd. 18.09.2012

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ГИДРОМЕТЕОРОЛОГИИ И МОНИТОРИНГУ ОКРУЖАЮЩЕЙ СРЕДЫ
ФГБУ "НАУЧНО-ИССЛЕДОВАТЕЛЬСКИЙ ЦЕНТР КОСМИЧЕСКОЙ ГИДРОМЕТЕОРОЛОГИИ "ПЛАНЕТА"



Радиолокационное изображение ледовой обстановки в российском секторе Арктики

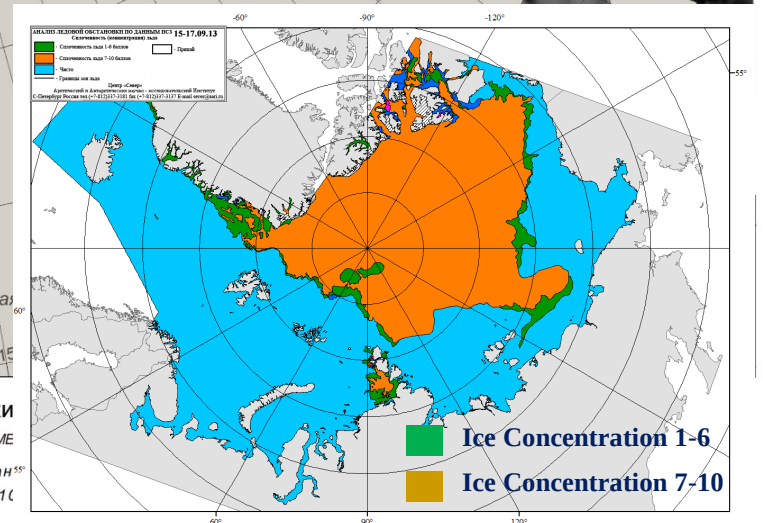
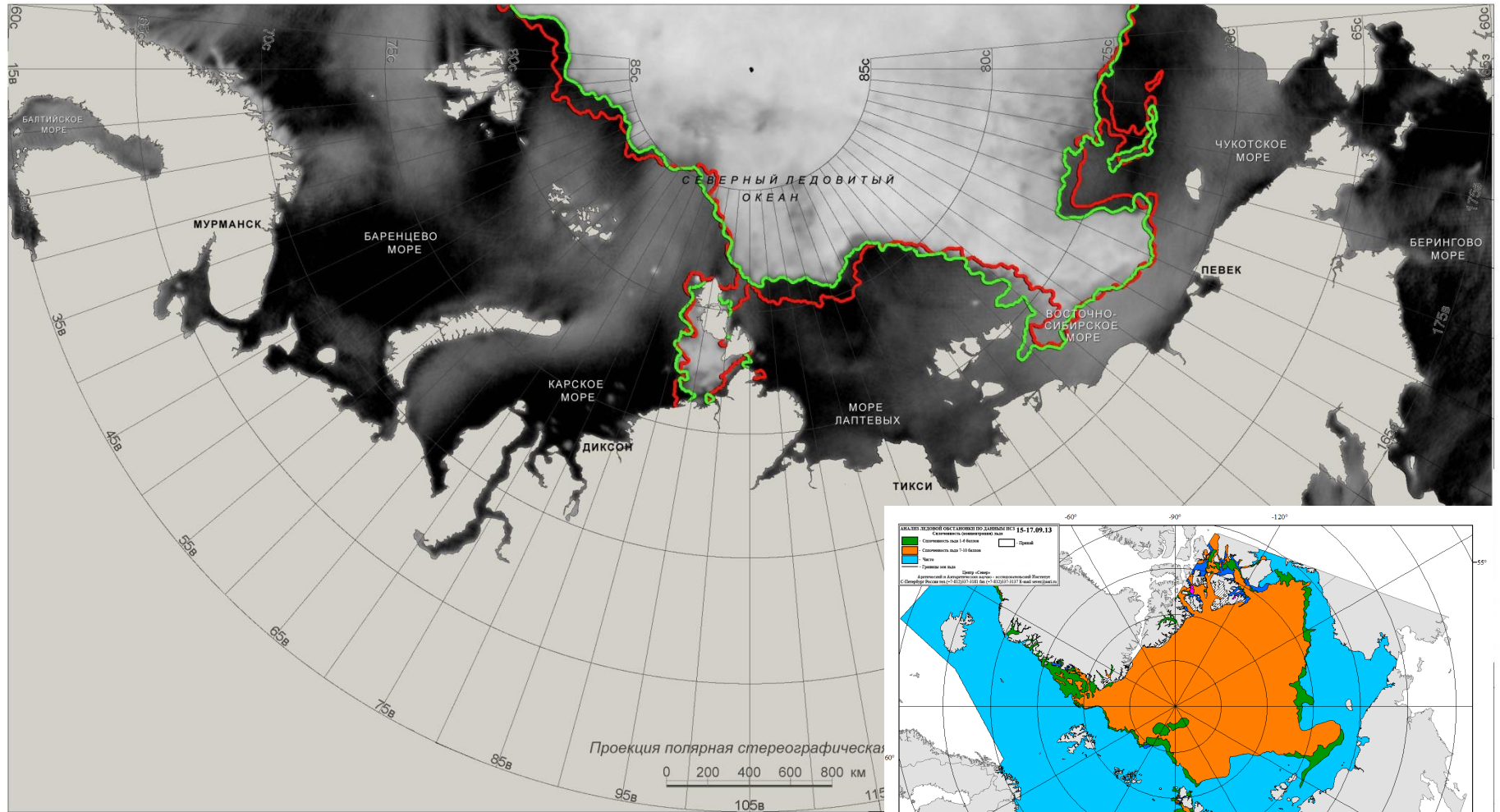
Составлена по данным ИСЗ Oceanisat-2/OSCAT, AQUA/MODIS, NOAA/AVHRR, DMSP/SSM/I © EUMETSAT OSI SAF, © NOAA-NESDIS-STAR, 17.09 - 18.09 2012

- положение кромки дрейфующего льда (сплоченностью 1-10 баллов) на 17.09 - 18.09.2012
- положение кромки дрейфующего льда (сплоченностью 1-10 баллов) на 09.09 - 11.09.2012

Ice Conditions in the Russian Arctic

Satellite Image of Ice Conditions in the Russian sector of Arctic dd. 17.09.2013

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО ГИДРОМЕТЕОРОЛОГИИ И МОНИТОРИНГУ ОКРУЖАЮЩЕЙ СРЕДЫ
ФГБУ "НАУЧНО-ИССЛЕДОВАТЕЛЬСКИЙ ЦЕНТР КОСМИЧЕСКОЙ ГИДРОМЕТЕОРОЛОГИИ "ПЛАНЕТА"



Радиолокационное изображение ледовой обстановки

Составлено по данным ИСЗ: Oceansat, MetOP/ASCAT, AQUA/MODIS, NOAA/AVHRR, © EUMETSAT

— положение кромки дрейфующего льда "осеннего образования"
— положение кромки дрейфующего льда (сплоченностью 1-10)

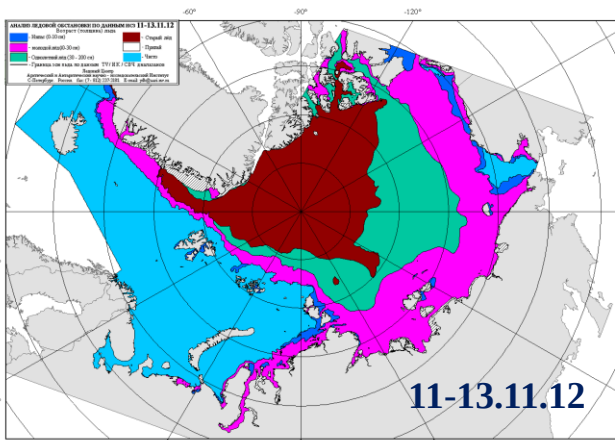
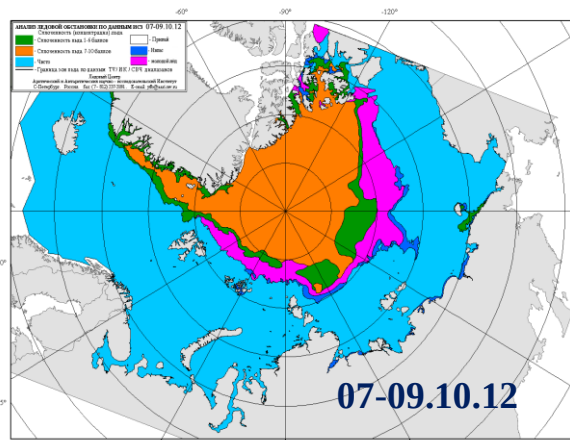
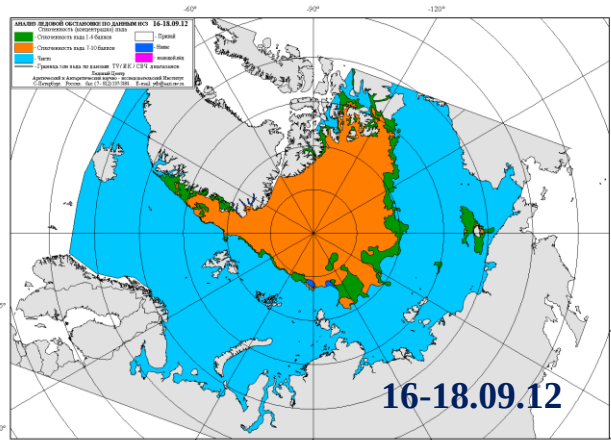
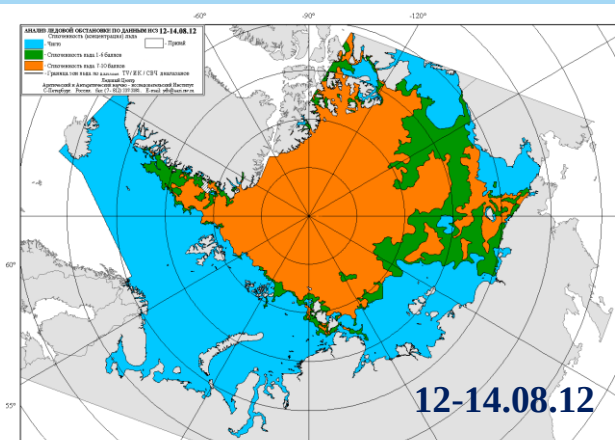
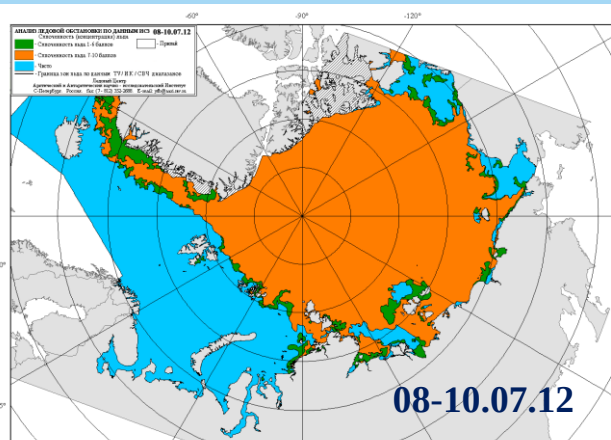
ФГБУ "НИЦ "ПЛАНЕТА"
Россия, 123342 Москва
Б. Предтеченский пер., 7
Тел: (499) 252 37 17
Факс: (499) 252 66 10
E-mail: asmus@planet.itp.ru

Permitted Ice Class for NSR Navigation for July – November period

Ice Class	Permitted Navigation	Kara Sea						Laptev Sea						East Siberian Sea						Chukchi Sea		
		South-West Area			North-East Area			Western Area			Eastern Area			South-West Area			North-East Area					
		H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
No Ice Class	in																					
	IB																					
Ice1 (1D)	in																					
	IB																					
Ice2 (1C)	in																					
	IB																					
Ice3 (1B)	in																					
	IB																					
Arc4 (1A)	in																					
	IB																					
Arc5 (1A Super)	in																					
	IB																					
Arc6	in																					
	IB																					
Arc7	in																					
	IB																					
Arc8	in																					
	IB																					
Arc9	in																					
	IB																					

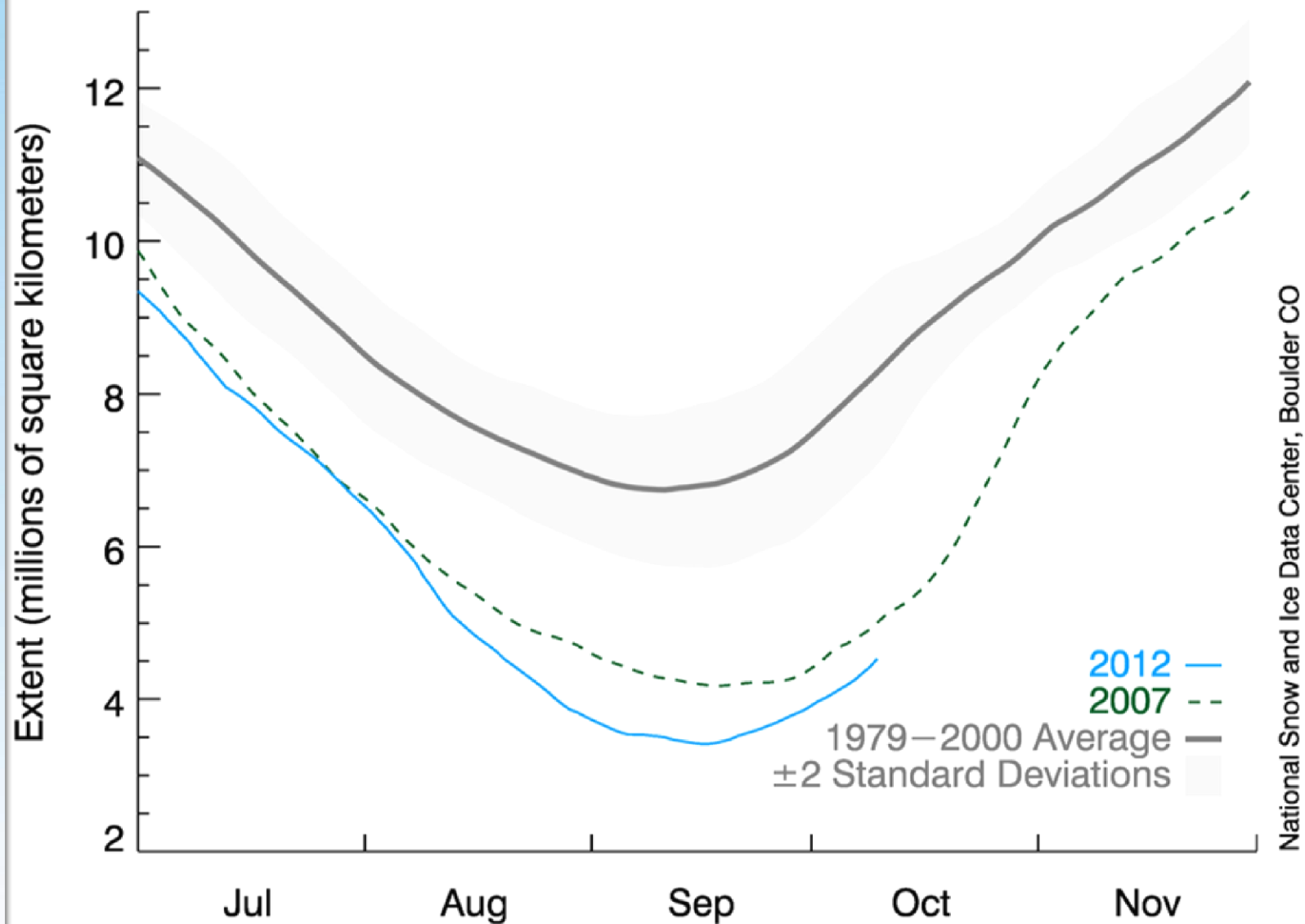
in – independent navigation, IB – navigation with icebreaking support, H – heavy, M – medium, L – light ice conditions

Ice Conditions by Periods:



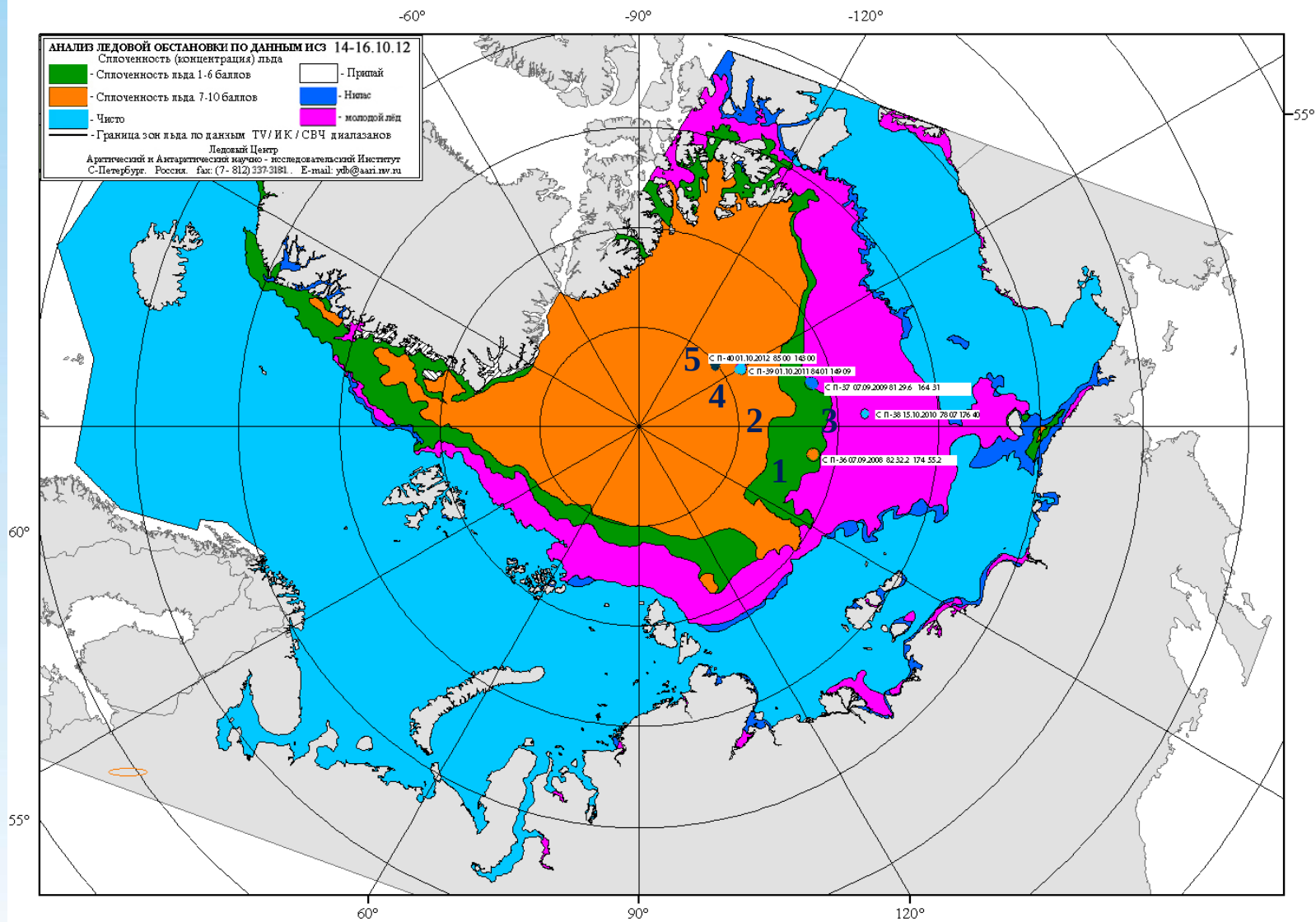
	Ice Concentration 1-6 points		Ice Concentration 7-10 points
	Extra Young Ice		Fast Ice
	Young Ice (0-30 cm)		Clear
	One-Year Ice (30-200 cm)		
—	Ice Area Border according to TV/IR/microwave		

Arctic Sea Ice Extent (Area of ocean with at least 15% sea ice)



National Snow and Ice Data Center, Boulder CO

Coordinates of Polar Stations Disembarkation 2008-2012



1 – PS-36 07.09.2008
 2 – PS-37 07.09.2009

3 – PS-38 15.10.2010
 4 – PS-39 01.10.2011

5 – PS-40 01.10.2012

III. Atomic Icebreaking Fleet and Further Development



Atomic Icebreaking Fleet of Russia



Atomic icebreakers of “Arktika” type:

Propulsion Capacity – 54 MW;

Water displacement – 23000 t;

i/b “Rossia” – **21.12.1985**

i/b “Sovetsky Soyuz” – **29.12.1989**

i/b “Yamal” – **28.10.1992**

i/b “50 Let Pobedy” – **23.03.2007**



Atomic Icebreakers of “Taimyr” type:

Propulsion Capacity – 35 MW;

Water displacement 21000 t;

i/b “Taimyr” – **30.06.1989**

i/b “Yaygach” – **25.07.1990**

Federal State Unitary Enterprise of Atomic Fleet



Atomic Fleet has 18 units:

Personnel: 1234

- ☐ Atomic Vessels - 10
 - ☐ Atomic Icebreakers – 9
 - Among them operational - 5
 - ☐ Atomic container carrier - 1
- ☐ Special Vessels – 5
- ☐ Floating Port Crane
- ☐ 2 Floating Docks

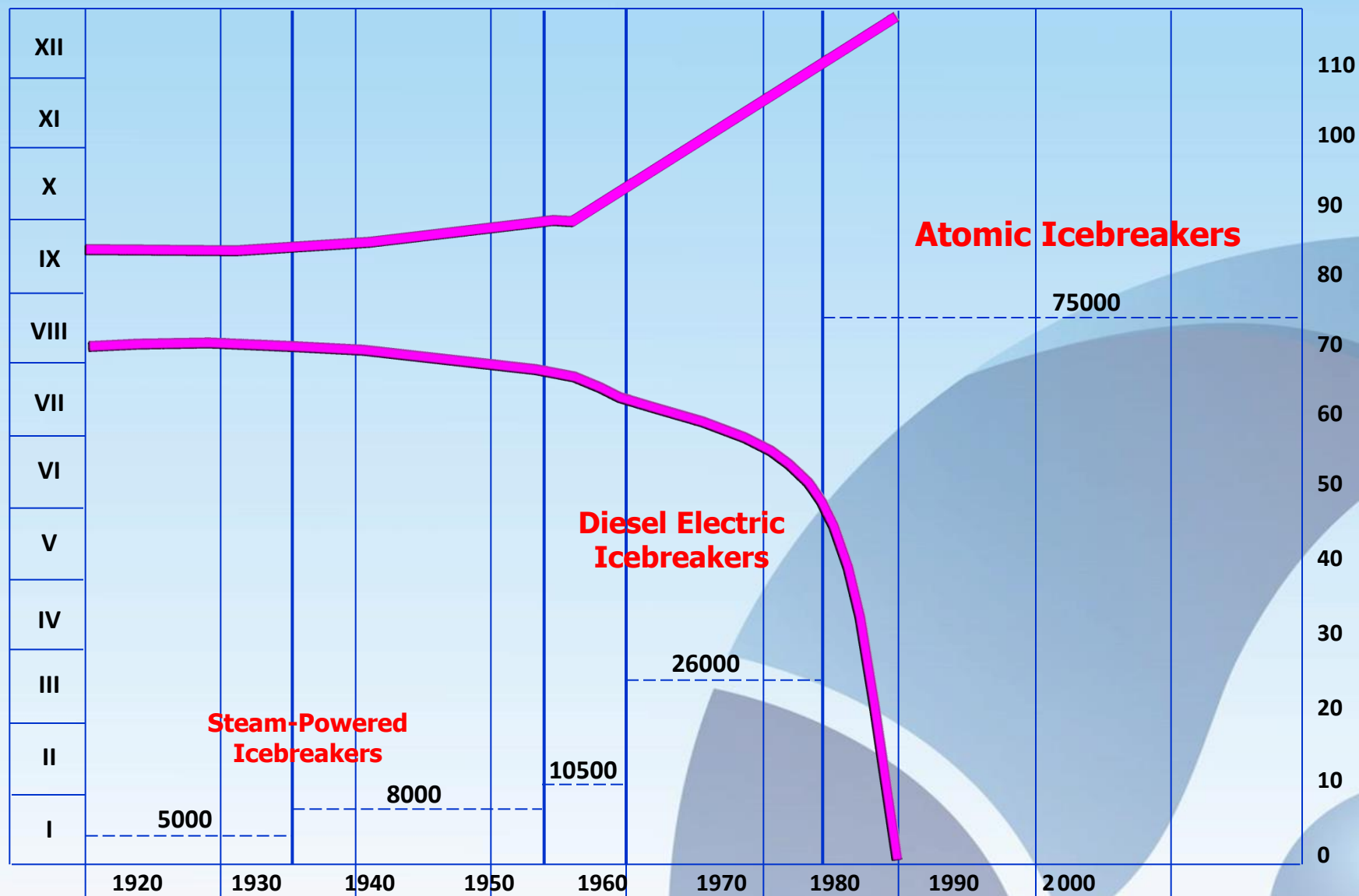
Coastal Facilities:

Personnel: 825

- ☐ base for the atomic icebreaking fleet;
- ☐ full complex of ship repair;
- ☐ nuclear fuel handling;
- ☐ radioactive wastes handling.

Increase in navigation period in the western area of Russian Arctic in 1920-2009 related to rise of icebreaking capacity

N h.p.



100 Icebreakers on the North Pole

1977 - 2013

1977 1987 год 1990 91 92 93 94 95 96 97 98 99 2000 01 02 03 04 05 06 07 08 09 2010 11 12 13

100
ледоколов

85 Россия
3 Германия
8 Швеция
1 Канада
3 США

на Северном полюсе



а/л «Арктика» —
первый ледокол
на Северном Полюсе.
17 августа 1977г.

81
14

Атомоходы класса «Арктика»:

Дизель-электрические ледоколы под проводкой ледокола класса «Арктика»

Дизель-электрические ледоколы в самостоятельном плавании

«Oden» & «Polarstern»
«Polar Sea» & «Louis S. St. Laurent»

«Healy» & «Polarstern»

«Oden» & «Vidar Viking»
«Oden» & «Healy»

«Академик Федоров»

«Академик Федоров»

«Oden»
«Polarstern»
«Oden»

2 рейса



АРКТИКА



СИБИРЬ



РОССИЯ



СОВЕТСКИЙ СОЮЗ



ЯМАЛ



50 лет ПОБЕДЫ

20-й рейс а/л «50 лет Победы» был дважды юбилейным.

30 июля 2013

в сотый раз на Северный Полюс пришел ледокол.
Точно по расписанию рейса.



ледокол №1

1864 На небольшом пароходе «Луция Михаила Бритнева» была срезана носовая оконечность по образцу поморских лодок, в результате чего судно могло наползать на лед и ломать его своей тяжестью. Впоследствии пароход «Луция» привнес прообраз нового типа судов — **ледоколов**.

1899 По проекту адмирала С.О. Макарова построено первое в мире специализированное судно для прокладывания пути во льдах — **ледокол «Ермак»**. После 60 лет работы, по решению Министерства морского флота СССР «ледушка ледокольного флота» был сожжен на рейде как **„ не представляющий исторической ценности“**

1959 В СССР построено первое в мире атомное судно с ядерной силовой установкой — **атомный ледокол «Ленин»**.

1975 Построен первый в истории корабль, способный ходить в Северном Ледовитом океане куда и когда угодно. Головной в серии из шести атомоходов — **атомный ледокол «Арктика»**

2007 На «Балтийском заводе» (Санкт-Петербург) построен самый большой и мощный ледокол в мире, последний из серии атомоходов класса «Арктика» — **атомный ледокол «50 лет Победы»**.



Med-term Operational Period of Atomic Icebreakers (with Nuclear Power Plant resource of 150-175 000 hours)

Наименование	Год ввода в эксплуатацию	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Taimyr	1989																
Vaygach	1990																
Rossiya	1985																
Sovetskiy Soyuz	1989																
Yamal	1992																
50 Let Pobedy	2007																
Commission of Universal Atomic Icebreakers (IB-60 type)																	
1 st IB-60	2017																
2 nd IB-60	2019																
3 rd IB-60	2021																

- Linear icebreakers operational period
- Low-draught icebreakers operational period
- New universal icebreakers operational period

- If prolonged up to 175 000 hours
- If prolonged up to 175 000 hours

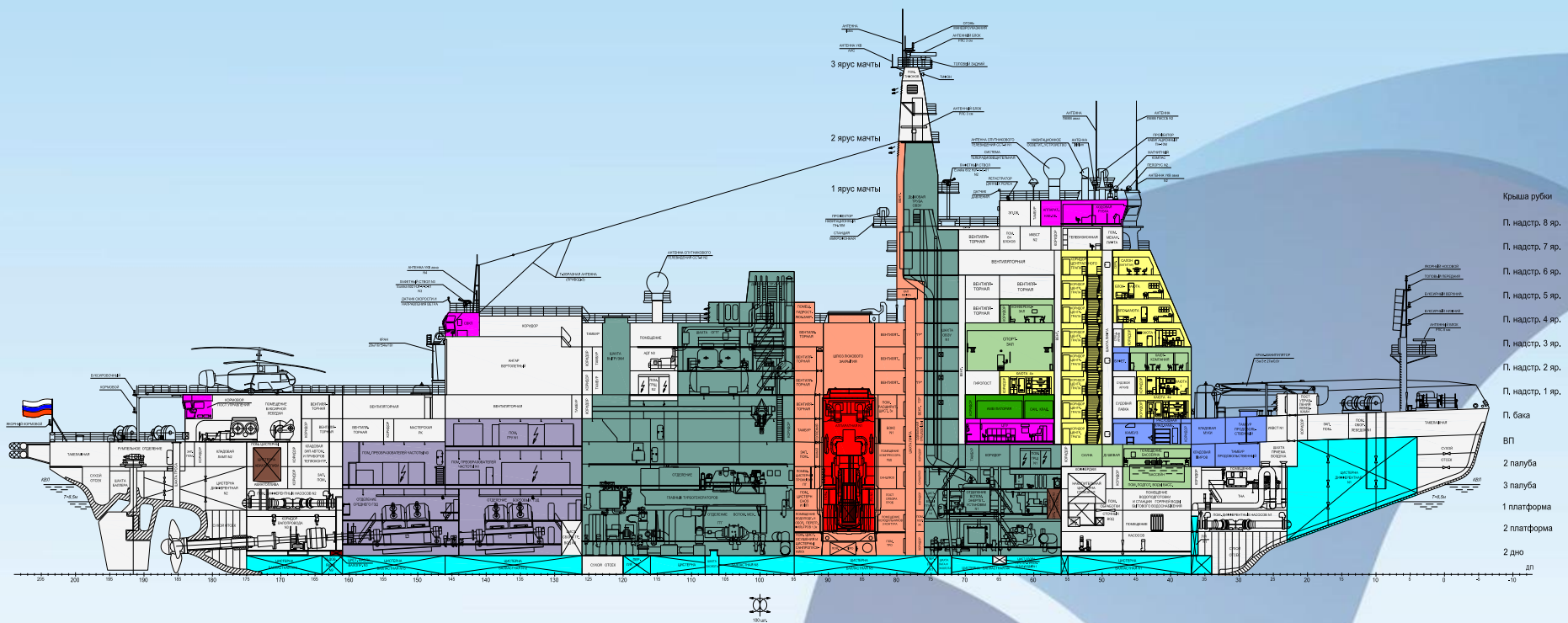
Universal Atomic Icebreaker



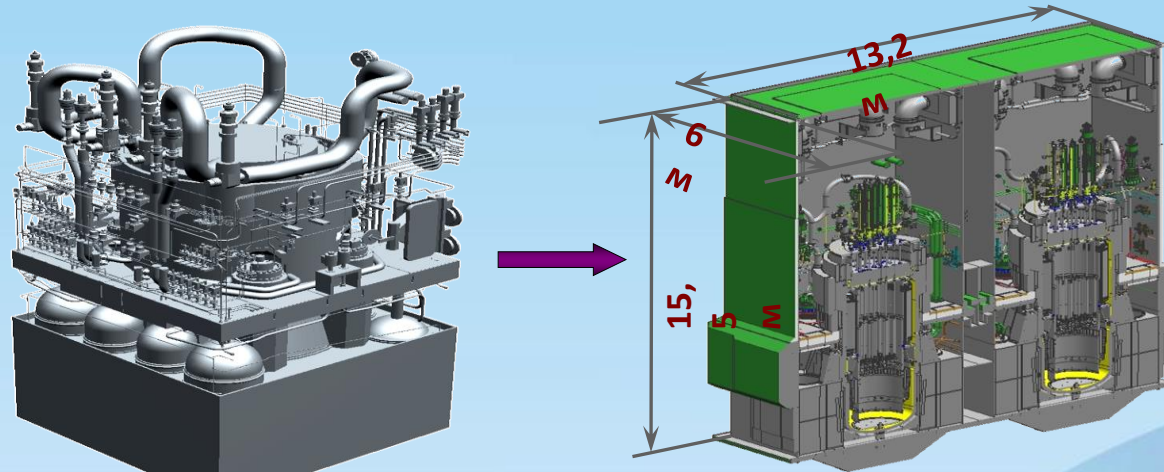
Universal Atomic Icebreaker.

General Scheme.

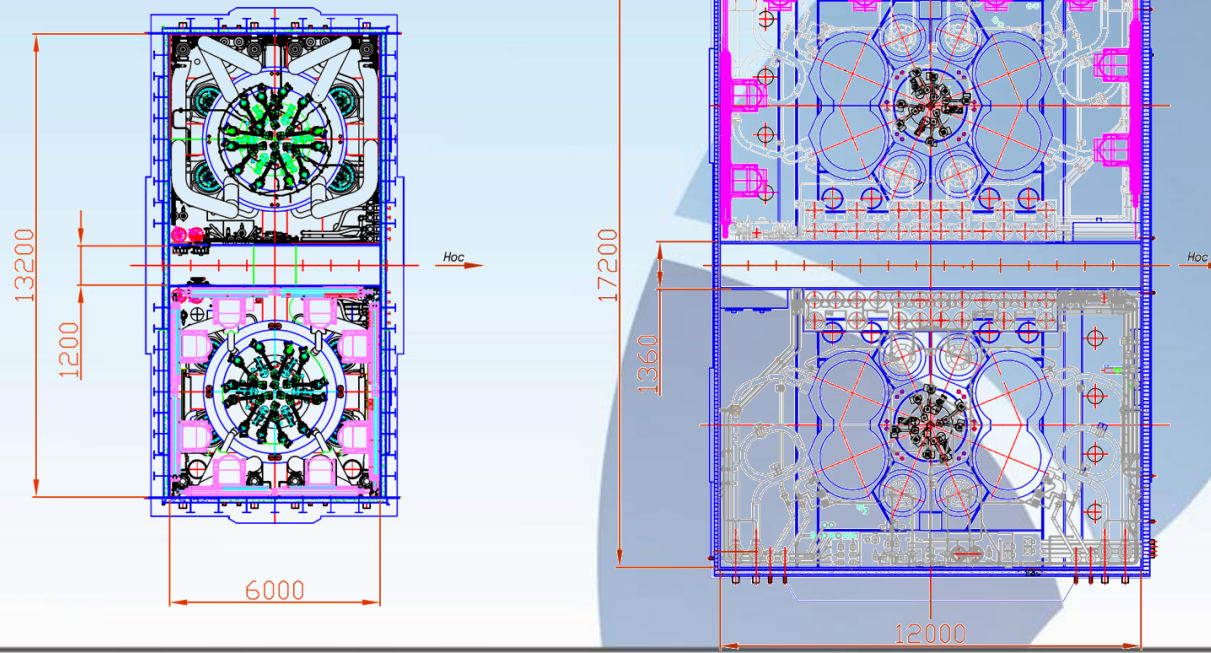
Longitudinal Section.



Reactor Plant RITM-200 in Protective Casing.



RITM-200 dimensions compared to present icebreakers' NPP



Principal Dimensions	Project 1052	Project 10580	Project 22220
Basic area of operations	Arctic	Yenisei River and shallow Arctic waters	Permanently – Western Arctic incl. Barents, Pechora and Kara Sea, shallow waters of the Yenisei River (up to port of Dudinka) and the Gulf of Ob. Eastern Arctic – in summer-autumn period
Length overall, m	148,0	150,0	173,3
Beam, m	30,0	29,2	34,0
Board height, m	17,2	15,2	15,2
Draught, m	11,00	8,1	10,5
Minimal	-	-	8,55
Water displacement, t	23 460	19 600	33 530
Minimal	-	-	25 540
Quantity and power of turbines, kW	2 * 27 580	2 * 18 400	2 * 33 500
Propulsion, hp	75 000	50 000	91 000
Ice-free water speed, knots	20,8	20,2	~ 22
Ice passability, m	2,25	1,95	2,8 – 2,9
Shaft power to water displacement	2,09	1,66	1,79
Crew quantity	107	91	75

Thank you for your attention!

