WP4: Report on the service structure for Chinese monitoring for coastal environment and security

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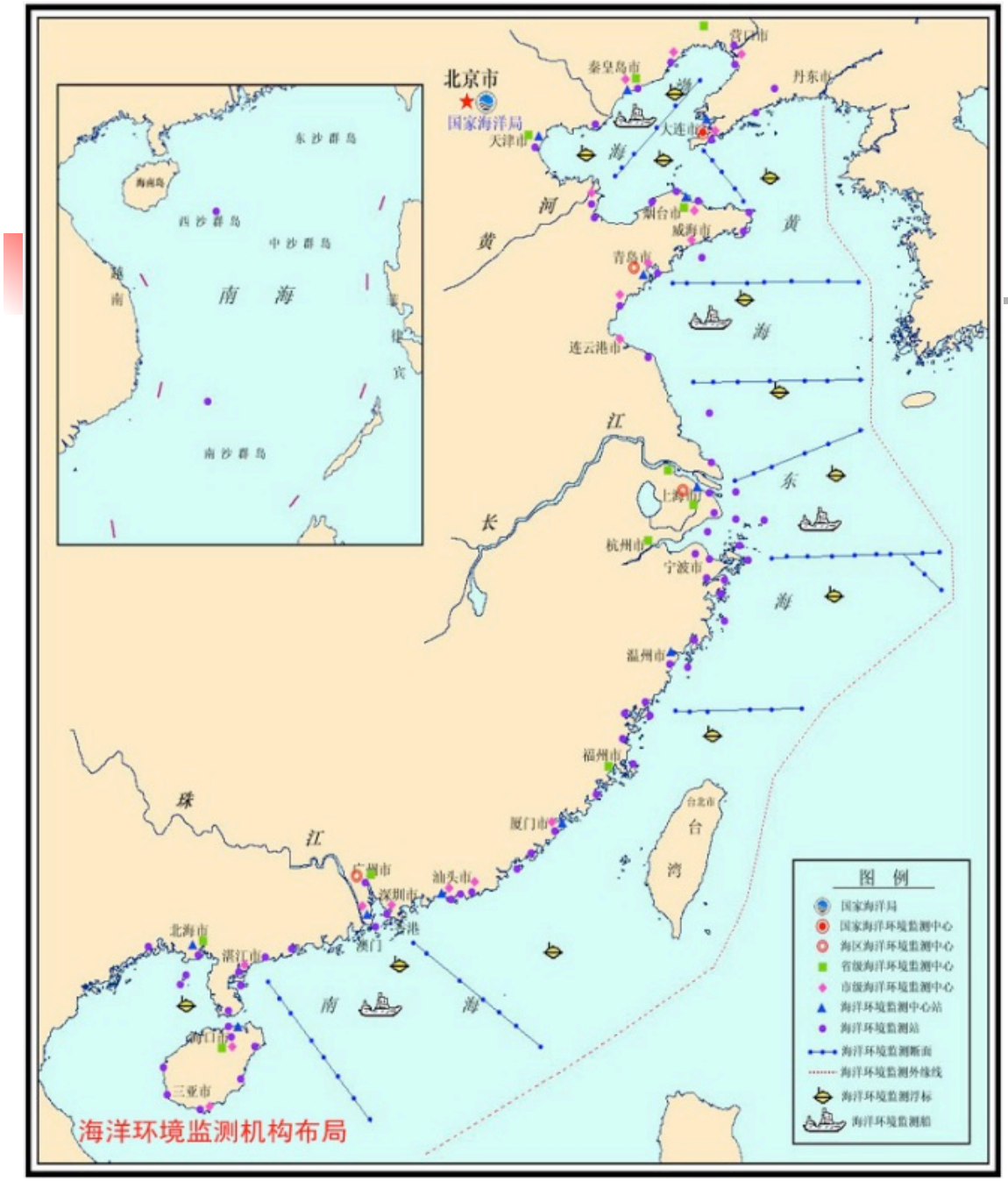
1. Framework of coastal environmental security service

1.1 *Shore-based stations*

The coastal environmental security monitoring is carried out by a shore-based regular observation network run by the State Oceanic Administration (SOA) and its 3 branches in different areas – North Sea Branch, East Sea Branch, and South Sea Branch. The regular observations are performed by more than 100 shore-based stations, which are respectively supervised by the national, regional, provincial and civic administration. In-situ observations are also performed regularly along several sections in China Seas.



Monitoring network in China

State Oceanic Administration

National Marine Environmental Monitoring Center

Regional Marine Environmental Monitoring Center

Provincial Marine Environmental Monitoring Center

Municipal Marine Environmental Monitoring Center

The center station of Marine Environmental Monitoring

The station of Marine Environmental Monitoring

The profile of Marine Environmental Monitoring

The boundary of Marine Environmental Monitoring

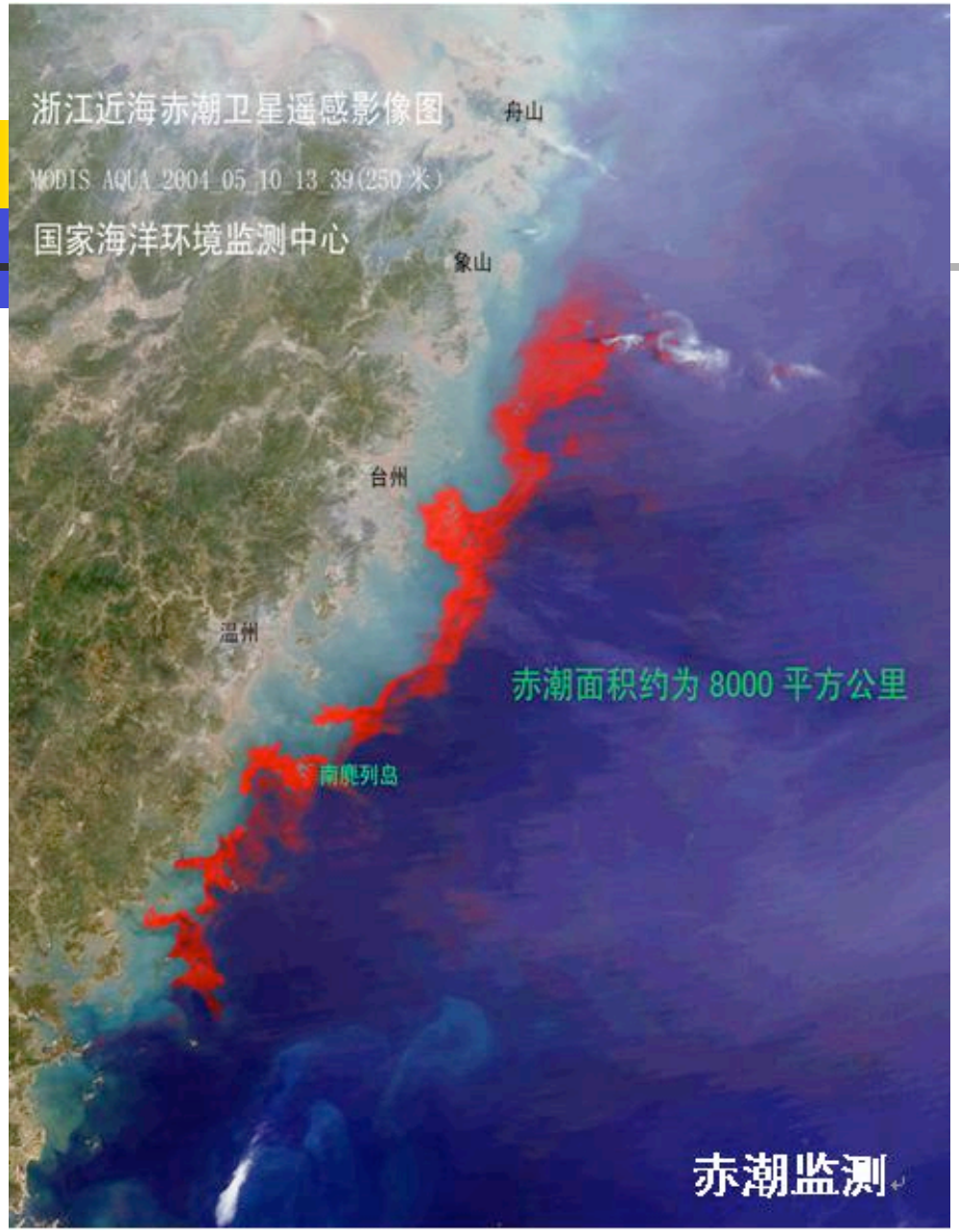
The bouy of Marine Environmental Monitoring

The ship of Marine Environmental Monitoring

1.2 *Aviation and Satellites*

Red tide and Green tide

Together with the information from the shore-based observations of red tide related sea properties, red tide could be reported on time, and when Harmful Algal Blooms take place, they will be better tracked and precautions could be more effective.



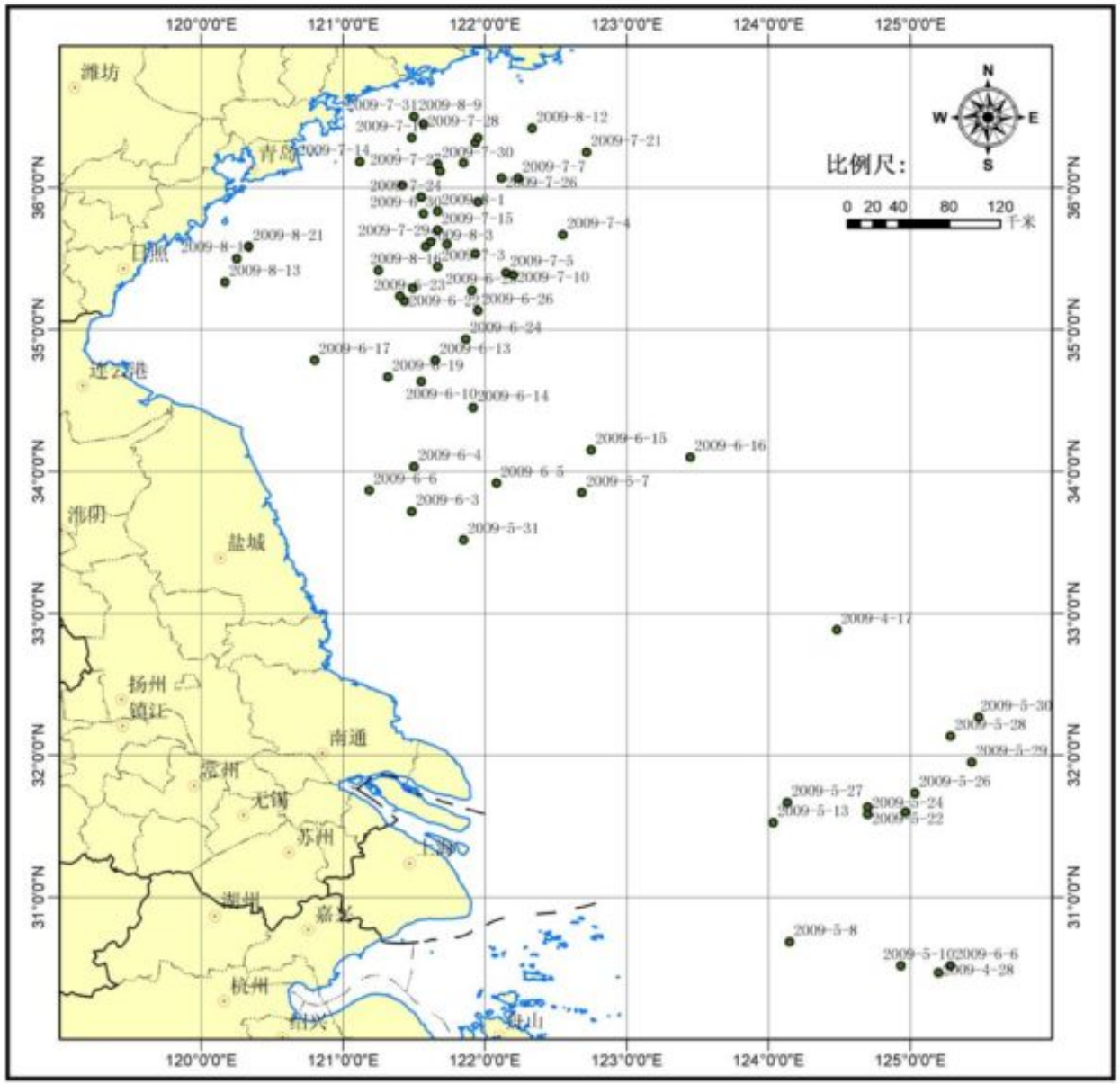
The red tide satellite remote sensing image in Zhejiang province

By National Marine Environmental Monitoring Center

1.2 *Aviation and Satellites*

Red tide and Green tide

Green tide has recently become highly concerned, especially after the case during the Beijing 2008 Olympics. NMEFC and National Satellite Ocean Application Service (NSOAS) started a program that deals with the monitoring of the green tide and its route forecasting service. Satellite HY-1A monitors the water color and chlorophyll, and figures the green tide shape.



Green Tide Monitoring in 2009

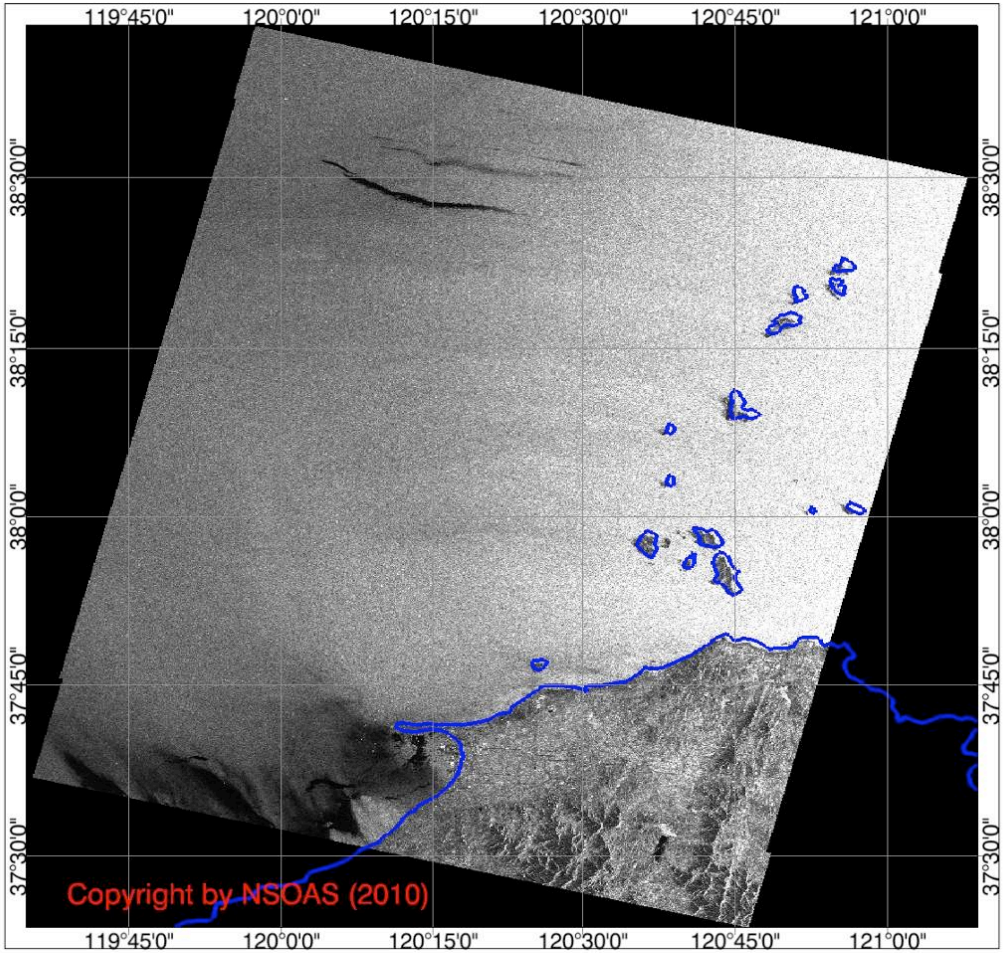
By National Satellite Ocean Application Service

1.2 *Aviation and Satellites*

Oil Spill monitoring

The identification system of oil spill pollution was an important achievement made by the NMEMC. Infrared spectrum, fluorescent spectrum were tested in situ in Dalian Port Surveillance for two years. 20 difficult and complicated cases of ship spilled-oil are treated. It had more environmental, economical and social effects in identification of ship oil pollution sources and provided scientific basis for law-enforcement management of sea surface oil spill, which filled the blank in this research field in China. NSOAS and NMEFC apply this method with HY-1B and Terra satellite data into the spy of oil spill. Relative forecast of the oil drifting route is also offered to help the treatment in succession.

№.2010036B 渤海溢油遥感监测解译图



The image of oil spill
Photo by aircraft

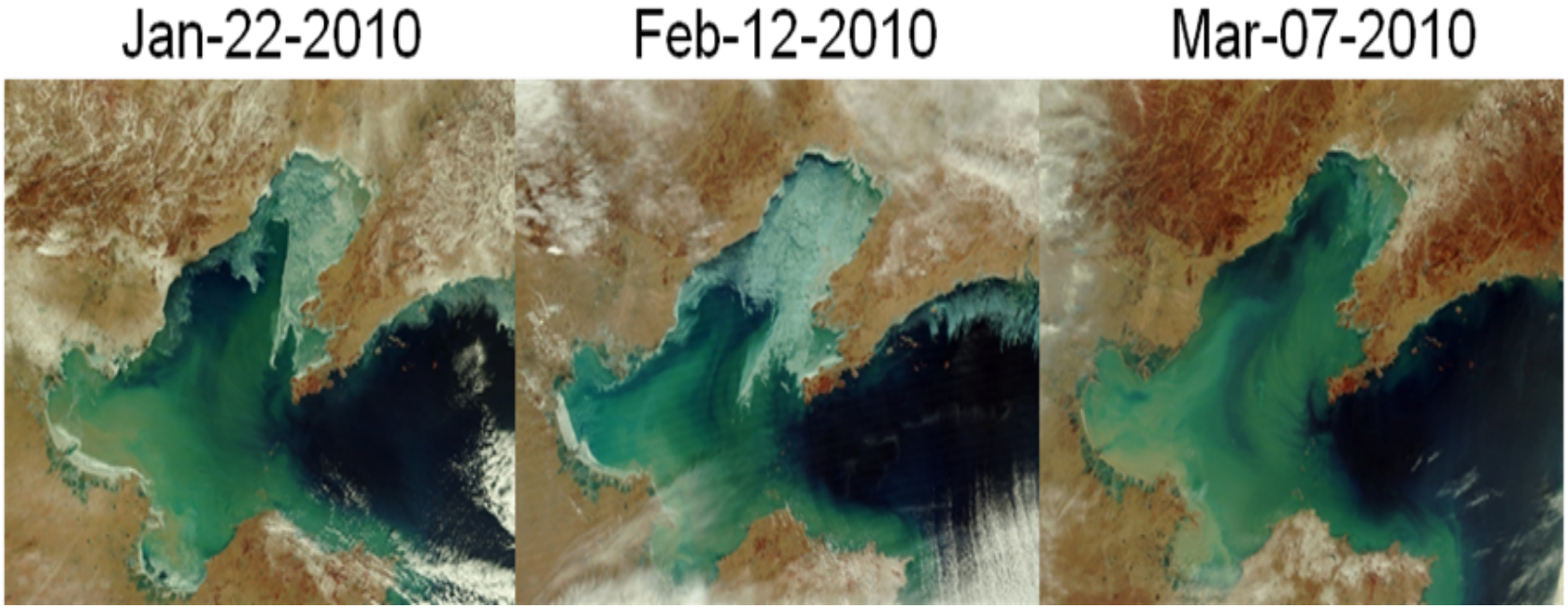
The oil spill satellite remote sensing image in Bohai sea

By National Satellite Ocean Application Service

1.2 *Aviation and Satellites*

Sea ice monitoring

Two main methods were used in this proceeding: the aviation and the satellite monitoring. The aviation monitoring uses camera, microwave radiometer, side-looking radar, usually operated by the aviation group of the North Sea Branch of SOA. The satellite remote sensing monitoring uses the NOAA and the HY-1 satellite data to determine sea ice parameters such as sea ice scope, drift velocity, ice category etc.



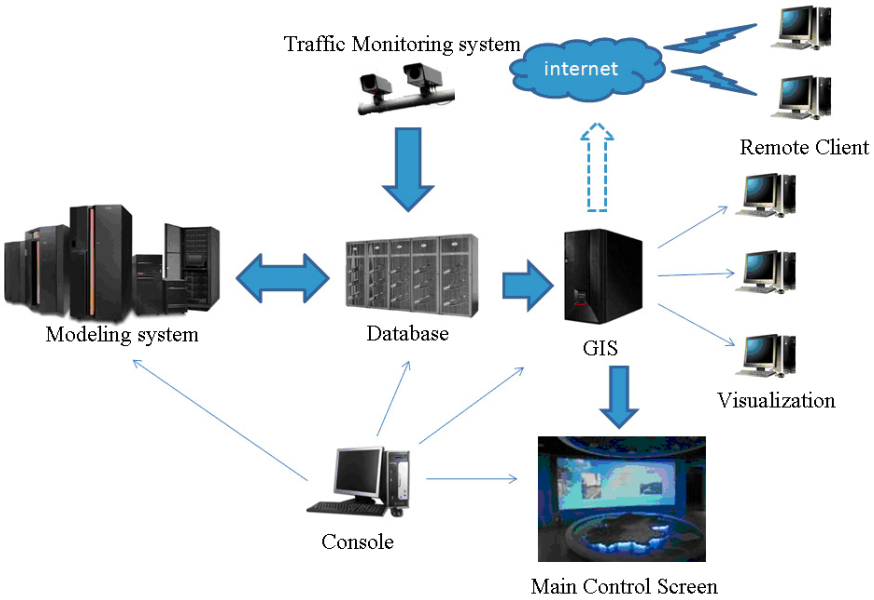
Satellite images of sea ice monitoring

As is illustrated in above figure, the whole procedure from ice forming, spreading and shrinking have been well monitored.

1.2 *Aviation and Satellites*

Air quality

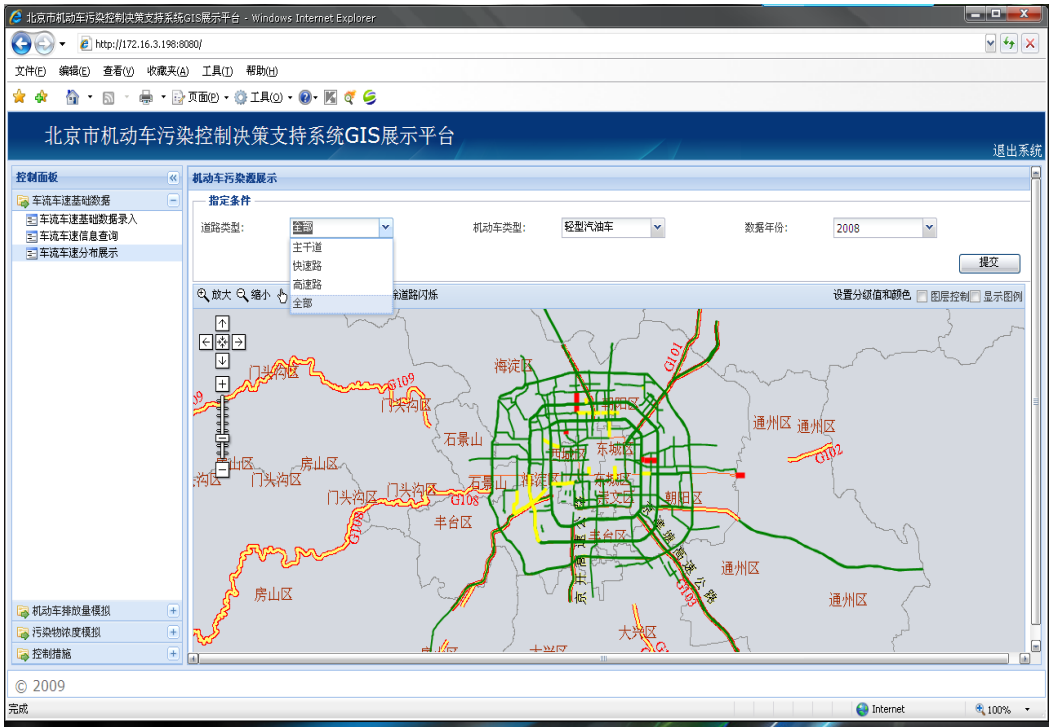
The Beijing Municipal Environmental Protection Bureau (BMEPB) initiated a project named 'Research and Development of the Decision and Support System for Vehicular Pollution Control' in October 2008, aiming at understanding the contribution of vehicle emission to local air quality and evaluating multiple measures on automobile control in Beijing. The transportation Commissions within the Beijing Metropolitan Government involved in this project. The results of DSSAPC (Automobile Pollution Control) are going to be used by the BMEPB only.



Hardware Framework of the DSSAPC (upper left)

Road Network and traffic flow in Beijing: a snapshot (upper right)

Snapshot of real-time traffic emission from the system (below right)



1.3 *Monitored Aspects*

- Trend assessment of marine environmental quality;

  Water, sediment, marine life quality monitoring ;

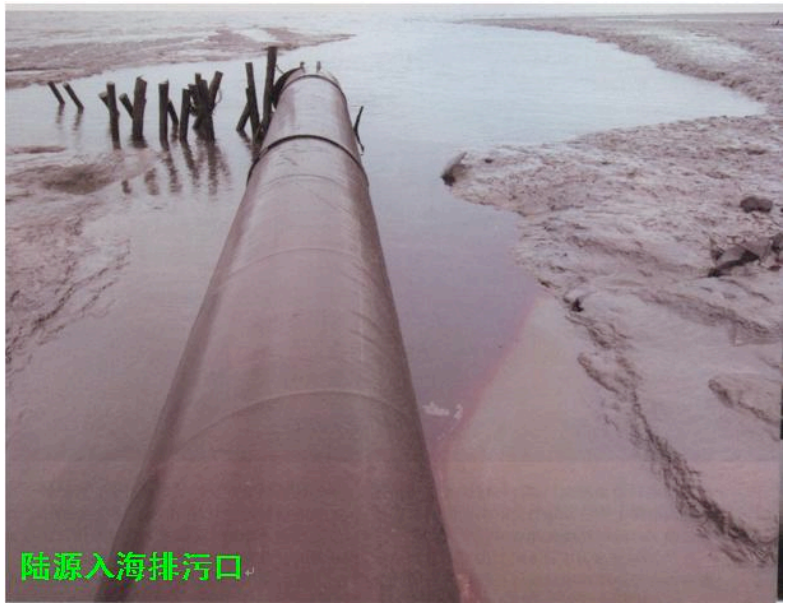
  Marine functional areas monitoring (beach, culture areas, dumping areas, nature reserves, etc.);

  land-based sources of pollutants monitoring;
- Coastal red tide monitoring;
- Coastal marine ecology monitoring;

1.3 *Monitored Aspects*

- Estuary and adjacent zone monitoring;
- Olympic sailing venue monitoring;
- Marine meteorological monitoring;
- Sea ice monitoring

Land-based Pollution Monitored in 2009

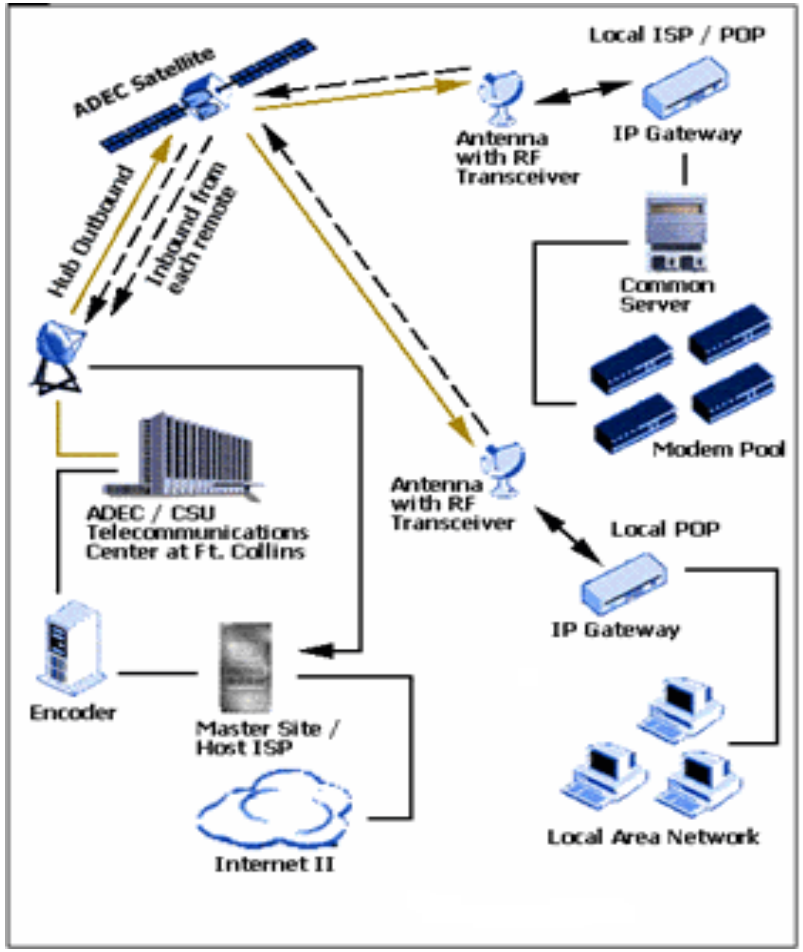


Seaside sewage outfall

A pitiful seabird

1.4 *Communication Mechanism*

- All the shore-based observations are sent to NMEFC through a network called VSAT (Very Small Aperture Terminal). Then the data are shared relevant centres and service units to help picture the sea and to give forecasts or pre-warnings.
- The satellite data of HY-1A, HY-1B and also received Terra, Aqua, etc. are interpreted by NSOAS (National Satellite Ocean Application Service) and sent to related department of other centres for further service, like SST, green tide, red tide and oil spill.
- Tide and tidal observation goes to NMDIS (National Marine Data and Information Service), and delivered upon user request.


Local ISP / POP
ADEC Satellite
Antenna with RF Transceiver
IP Gateway
Hub Outbound
Inbound from each remote
Common Server
Modem Pool
ADEC / CSU Telecommunications Center at Ft. Collins
Antenna with RF Transceiver
Local POP
IP Gateway
Encoder
Master Site / Host ISP
Internet II
Local Area Network

VSAT System

2. Service catalogue

2.1 *Bulletins and callboards*

Most of the services are provided on website of each centre. Every year, different aspects of the China seas' situation are assessed and reports are published. The main bulletins are in sea level, ocean environment quality and ocean disasters.

2.1 *Bulletins and callboards*

Chinese Sea level Bulletin

Chinese Sea Level Bulletin is published every year by NMDIS to summarize the sea level characteristics and variation within the year. In the 2009 report, the interaction between the rising of sea level and climate change, ocean disasters, and its influence on long-shore ecosystem was also demonstrated. Upon all these facts and research, prospective strategies were studied and discussed. The Chinese Sea level Bulletin is an important reference to the policy makers and ocean administrators, as well as those industries and business along the sea shore.

2.1 *Bulletins and callboards*

Ocean Environment Quality Bulletin

The ocean environment is quite an important factor in the nation's coastal development, socially, economically and ecologically. Thus it has been highly concerned by the government, national and provincial. The Environmental Quality Bulletin also has two types: the national one called "Chinese Environment Quality Bulletin" and the provincial ones named after different provinces.

2.1 *Bulletins and callboards*

Ocean Environment Quality Bulletin

The Bulletin depicts the health situation of the long-shore areas and estuaries, the pollution quantities at drainage areas, and situation of the vulnerable areas of the seas, as well as ecology disasters like red tide and green tide, etc. The Bulletin provides an overall understanding of the sea shore and the ecosystem, makes people aware of the probable disasters that may be caused to the sea by human's improper behaviours, and help adjust regulations and developing plans of local government to make a better but continuable use of the ocean.

2.1 *Bulletins and callboards*

Chinese Ocean Disaster Bulletin

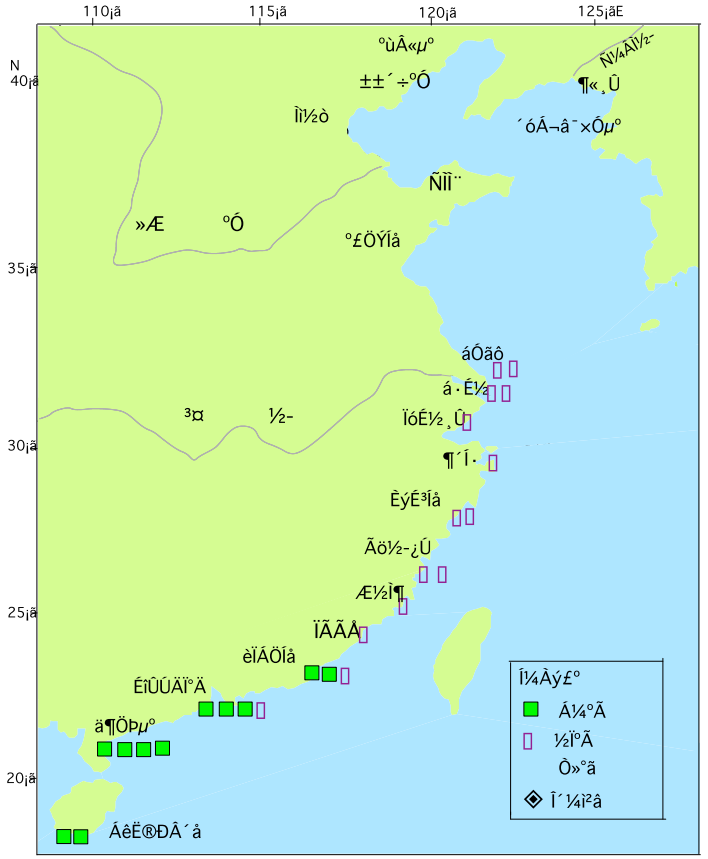
The Chinese Ocean Disaster Bulletin mainly summarizes the disasters happened in the year, and the loss that caused by storm surges, huge waves, sea Ice, erosions, Tsunami, green tide, etc.

Distribution of earthquake sources may caused tsunami in 2009

2.1 *Bulletins and callboards*

Red Tide Callboard

The callboard is monthly published on investigation of the environmental parameters in aquaculture areas and the dominate species of algal. Assessment is made of different aquaculture zones, as is shown in right Figure ,Green stands for GOOD, purple for FINE, magenta for ordinary，blank rectangle for not-assessed.



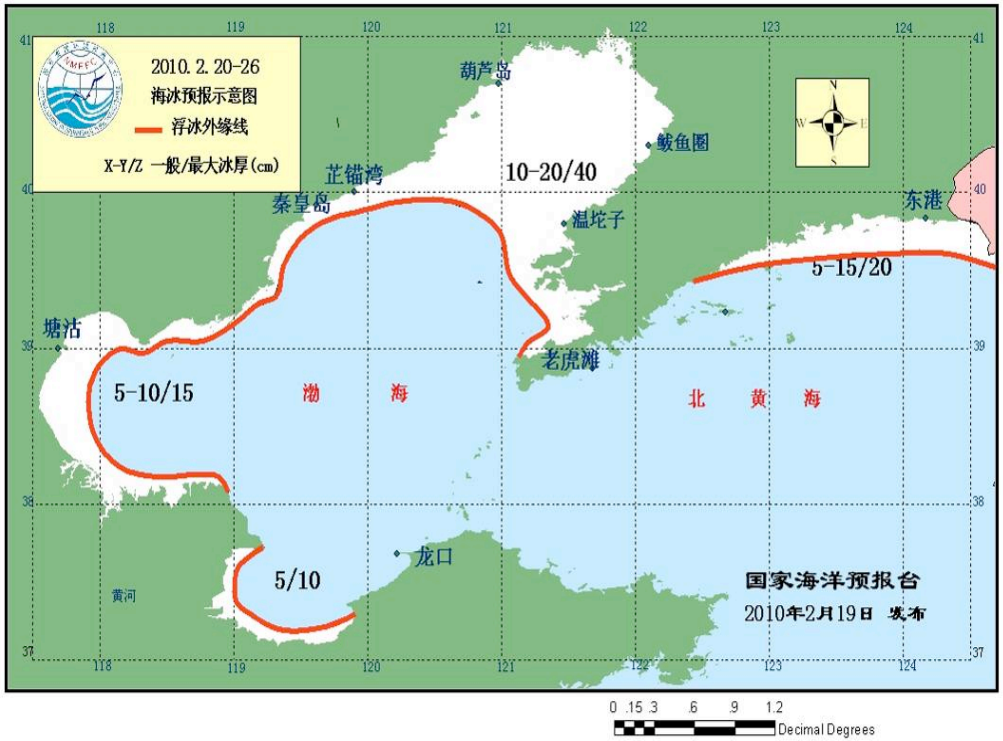
Monitor over aquaculture zones in Jan, 2009

2.2 *Reports and forecasts*

Sea Ice

In the winter of 2009, the severe sea ice situation in Bohai Sea and North Yellow Sea spread hot around TV and broadcast news, interviews, on-spot record and so on. NMEFC set up and sea ice emergency group to monitor and report the variation of the ice, and deliver forecasts and pre-warnings, which were accomplished effectively and successfully.

Sea ice in Bohai Sea



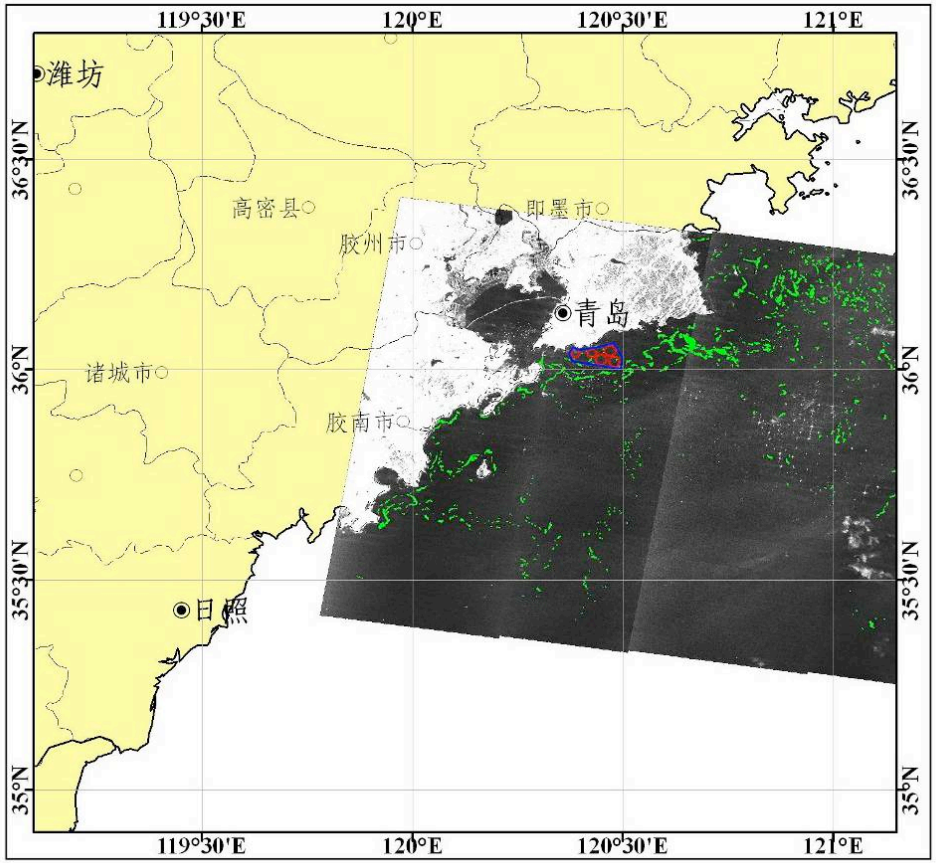
Sea ice extent forecast in Bohai Sea and North Yellow Sea

By NMEFC

2.2 *Reports and forecasts*

Green tide

In the summer of 2008, green tide become a trouble for the sailing race of the Olympics. NMEFC started an emergency reaction group to monitor the green tide by satellite images and reported, which was successful thus was continued in 2009 and become a public service ever since.

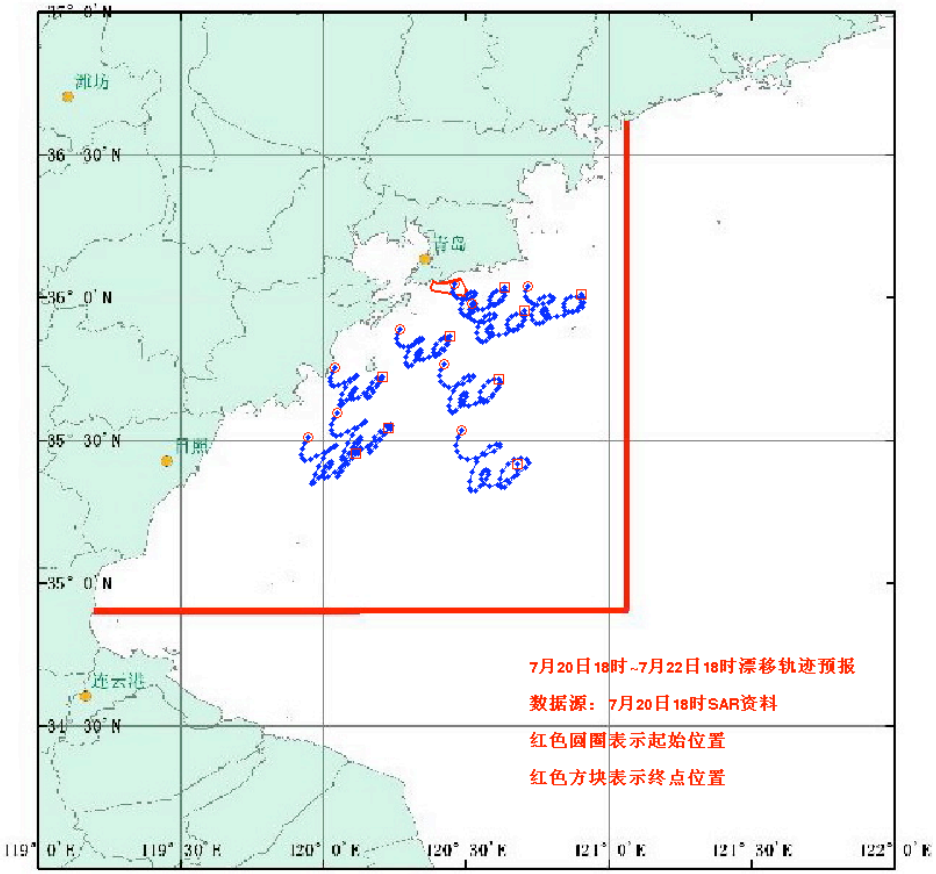


Satellite remote sensing interpretation map of Green tide

By NSOAS

The forecasting of the drift direction and distance of the Green tide based on Satellite remote sensing interpretation map

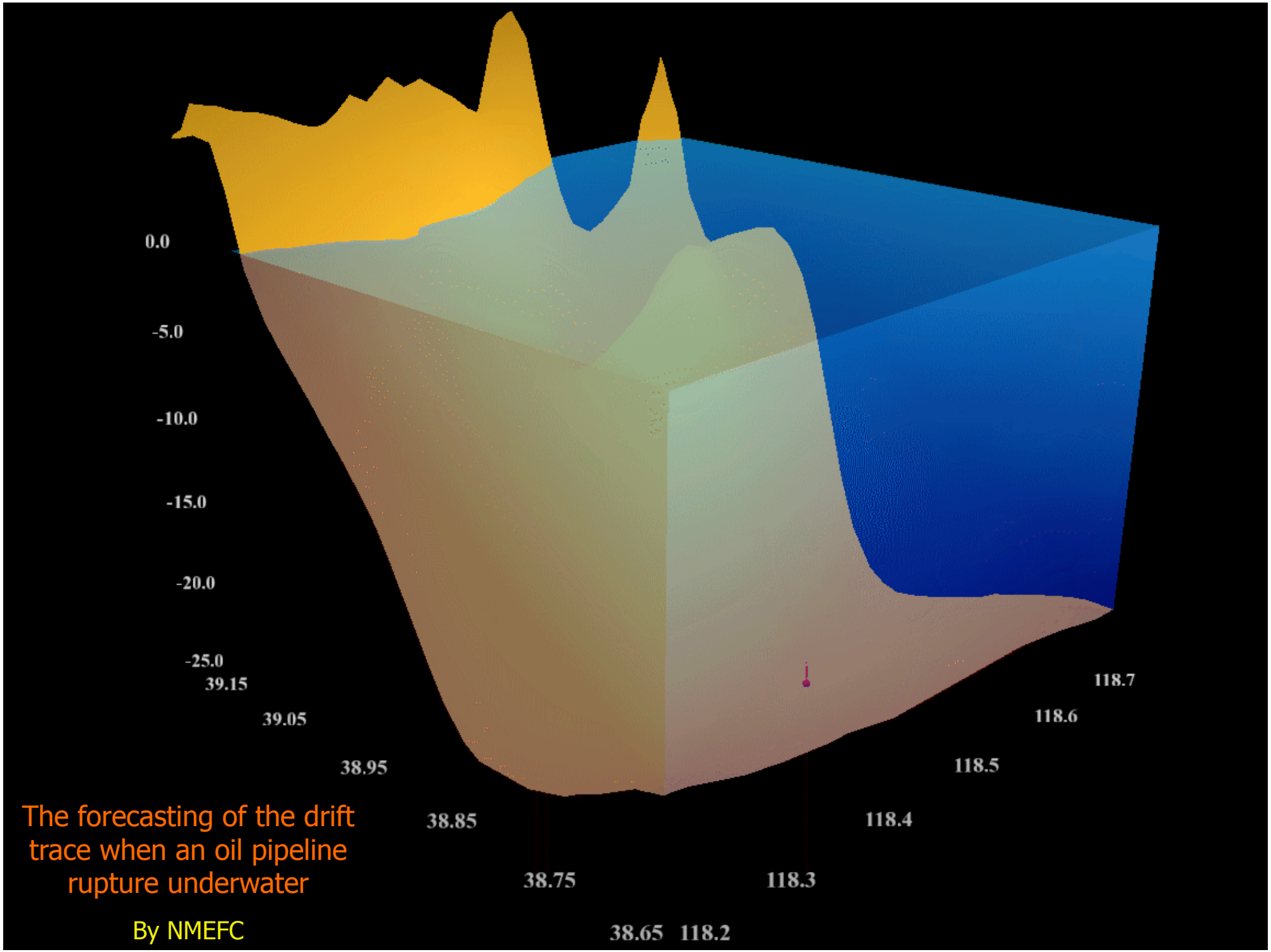
By NMEFC



2.2 *Reports and forecasts*

Oil spill

Along the sea shore of China Seas, there are a lot of oil fields, platforms, and the long coast makes great harbours. Sometimes, incidents take place and oil could spill out into the sea from ships or from under the sea. The spread of oil could cause damage to fishery and harm the coastal environment. From satellite picture and the interpreting technique, oil spill is reported in time, forecast of the track is delivered, and measures are taken.


0.0
-5.0
-10.0
-15.0
-20.0
-25.0
39.15
39.05
38.95
38.85
38.75
38.65
118.2
118.3
118.4
118.5
118.6
118.7
The forecasting of the drift trace when an oil pipeline rupture underwater
By NMEFC

2.2 *Reports and forecasts*

Long-shore Tourism and Beach Bathing

China has a long coast line and a great number of long-shore tourism spots and bathing beaches, thus a monitor network of these spots and beaches was set up in 2002 by SOA, with 16 spots and 23 beaches.

Bathing Beach along the coast of China

2.2 *Reports and forecasts*

Long-shore Tourism and Beach Bathing

The monitoring contents include: water quality, hydrographical and meteorological parameters , sometimes emergencies of oil spill or red tide, etc. According to the monitoring, assessing follow content and released to the public:

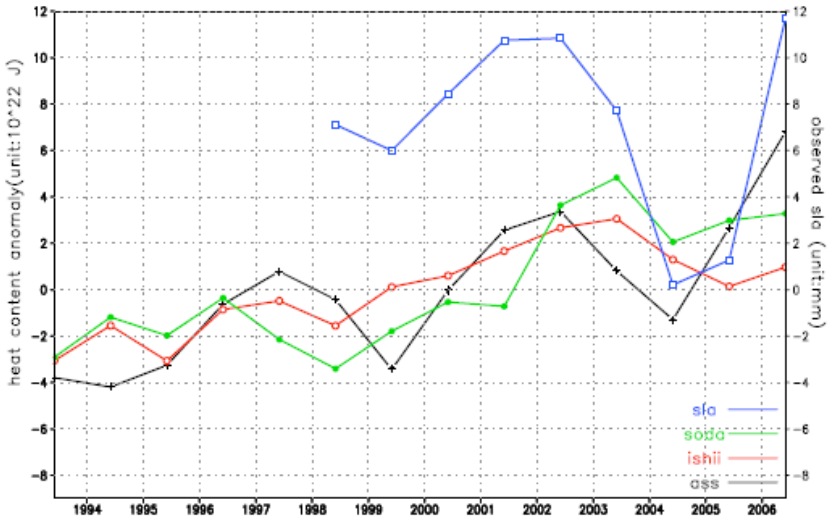
- Fishery degree in the sea
- Sight-seeing degree on the sea
- Sight-seeing degree under the sea
- Sight-seeing degree along shore
- Swimming degree in the sea
- Entertainment degree on the sea
- Entertainment degree on the beach

2.2 *Reports and forecasts*

Ocean reanalysis system

An ocean reanalysis system for the joining area of Asia and Indian-Pacific Ocean (AIPO) is developed by IAP and has being delivered reanalysis data sets for study on the air-sea interaction over AIPO and its climate variation over China in the inter-annual time scale. This system consists of a nested ocean model forced by atmospheric reanalysis, an ensemble-based multivariate ocean data assimilation system and various ocean observations.

AIPO Reanalysis now released a coarse resolution (3/4degree by 3/4 degree) reanalysis. It contains daily 3-dimensional temperature, salinity, velocity and sea level which can be downloaded via ftp://159.226.119.9/data/973AIPO/



The time series of the heat content anomalies of the upper 700m ocean from three data sets and observed SLA changes

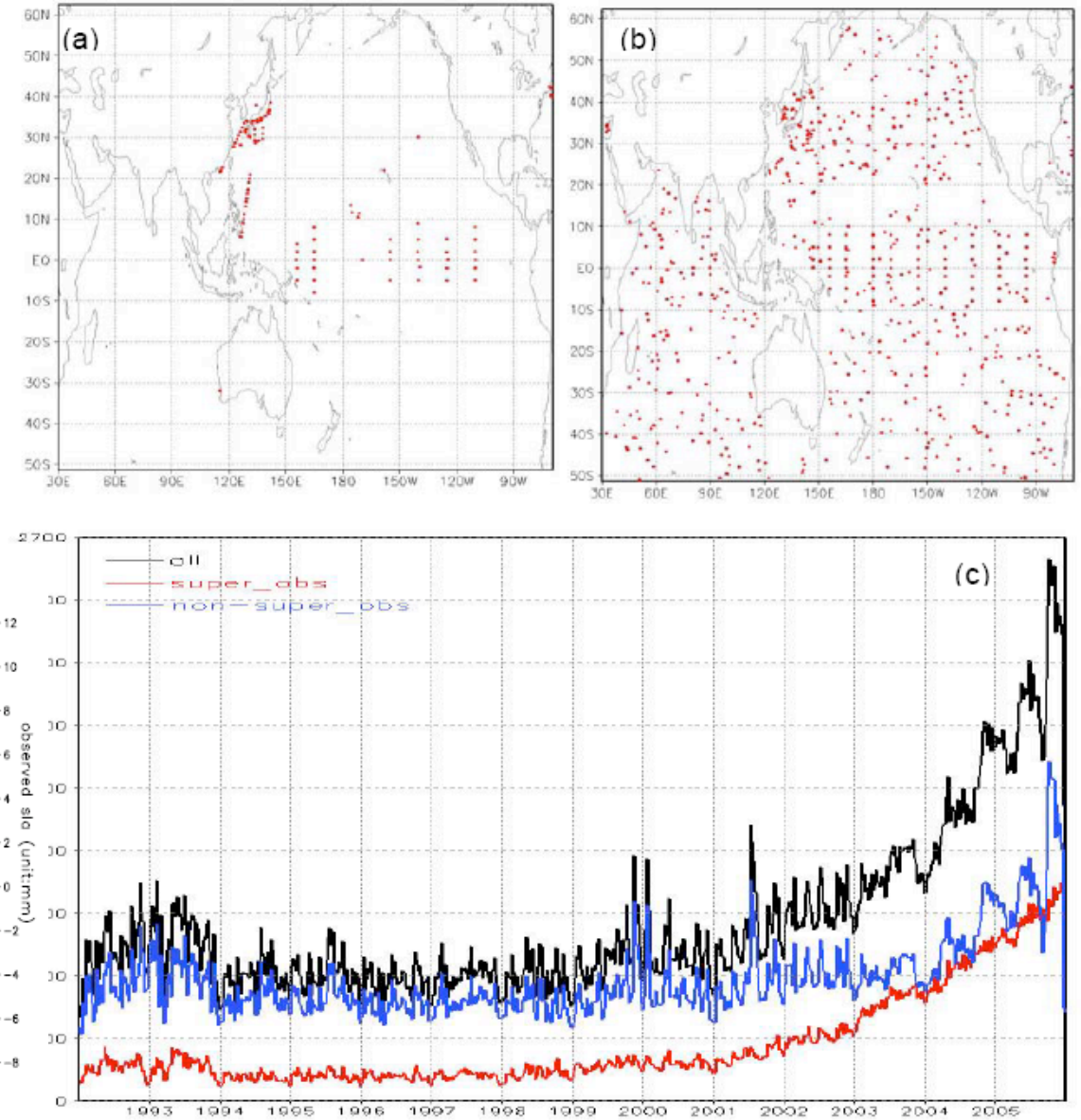


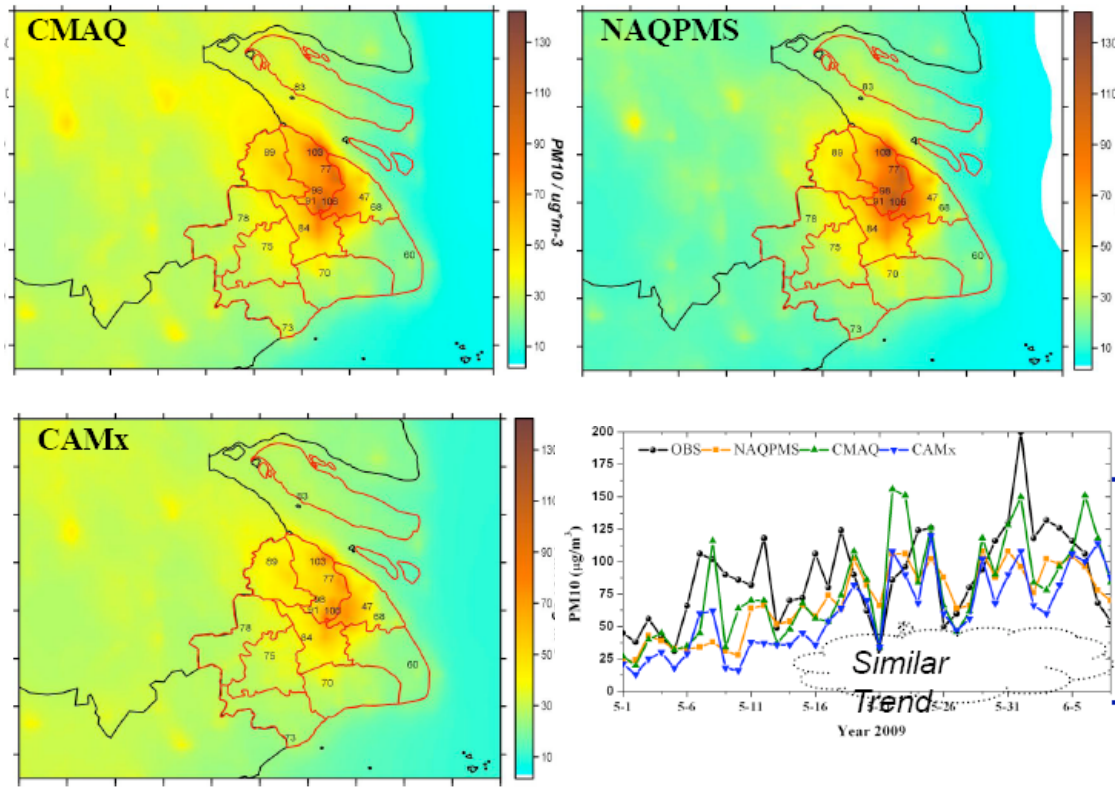
Figure (a) the super-observations for temperature and salinity profiles for seven days of Jan 8-14, 1992 (b) the super-observations for temperature and salinity profiles for seven days of Feb 22-28, 2005, (c) the numbers of profiles with the window of 7 days for the studied region from all observations (black line), super-observations (red line), withheld observations (blue line)

2.2 *Reports and forecasts*

Air quality

Case to Shanghai World Expo 2010

A regional air quality monitoring network in the Yangtze Delta covering Shanghai, Jiangsu and Zhejiang province is being established so as to monitor local atmospheric environment comprehensively and promote regional data-sharing and cooperation. an ensemble modeling system of air quality forecast for Shanghai Expo 2010 (EMS-Shanghai) is also designed and established.



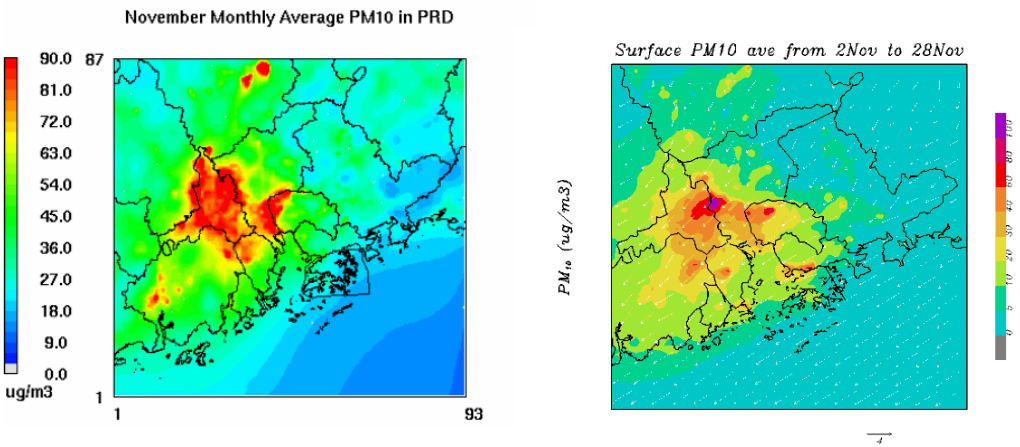
Ensemble modelling system of air quality forecast for Shanghai Expo 2010

2.2 *Reports and forecasts*

Air quality

Case to the 16th Asian Games in Guangzhou

According to " Air quality protection plan for Asian Games", different emission reduction strategy and control measures will be conducted before Asian Games, during Asian Games and in situation when weather conditions is adverse for dispersion of air pollutants. Through modified model emission, one can used regional models to assess the effects of all kinds of control measures. Model results indicated that the implementing of " Air quality protection plan for Asian Games" could effectively bring down the level of PM10 concentration in Guangzhou and Foshan.



Monthly Average PM10(ug/m3) in Nov 2006 over PRD, left: CMAQ simulation, right: NAQPMS simulation

2.2 *Reports and forecasts*

Climate model

The new version of the Bergen Climate Model (BCM2) has been developed. No flux adjustment is applied between the atmosphere and ocean. It contains the following parts

- The atmosphere component of BCM is the spectral atmospheric general circulation model ARPEGE-CLIMAT3 from METEO FRANCE
- The oceanic component of BCM is the Miami Isopycnic Coordinate Ocean Model (MICOM)
- The sea-ice model of BCM2 is GELATO, a sea-ice model that was developed at METEO FRANCE and described in detail by Salas-Melia (2002)
- The coupler: The OASIS coupler (version 2.2) has been used to couple the atmosphere and ocean models. It was developed at the National centre for climate modeling and global change (CERFACS), Toulouse, France (Terray and Thual, 1995)

3. An Overview of WP4

3.1 *Assessment of current status on the Ocean and coastal information products and services*

Ocean environmental forecasting system and the related products provided in China are introduced in the first and second year reports. The main gaps between China's service system and European service system should be decreased by China with future continuous efforts in the following fields:

- **The initial forcing field and data assimilation availabilities.**
- **Mechanism of some key physical process studies and parameterization.**
- **Model products' verification and validation.**
- **In situ data, satellite data and model forecasting data service should be improved.**

3.1 *Assessment of current status on the Ocean and coastal information products and services*

Mean differences are:

- **No real operational european coastal products.** Europe starts from regional and global to coastal areas. Downscaling is in preparation.
- **European centralisation of input data and output products in dedicated centers.**
- **Products access mostly freely via web site.**

3.2 *The service structure for Chinese monitoring for coastal environment and security*

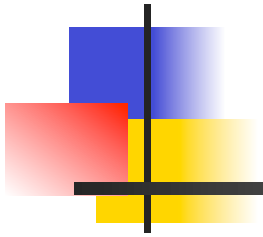
The service structure for Chinese monitoring for coastal environment and security is discussed in the third year report. The service of Chinese monitoring for coastal environment and security is now quasi-officially controlled by the government. SOA, the leading department of the oceanic managements, is mainly controlling the whole story with its 3 branches and hundreds of local agents along the coasts. The oceanic service information is also issued by SOA's agents, either from the headquarters, or from the local agents.

3.2 *The service structure for Chinese monitoring for coastal environment and security*

Lacking sustainable financial support, universities and research institutes are unable to establish their own operational service systems though they have the advantages in most of the ocean-related fields. Lacking quick transfer of the new techniques and new findings from universities and research institutes, China's operational service systems remain behind those of the European partners. The service system of Chinese monitoring for coastal environment and security is also in a great need of a resource-sharing system which now significantly limits the development of the ocean science in China.

3.3 *Summary*

Gaps of the oceanic operational service systems between China and Europe have been in existence for past decades and will remain for quite a long time in the coming decades. Measures must be taken to decrease these gaps. State financial supports should also go to the universities, research institutes and even personal companies who are capable of establishing operational service systems to introduce in a competition among operational systems. The stated funded projects of China should contribute their measurements to a state-owned resource sharing system which will distribute the measurement freely to those potential users. European partners have already set up many good examples among European institutions and universities.



THANKS

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