Global Environmental Policy

International Collaborative Programme, INSROP;

INSROP GIS;

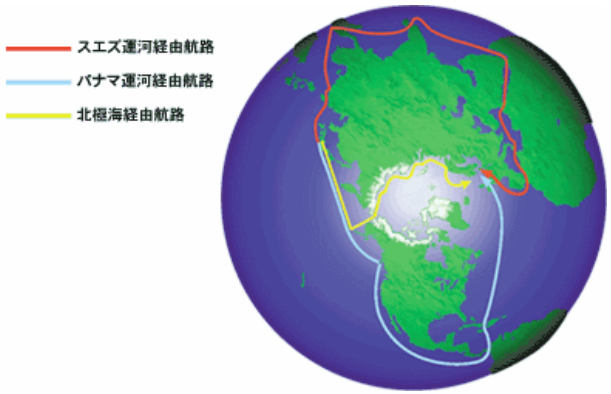
Trial Voyage

July 21, 2005

Hajime Yamaguchi

INSROP

International Northern Sea Route Programme



INSROP

1st Phase: 3 years, 1993-1995

Evaluation Phase: 1 year, 1996

2nd Phase: 2 years, 1997-1998

Final Presentation: 1999

Budget: 2-3,000,000 US$ / year

INSROP

Organized by

CNIIMF, Central Marine Research & Design Institute, Russia

SOF, Ship & Ocean Foundation, Japan

FNI, The Fridtof Nansen Institute, Norway

- Russia
- Japan
  - Canada
  - Finland
- Norway
  - Finalnd
  - Russia

Major Roles

- Russia:
  CNIIMF, Icebreaker and navigation data
  AARI, Ice conditions and other environmental data
- Norway:
  GIS
  Environmental impact assessment
  Political and economical demands
- Japan:
  Extensive tank tests for optimal ship design
  Experimental voyage
  Navigation simulation and economic assessment
  Inputs from Canada and Finland

INSROP

4 Sub-Programmes

1. Natural Conditions and Ice Navigation
2. Environmental Factors
3. Trade and Commercial Shipping Aspects
4. Political, Legal and Strategic Factors

Each sub-programmes manages 10-20 projects every year.

Many Negotiations

- Complicated structure of Russian Society
  > CNIIMF as agency
  SOF members = office workers and not many
  Volunteer works of researchers
- Tell clearly what we need, and what we want to do and can do with it.
- Find characters of whom we are asking something.
- Realize team working ASAP.
- Internet communication as well as normal communications.

INSROP Outputs

- 166 research project reports
- 3 books (2 English, 1 Japanese)
- 3 international conferences
- INSROP GIS

INSROP GIS
for
Sustainable Development

INSROP

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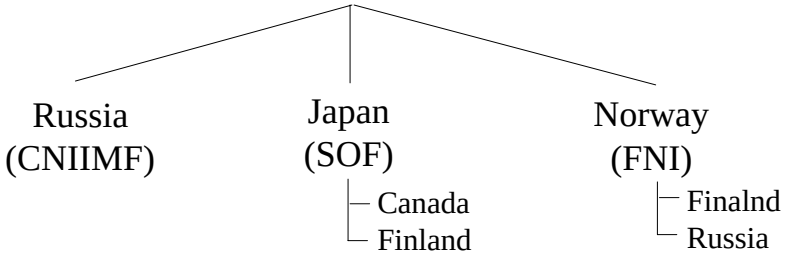
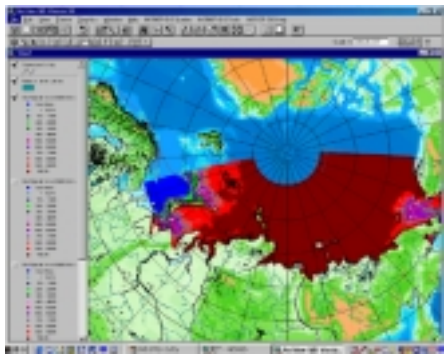


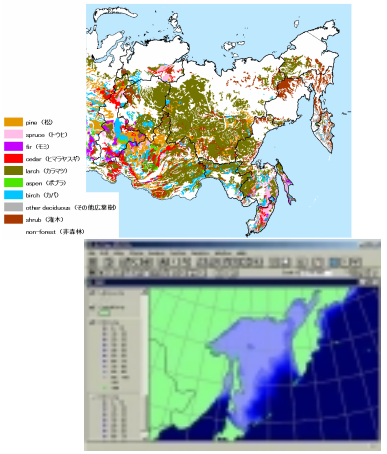
GIS, Geographic Information System

- Digital map displayed on a PC screen
  +
  Database

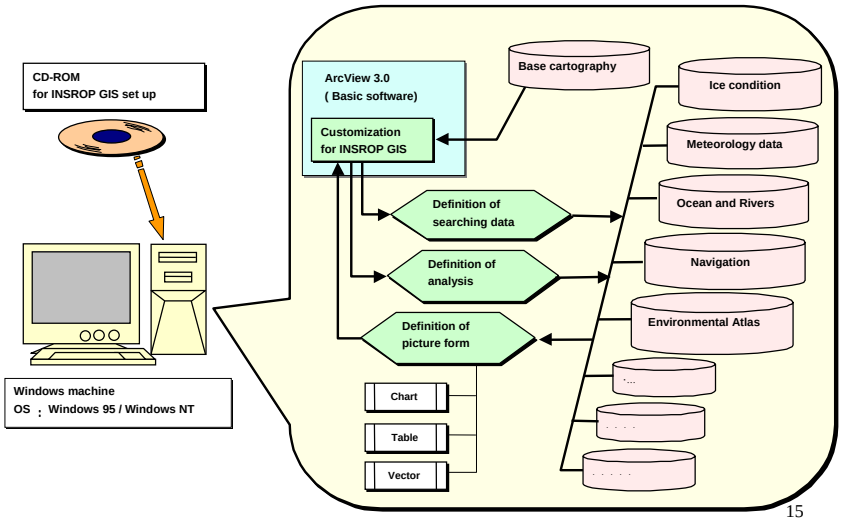


Post-INSROP Project: JANSROP-II

- 2002-2005：3.5 years
- Japan – Russia – Norway
- Sustainable development of the East Eurasian resources with environmental issues taken into consideration.
- GIS formation for Russian resources and environments, and preparation of resource development scenario.
- Proposals of regulations to keep the Okhostk sea environments.



INSROP GIS



GIS data

- GIS data compositions

map data : point (e.g. city and data point), line (e.g. river), polygon (e.g. country border), etc. to express the position and shape of the attribute

attribute data : any data related to the map data
e.g. population, address, area, name…

+

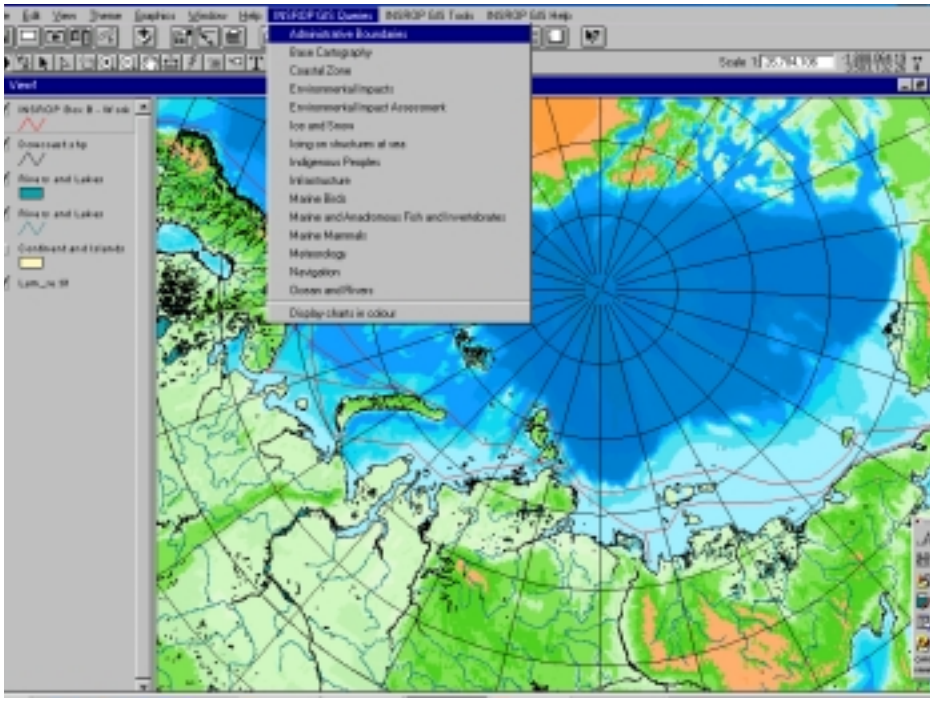
meta data : to describe the whole data set

INSROP GIS Demonstration

1. Color Map
2. Example of Data Analysis
3. Display of Oil Spill Simulation
4. Data Analysis along the Navigation Route
5. Simple Environmental Impact Assessment

GIS

helps us to view and analyze any spatial information and to make decision on a particular plan.

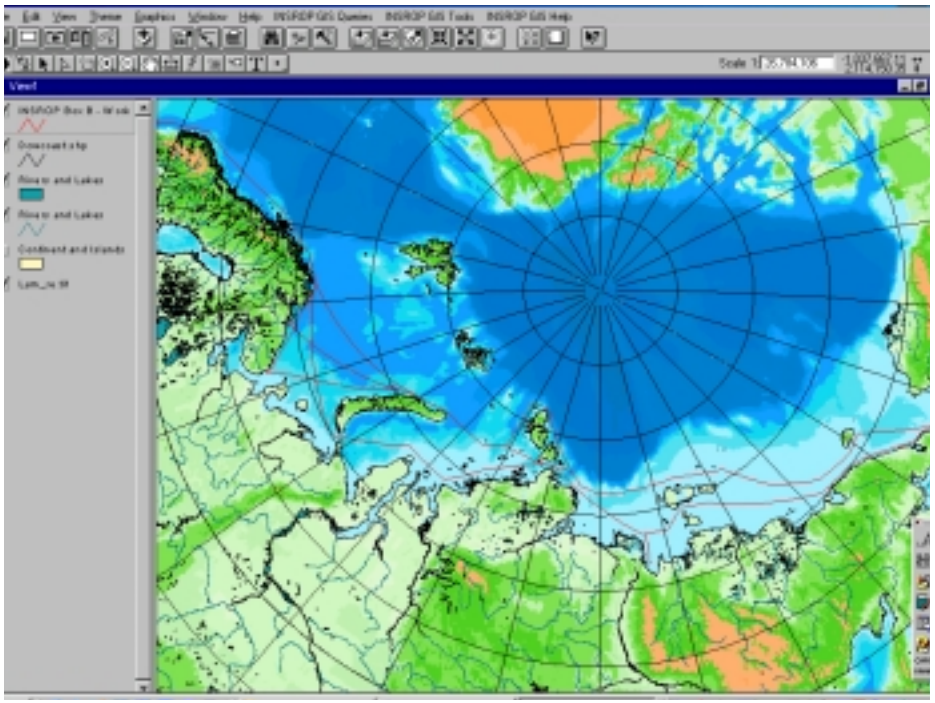


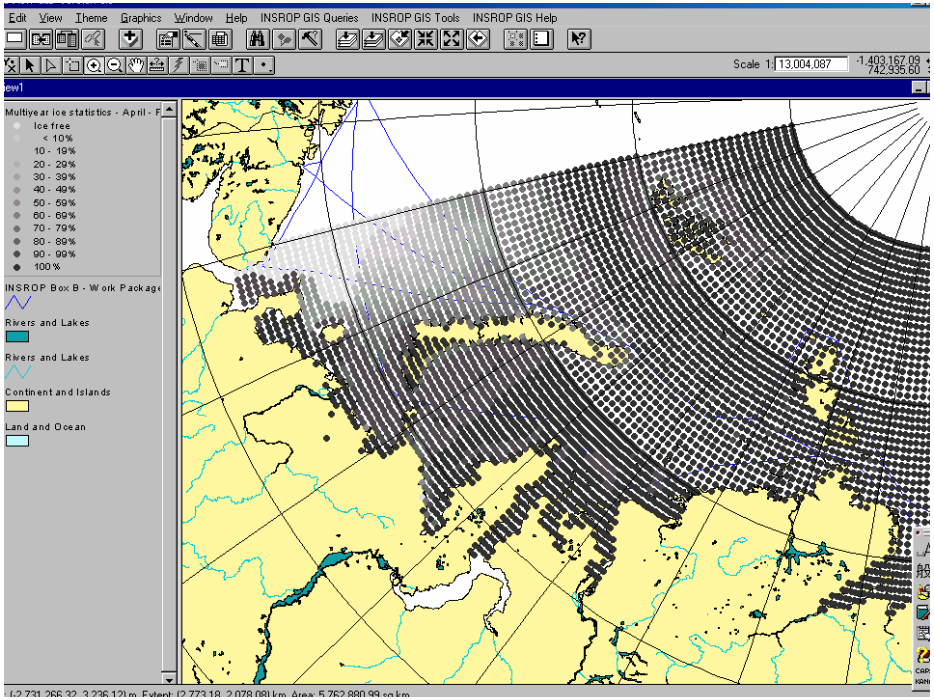
1. Color (BitMap)

- Base Map
- Query Menu to Extract the Data

2. Examples of Data View and Analysis

- Ice Concentration
- Air Pressure and Its Time Variation
- Polar Bear Distribution
- Sea Surface Current Distribution




Edit View Theme Graphics Window Help INSROP GIS Queries INSROP GIS Tools INSROP GIS Help
Scale 1: 13,004,087
Multiyear ice statistics - April - F
Ice free
< 10%
10 - 19%
20 - 29%
30 - 39%
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60 - 69%
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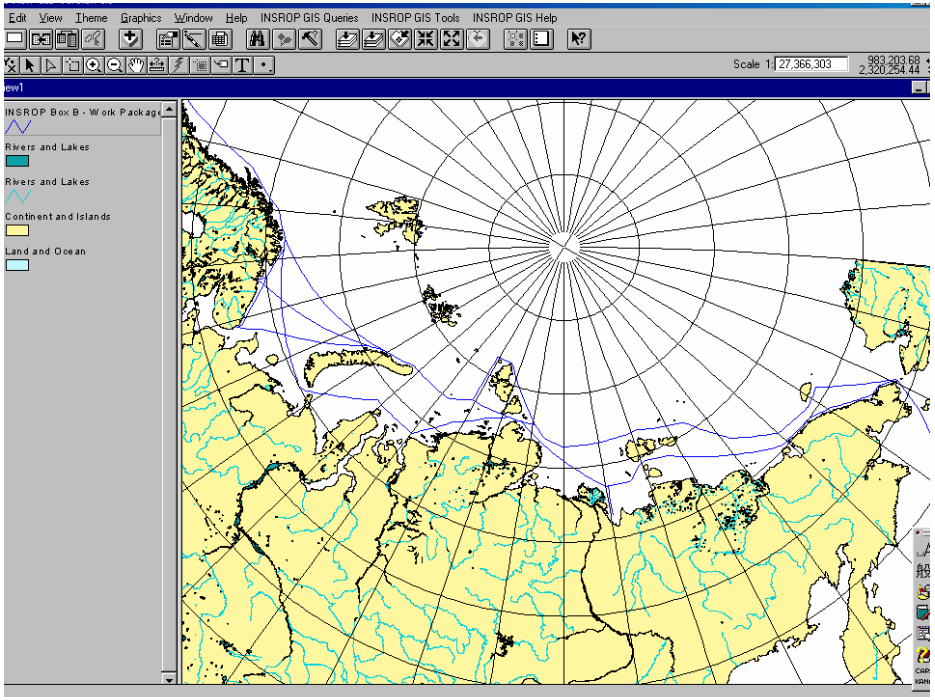
80 - 89%
90 - 99%
100 %
INSROP Box B - Work Package
Rivers and Lakes
Rivers and Lakes
Continent and Islands
Land and Ocean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INSROP Box B - Work Package
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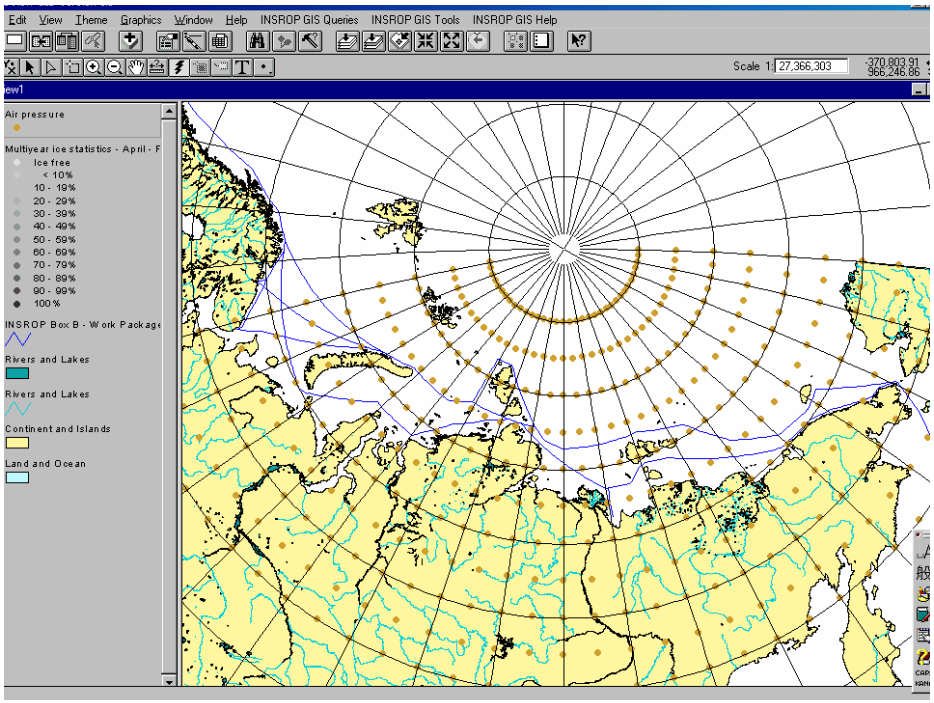
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Air pressure
Multiyear ice statistics - April - F
Ice free
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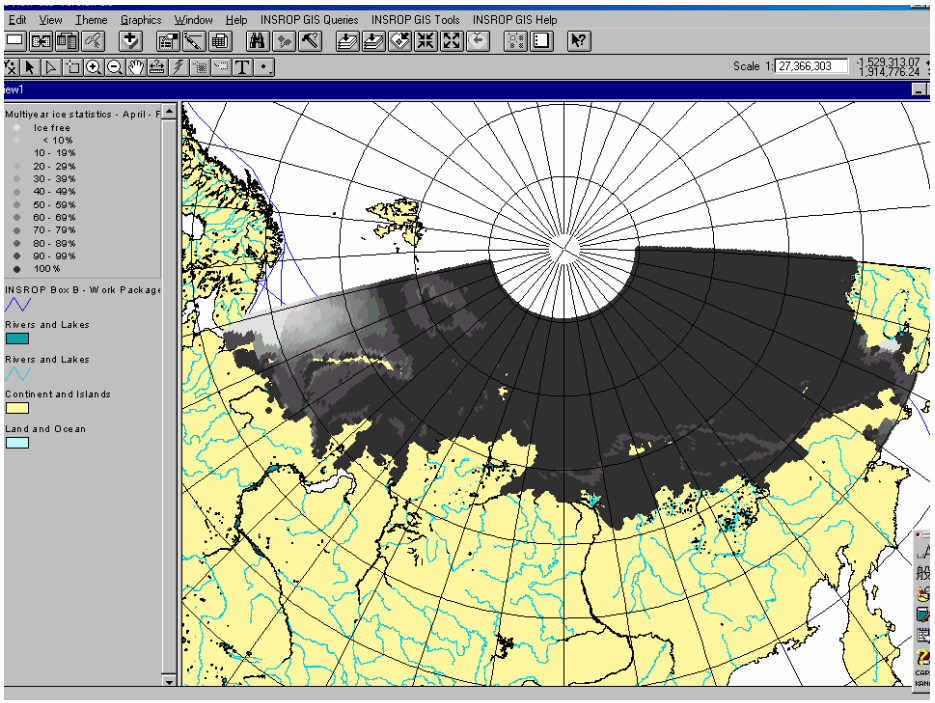
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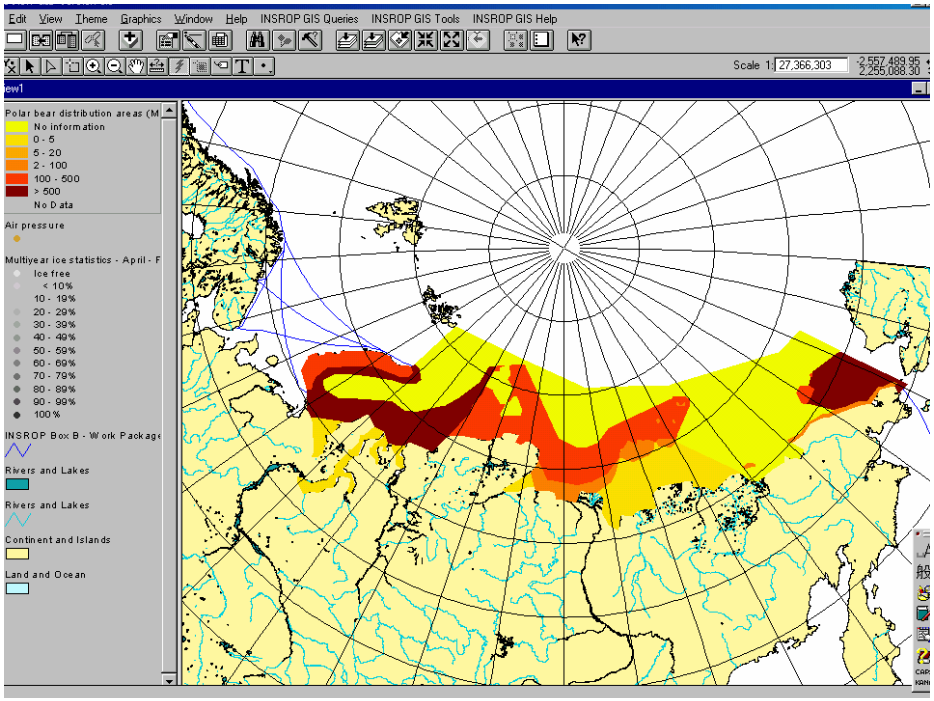
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Scale 1: 27,366,303
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View1
Polar bear distribution areas (M
No information
0 - 5
5 - 20
2 - 100
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> 500
No Data
Air pressure
Multiyear ice statistics - April - F
Ice free
< 10%
10 - 19%
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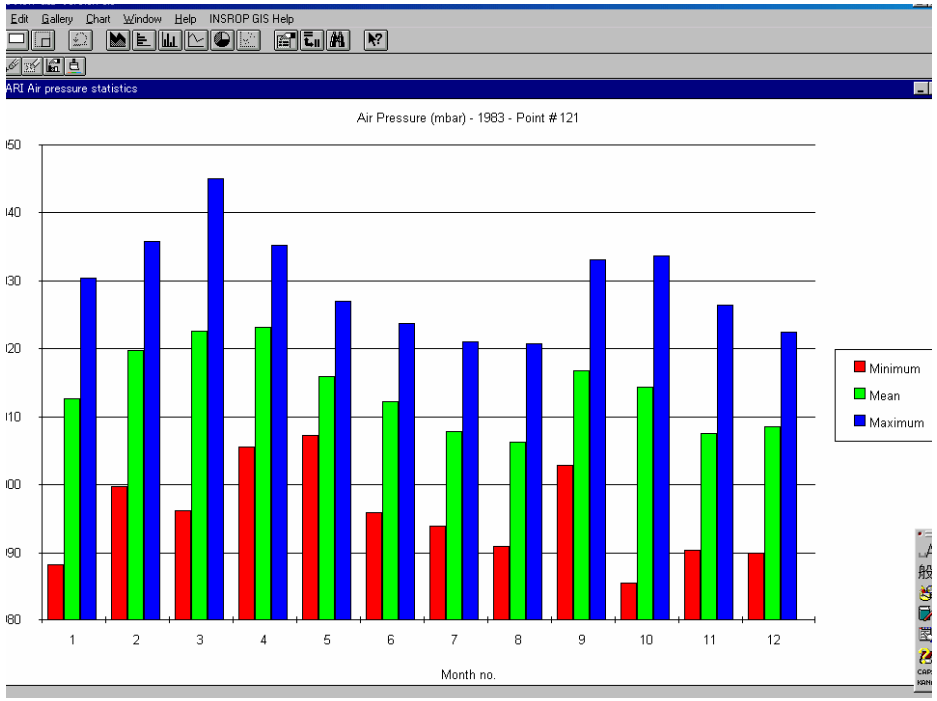
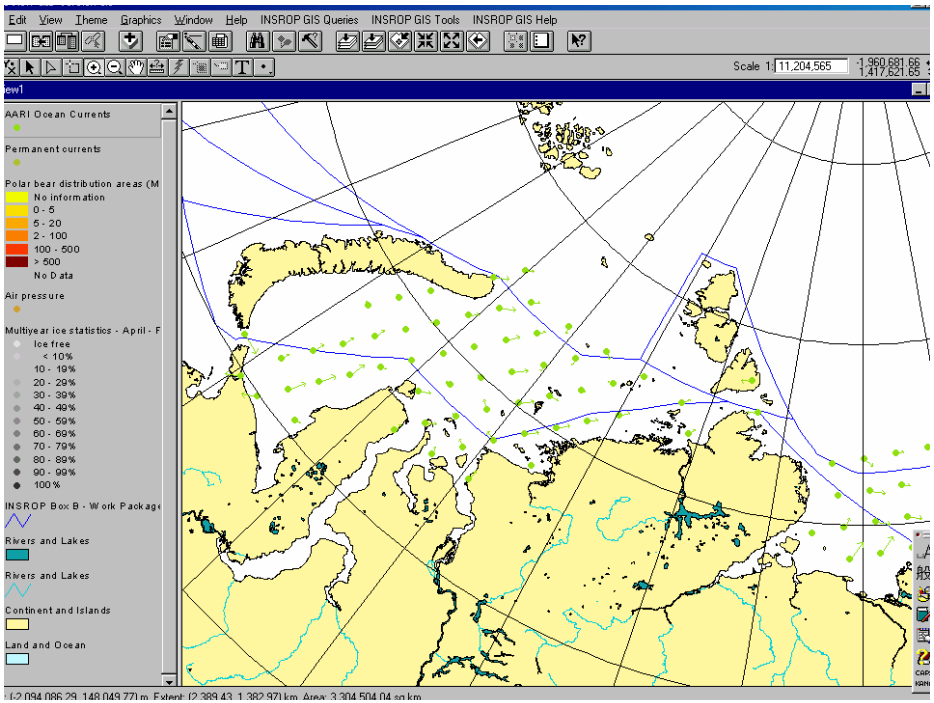

Edit Gallery Chart Window Help INSROP GIS Help
AARI Air pressure statistics
Air Pressure (mbar) - 1983 - Point # 121
150
140
130
120
110
100
90
80
1 2 3 4 5 6 7 8 9 10 11 12
Month no.
Minimum
Mean
Maximum


Edit View Theme Graphics Window Help INSROP GIS Queries INSROP GIS Tools INSROP GIS Help
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View1
AARI Ocean Currents
Permanent currents
Polar bear distribution areas (M
No information
0 - 5
5 - 20
2 - 100
100 - 500
> 500
No Data
Air pressure
Multiyear ice statistics - April - F
Ice free
< 10%
10 - 19%
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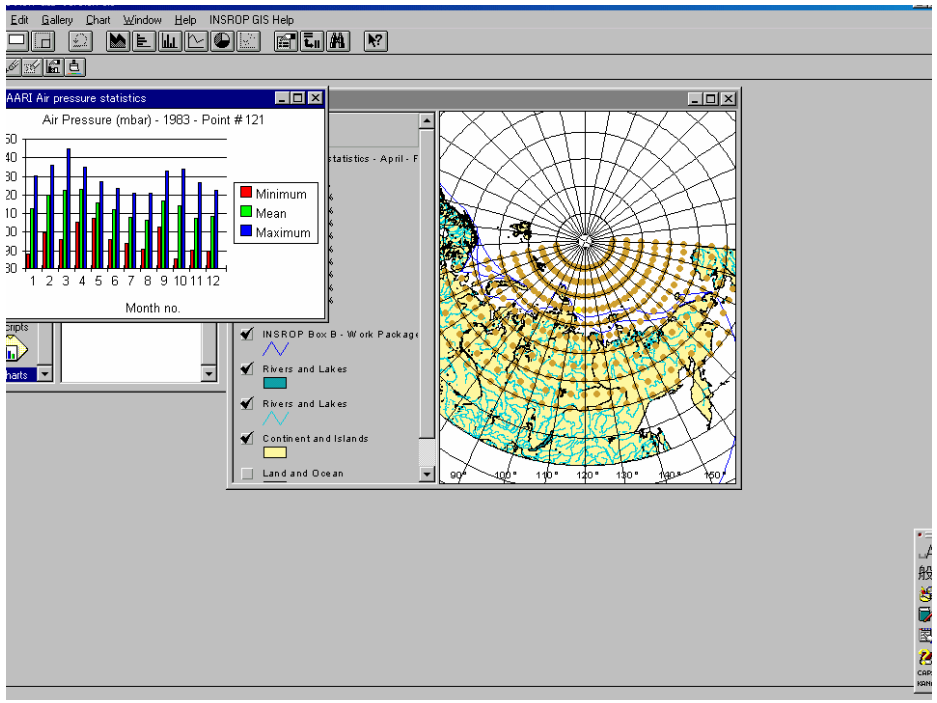
Edit Gallery Chart Window Help INSROP GIS Help
AARI Air pressure statistics
Air Pressure (mbar) - 1983 - Point # 121
1 2 3 4 5 6 7 8 9 10 11 12
Month no.
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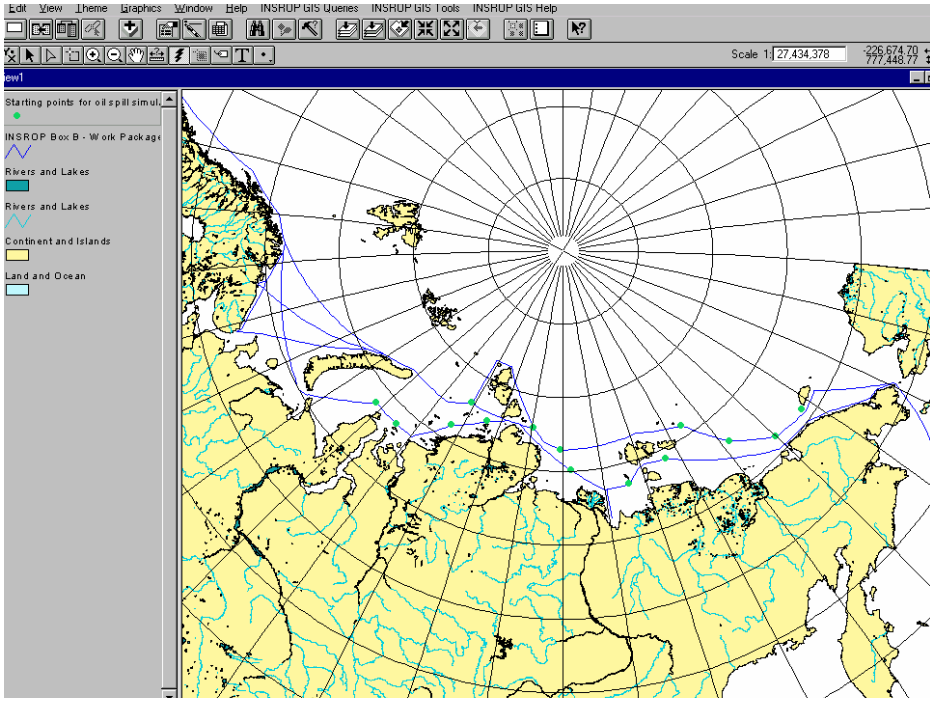
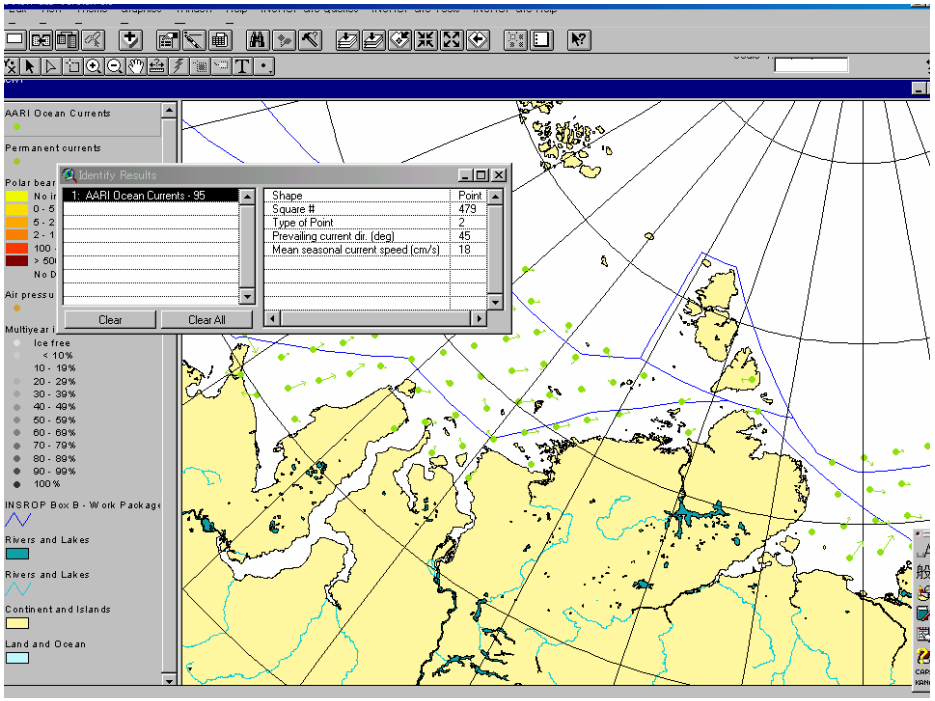
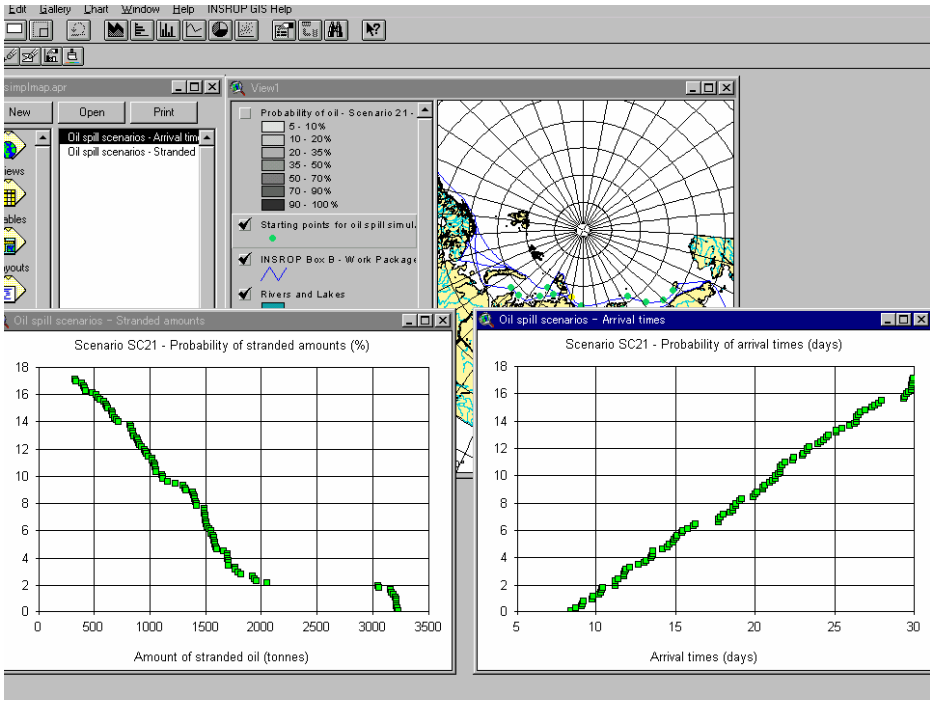
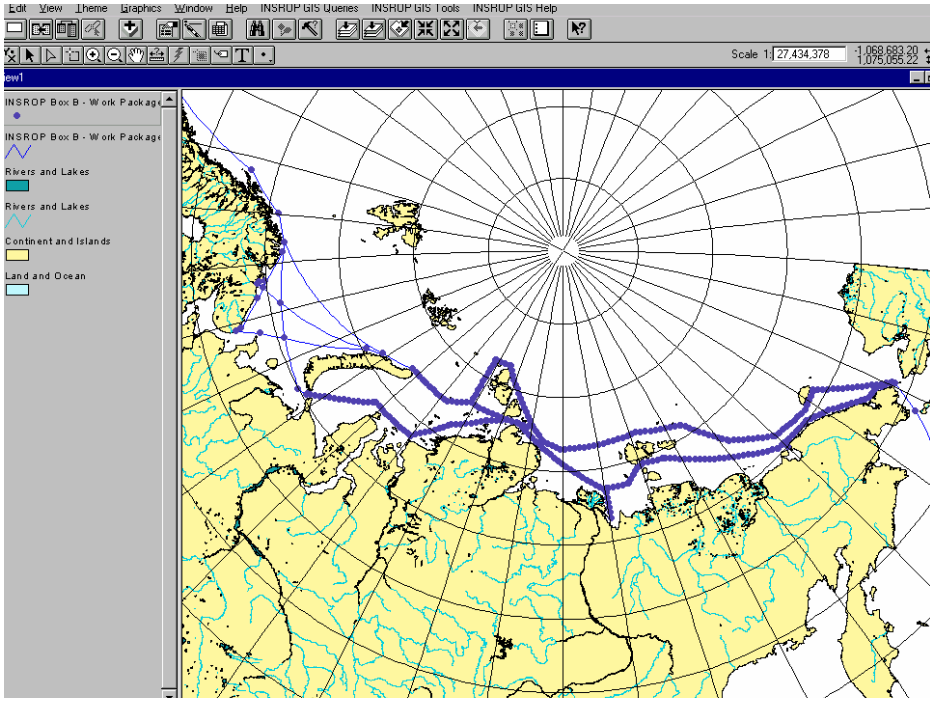


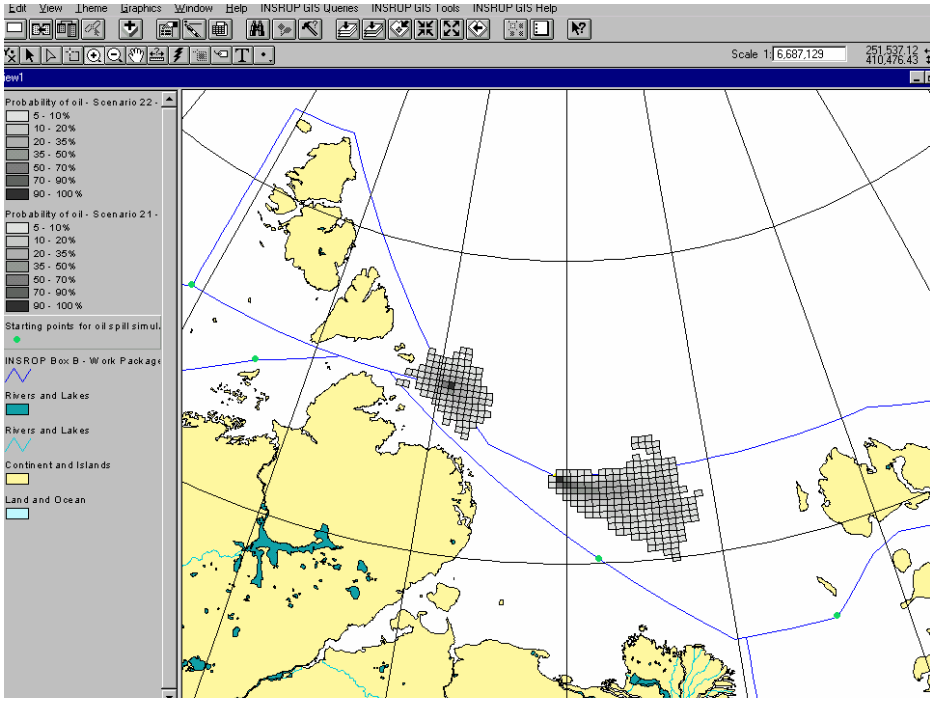


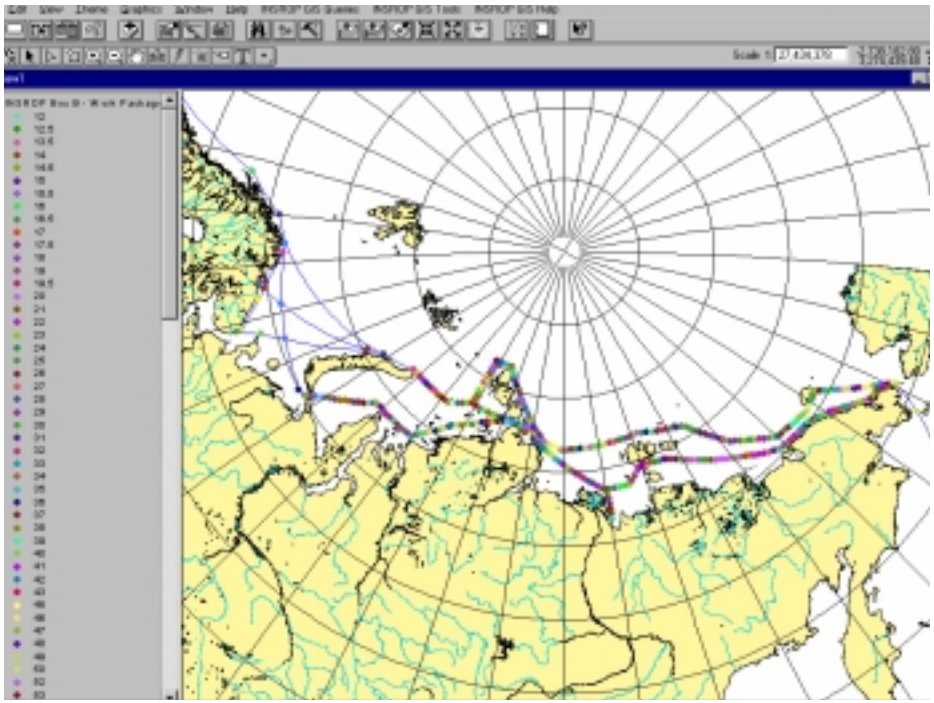


Oil Spill Simulation

- Wind and current data from the INSROP GIS.
- Assuming 3,500 ton oil spilled.
- Probability of oil presence due to statistical variation of wind and current.

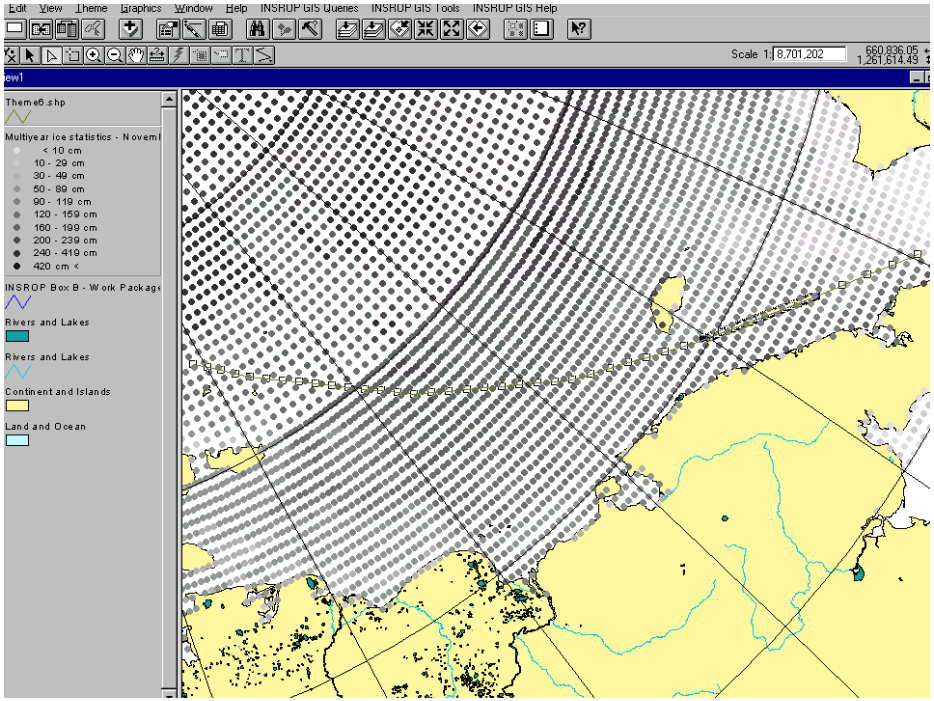






Navigation Route Analysis

- Sea depth data points
- Display of sea depth distribution
- Overlay of ice thickness
- Assumption of new route
- Ice thickness distribution in the narrow strip along the new route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660,836.05
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Multiyear ice statistics - Novem
< 10 cm
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120 - 159 cm
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240 - 419 cm
420 cm <
INSROP Box B - Work Package
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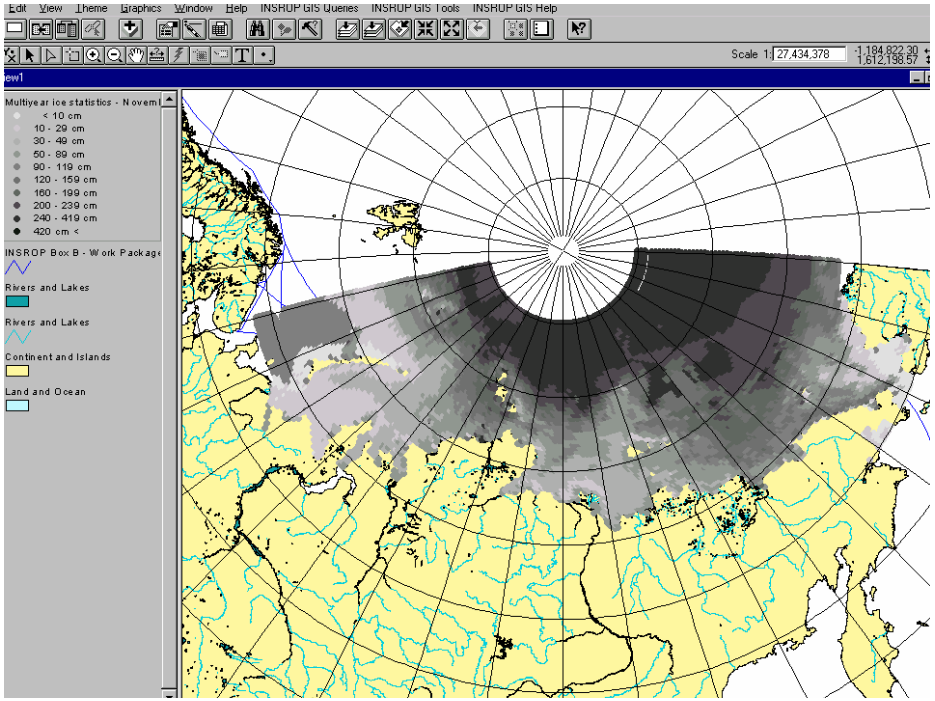
Continent and Islands
Land and Ocean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1,612,138.57
Multiyear ice statistics - Novem
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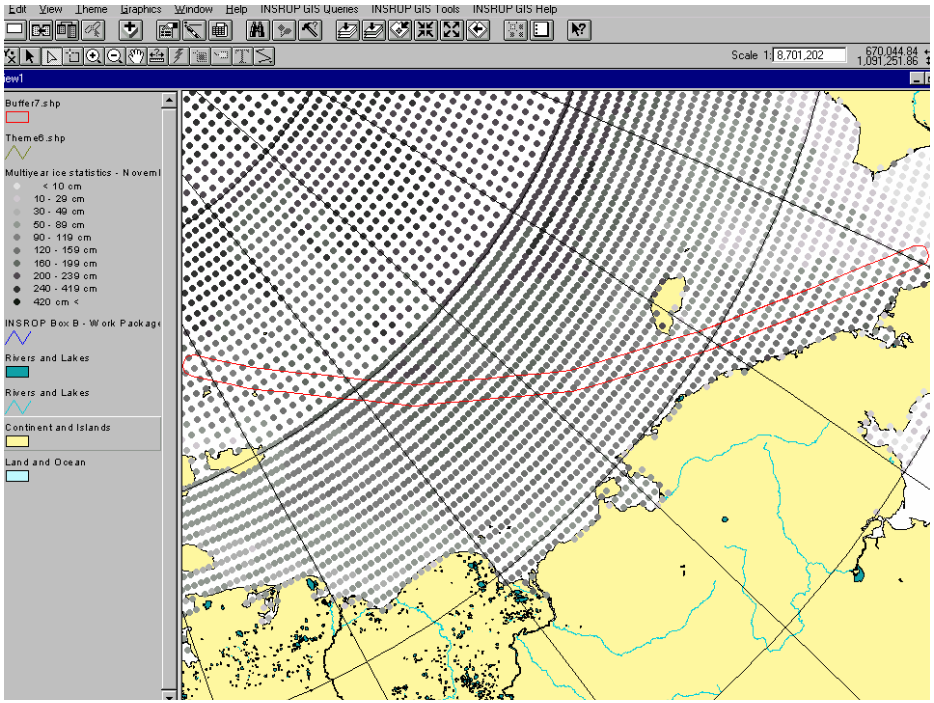
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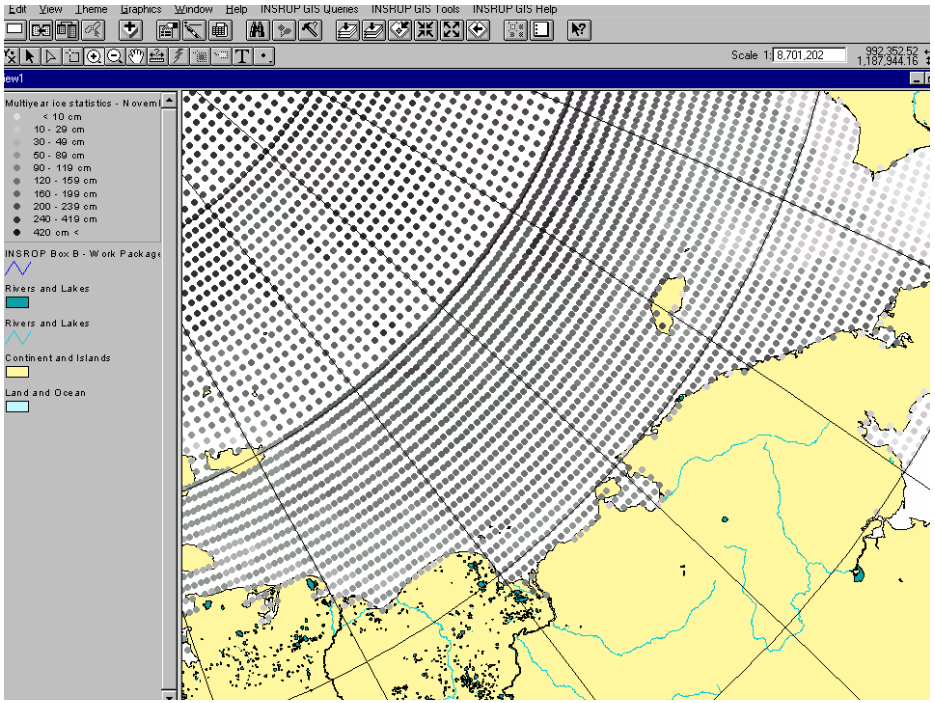
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Multiyear ice statistics - Novem
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420 cm <
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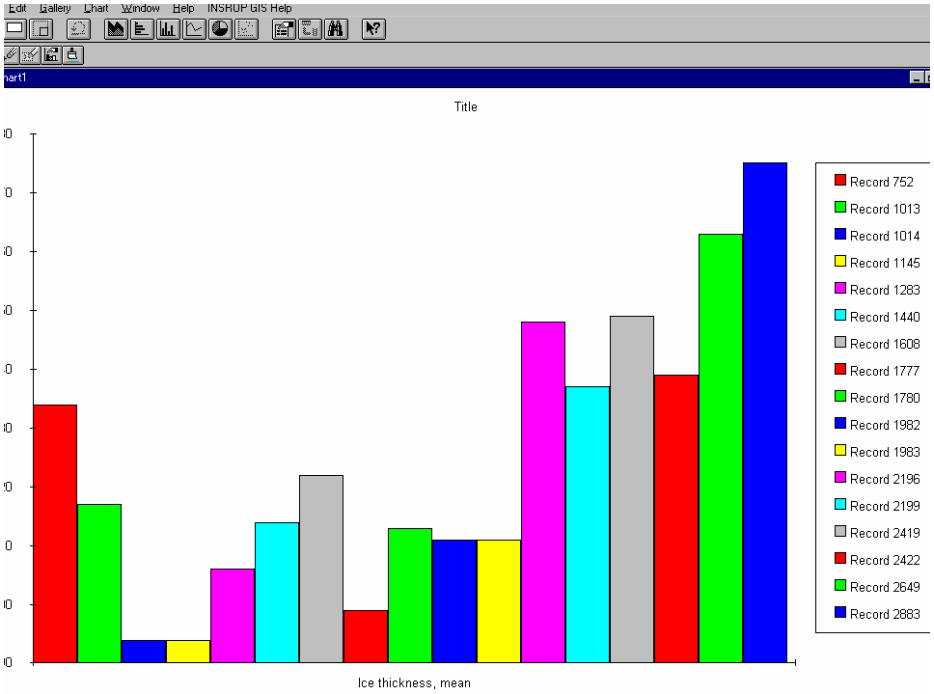
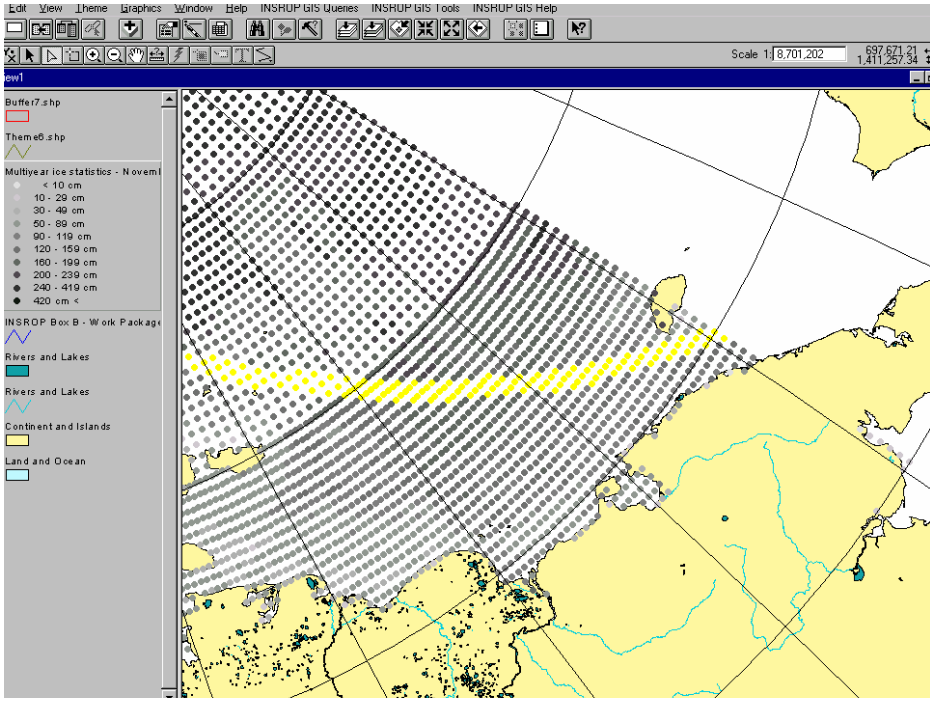
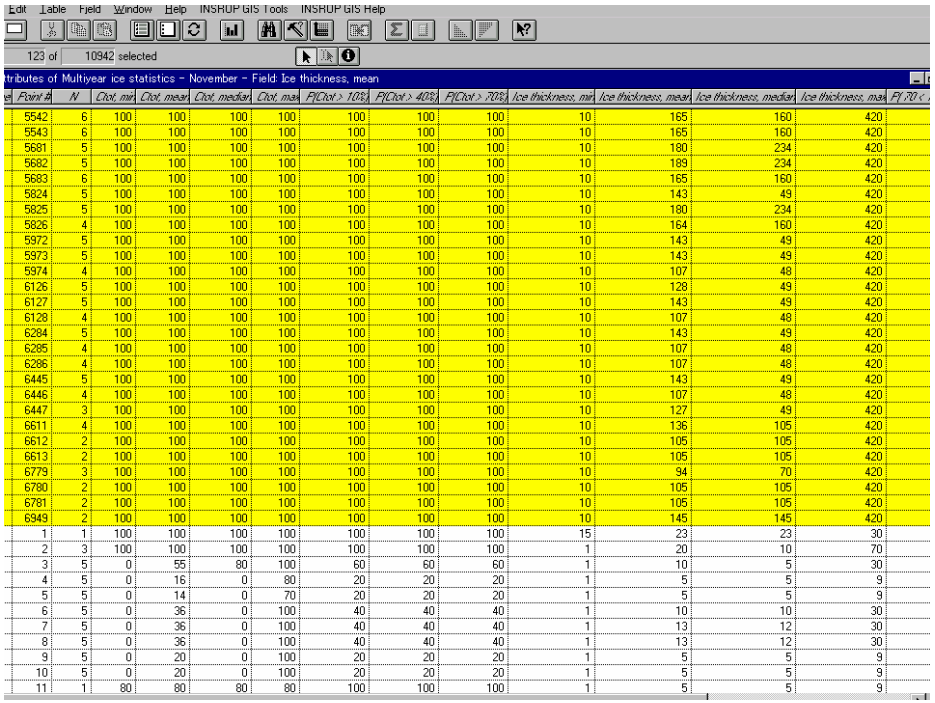




EIA
Environmental Impact Assessment
(Effects on Ecosystem)

Effects of increased NSR navigation on
Ivory Gulls in Kara Sea

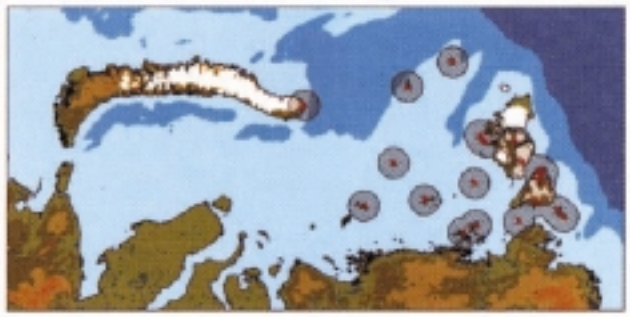
(quantification of simplified equation)



Point #	N	Dot, min	Dot, mean	Dot, median	Dot, max	F(Dot > 10%)	F(Dot > 40%)	F(Dot > 70%)	Ice thickness, min	Ice thickness, mean	Ice thickness, median	Ice thickness, max	F(70 <
5542	6	100	100	100	100	100	100	100	10	165	160	420	
5543	6	100	100	100	100	100	100	100	10	165	160	420	
5681	5	100	100	100	100	100	100	100	10	180	234	420	
5682	5	100	100	100	100	100	100	100	10	189	234	420	
5683	6	100	100	100	100	100	100	100	10	165	160	420	
5824	5	100	100	100	100	100	100	100	10	143	49	420	
5825	5	100	100	100	100	100	100	100	10	180	234	420	
5826	4	100	100	100	100	100	100	100	10	164	160	420	
5972	5	100	100	100	100	100	100	100	10	143	49	420	
5973	5	100	100	100	100	100	100	100	10	143	49	420	
5974	4	100	100	100	100	100	100	100	10	107	48	420	
6126	5	100	100	100	100	100	100	100	10	128	49	420	
6127	5	100	100	100	100	100	100	100	10	143	49	420	
6128	4	100	100	100	100	100	100	100	10	107	48	420	
6284	5	100	100	100	100	100	100	100	10	143	49	420	
6285	4	100	100	100	100	100	100	100	10	107	48	420	
6286	4	100	100	100	100	100	100	100	10	107	48	420	
6445	5	100	100	100	100	100	100	100	10	143	49	420	
6446	4	100	100	100	100	100	100	100	10	107	48	420	
6447	3	100	100	100	100	100	100	100	10	127	49	420	
6611	4	100	100	100	100	100	100	100	10	136	105	420	
6612	2	100	100	100	100	100	100	100	10	105	105	420	
6613	2	100	100	100	100	100	100	100	10	105	105	420	
6779	3	100	100	100	100	100	100	100	10	94	70	420	
6780	2	100	100	100	100	100	100	100	10	105	105	420	
6781	2	100	100	100	100	100	100	100	10	105	105	420	
6949	2	100	100	100	100	100	100	100	10	145	145	420	
1	1	100	100	100	100	100	100	100	15	23	23	30	
2	3	100	100	100	100	100	100	100	1	20	10	70	
3	5	0	55	80	100	60	60	60	1	10	5	30	
4	5	0	16	0	80	20	20	20	1	5	5	9	
5	5	0	14	0	70	20	20	20	1	5	5	9	
6	5	0	36	0	100	40	40	40	1	10	10	30	
7	5	0	36	0	100	40	40	40	1	13	12	30	
8	5	0	36	0	100	40	40	40	1	13	12	30	
9	5	0	20	0	100	20	20	20	1	5	5	9	
10	5	0	20	0	100	20	20	20	1	5	5	9	
11	1	80	80	80	80	100	100	100	1	5	5	9	

EIA for Normal NSR Operation

1st step: display the spatial distribution of Ivory Gull colonies

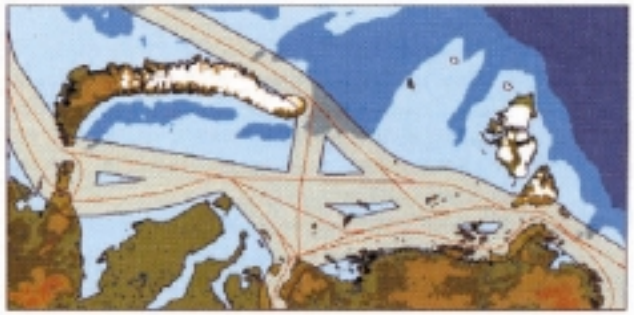


EIA

2nd step: typical sailing routes in Kara Sea

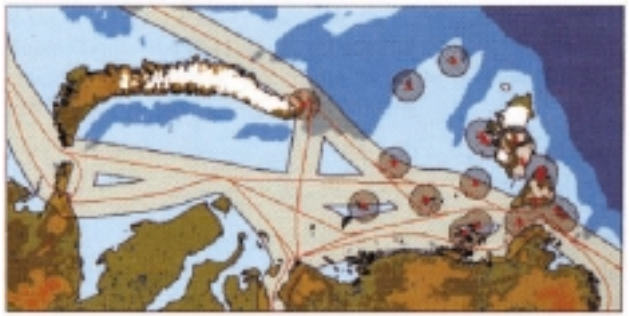
EIA

3rd step: spatial range of a given impact factor represented by an influence zone along the sailing segments



EIA

4th step: potential conflict area given as overlap between the Ivory colony distribution and the influence zone for the impact factor

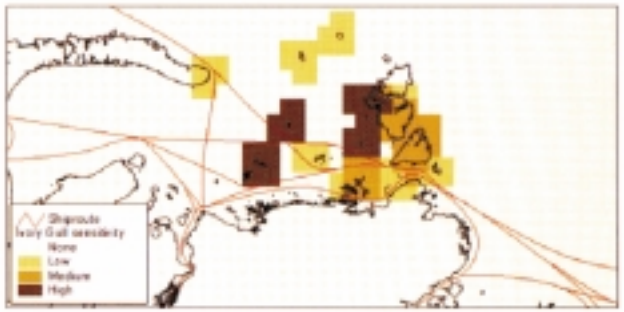


Why GIS for EIA?

- EIA can be done without GIS.
- But GIS speed-ups the EIA process, possibly realizing the PDCA (Plan-Do-Check Action) environment management system.

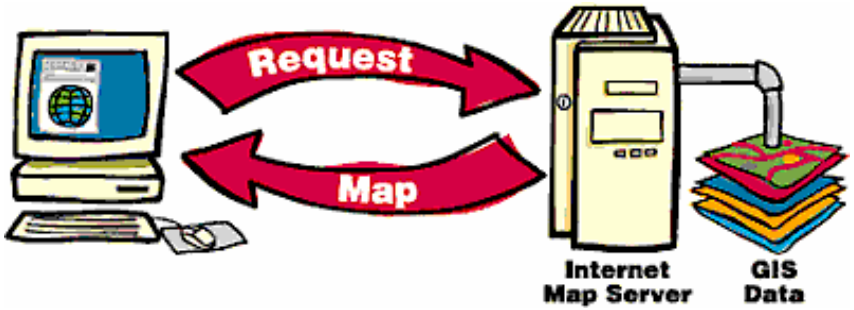
EIA

5th step: identification of sensitive/high risk areas

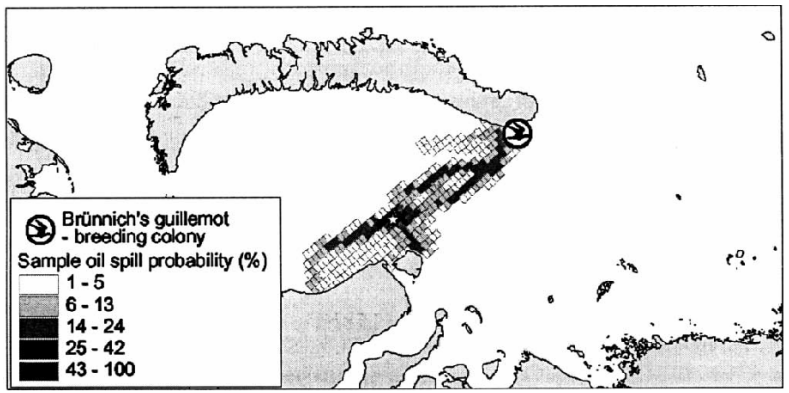


Communication with the Outside Society

- IMS, Internet Map Server



EIA for Accidental Event



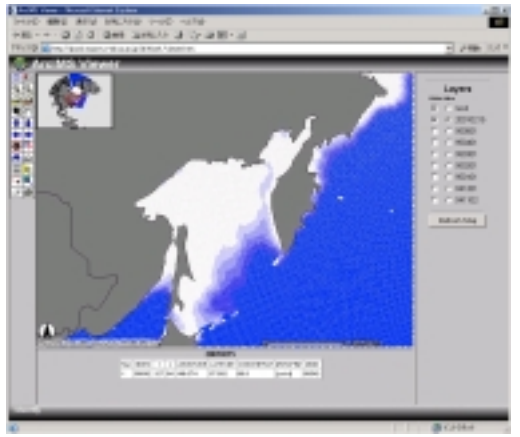
Results of Oil Spill Simulation and Guillemot Colony Position

Experimental Voyage through the Northern Sea Route: August, 1995

7 Tasks

- Monitoring the test voyage
  - Ice conditions along the route
  - Ship's progress
  - Evaluation of the transit voyage
- Evaluation of satellite ice information
  - Verification of satellite ice image by field data
  - Effectiveness of satellite ice image for navigation
- Performance measurement of SA-15 cargo ship
  - Daily logging of the voyage
  - Ship performance measurement

IMS Interface



Experimental Voyage through the Northern Sea Route: August, 1995

7 Tasks

- Technical issues of SA-15 cargo ships
- Operational problems of the NSR and future prospect
- Observation of natural environment
- Video documentation of the voyage

INSROP

↕ ・Data Survey/Construction and Future Prospects.

Experimental Voyage through the Northern Sea Route: August, 1995

・Acquisition of Actual NSR Data

・Acquisition of Ship Performance Data in Actural Sea Ice

↕

JANSROP

Extensive Model Tests in Ice Tanks

・Relation between Ship Hull Form and Performance

・Components of Force Acting on the Ship

Experimental Voyage through the Northern Sea Route: August, 1995

Projection of 35 min. video which recorded the onboard activities of the mission team consisting of 18 members from Japan, Russia and Canada.

People on board

- 32 Crew
  All Russian, A few persons can speak English.
- 18 Members of Scientific Team including 2 professional video crew, 1 director and 1 cameraman.
  15 Japanese, 2 Russian and 1 Canadian.

Homework

Investigate the modern history of resource development and transportation in cold regions, and discuss the environmental issues.

Travel with Troubles in the Beginning