

## **Long Term Observation for Ocean Research Performed in TORI**

**Wen-Chang Yang, Dr. Eng.**

**Associate Research Fellow,  
Taiwan Ocean Research Institute,  
National Applied Research Laboratories**

**2009/11/30 NCHC, Taichung, TAIWAN**

# Agenda

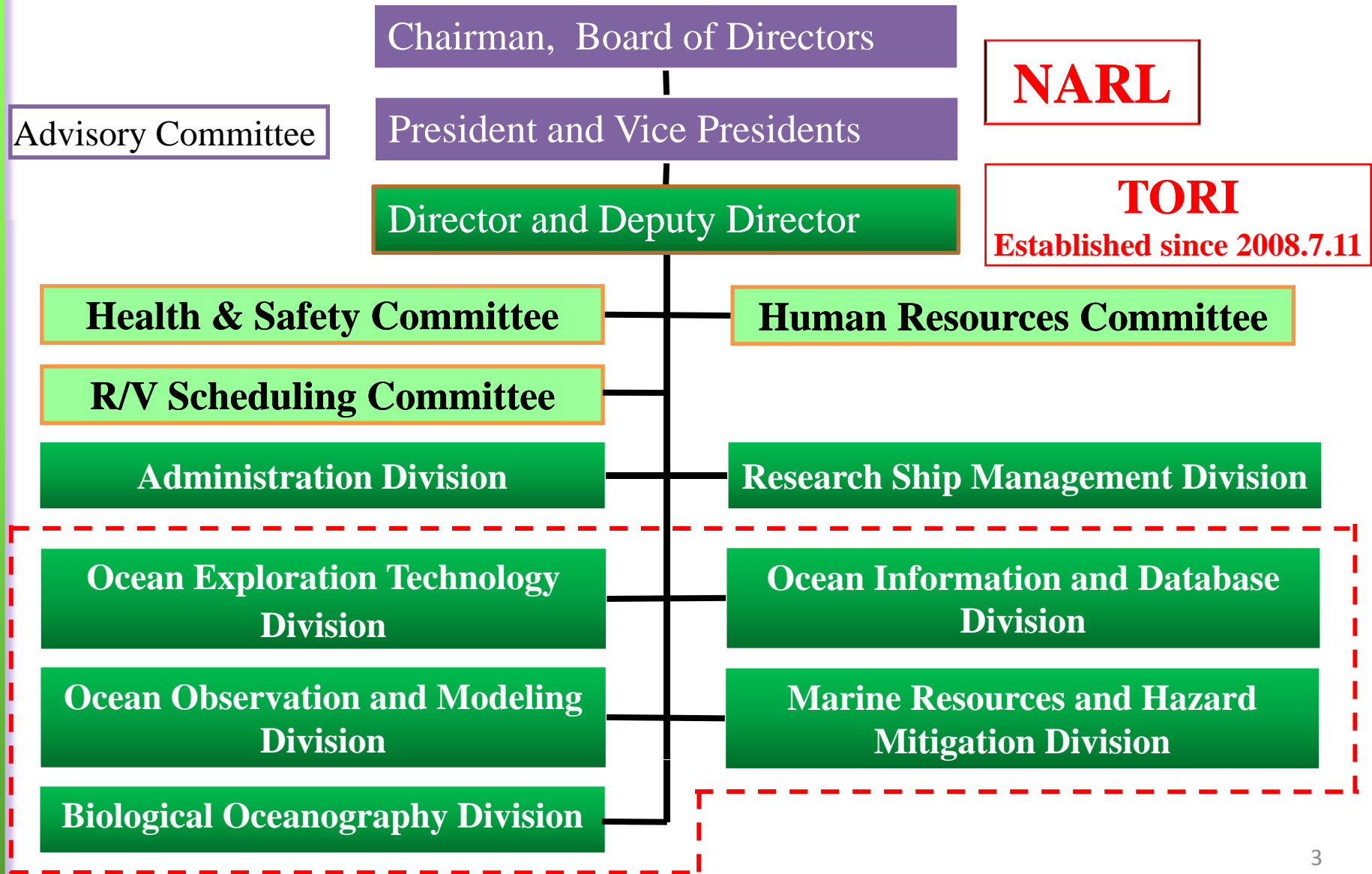
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**A. Introduction of TORI**

**B. Long Term Observation**

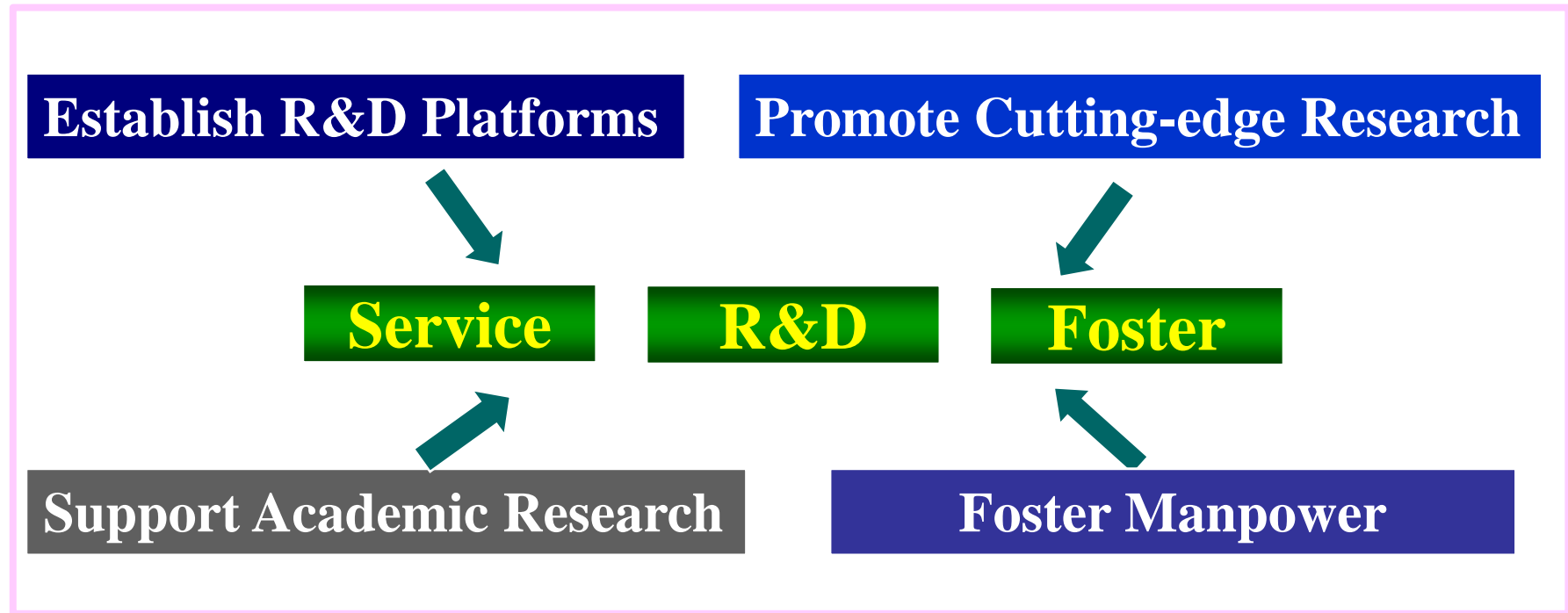
**C. Introduction of Headquarter**

# Organization of TORI



# Mission

*For Ocean Research*





# Subjects



● Building and operation of a 2700 ton New R/V

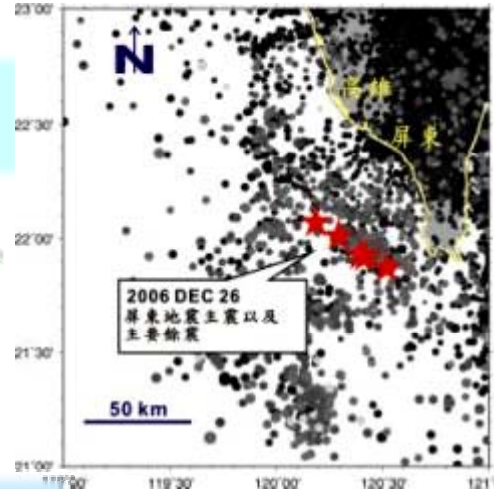
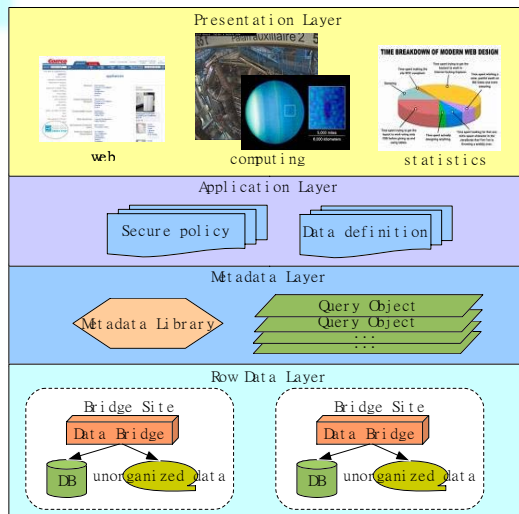


● Technology of marine biomass energy from algae

● Biological Oceanography

● Development of 3000m ROV of two-body type

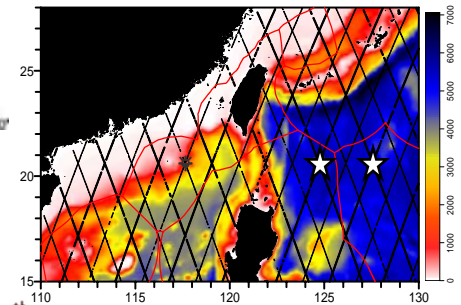
● Set-up of ocean database and network (Data Grid)



● Set-up of an observatory for marine earthquake in southwest sea bottom



● Set-up of long-term observation network and development of operational ocean model



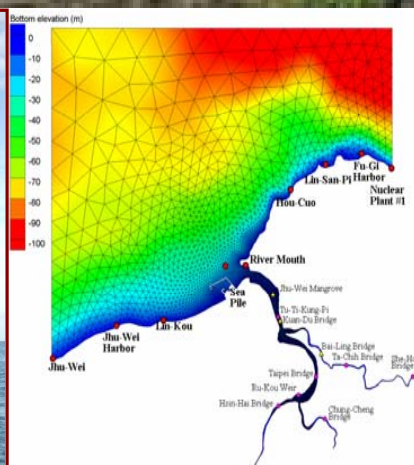
● Wave energy related technology development



# Subjects –for Ocean Observation and Modeling Division

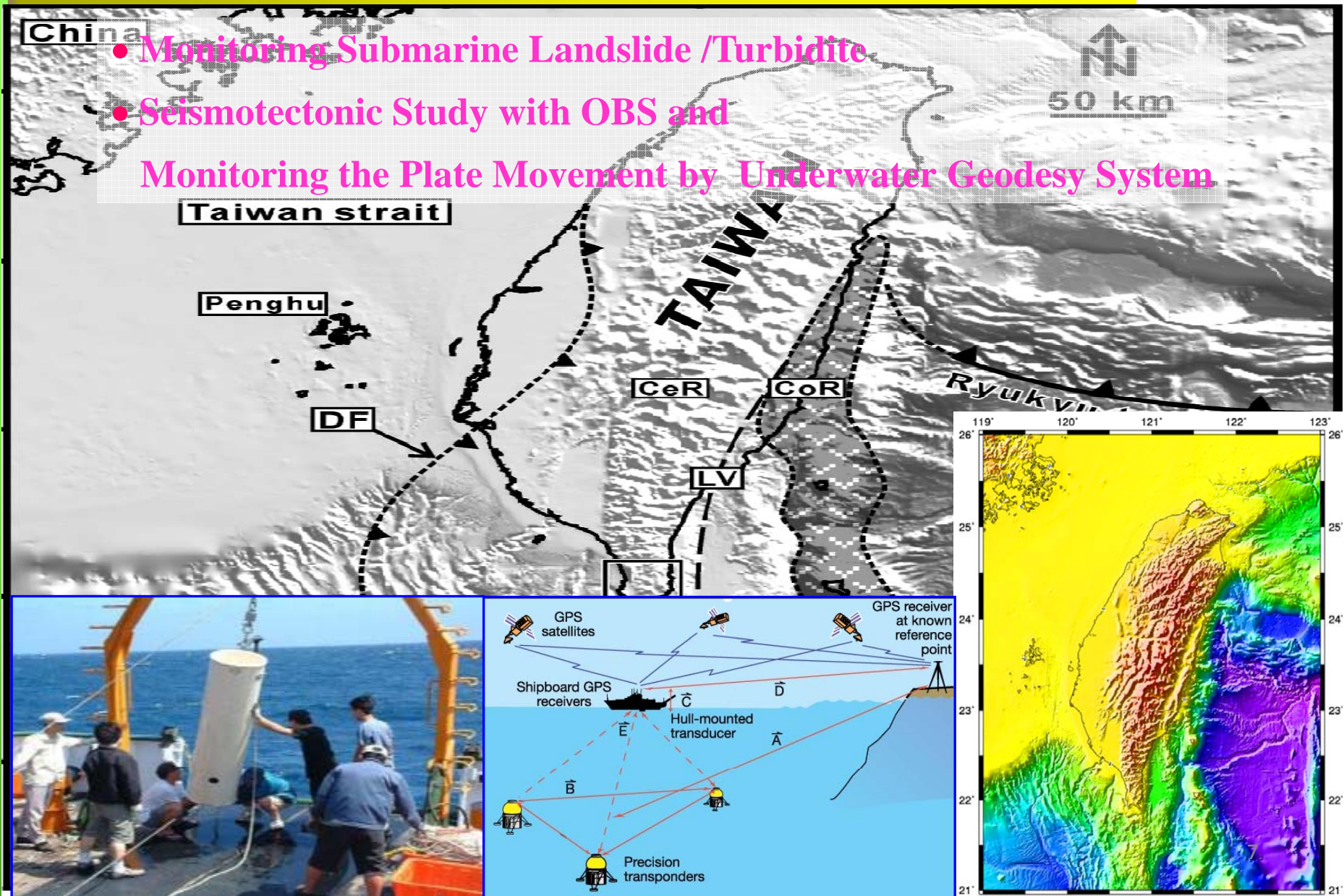
- Observational Platform for Surface Current around Taiwan
- Observational Platform for Physical Oceanography
- Observational Platform for Chemical Oceanography
- Observational Platform for Biological Environment
- Ocean Model Development and Application
- **Taiwan Coastal Observation & Assessment Station (TaiCOAST)**

San Clemente Island, California





# Subjects—for Marine Resources and Hazard Mitigation Division





# Subjects –for Ocean Information and Database Division

- Platform for Taiwan Ocean Data network (TODnet)
- TORI Marine Environmental Database (TORI-MED)
  - Shipboard
  - Hydrographic data
  - Geological data
  - Geophysical data
  - Biological data
  - Long-term observatory and monitoring data
  - Remote sensing data (ocean color / SST)
  - Core repository

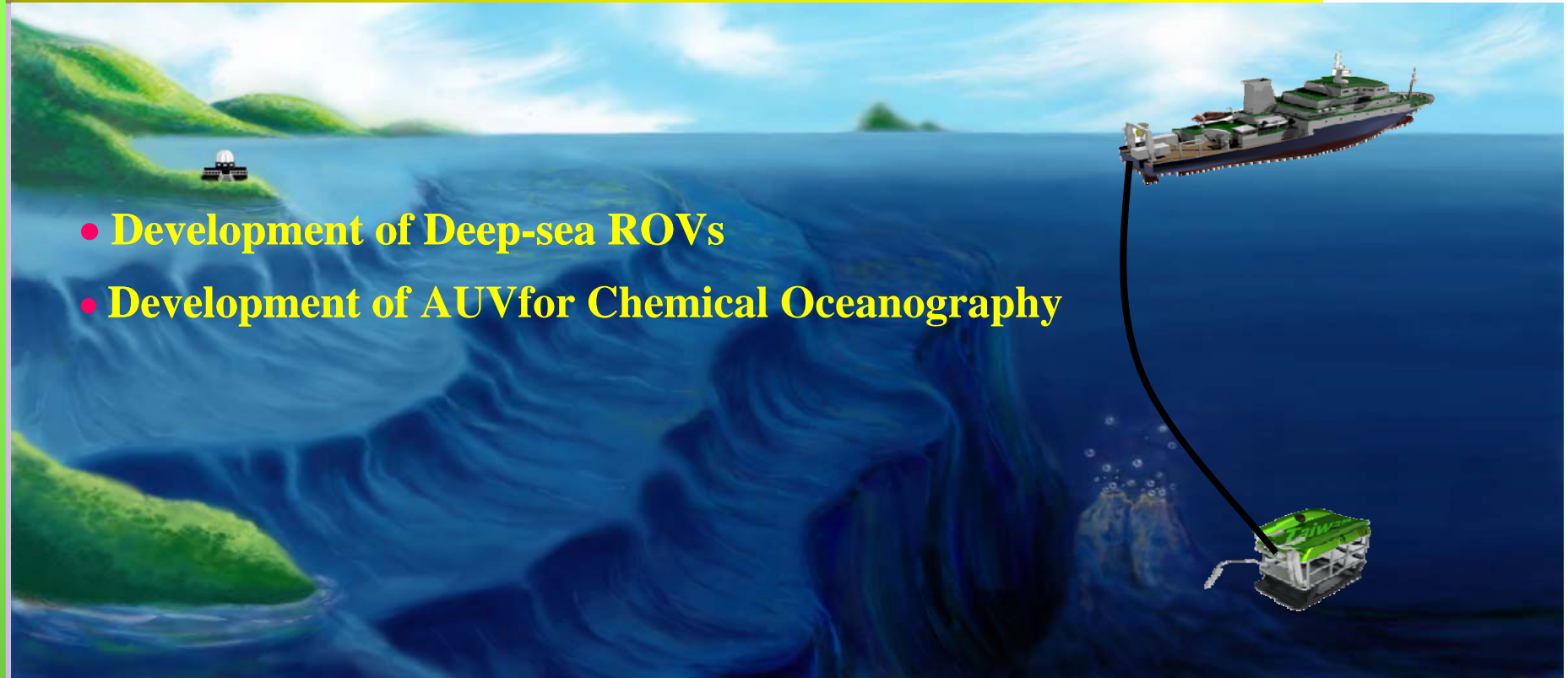
Ocean  
database





# Subjects – for Ocean Exploration Technology Division

- Development of Deep-sea ROVs
- Development of AUV for Chemical Oceanography



Autonomous underwater vehicle

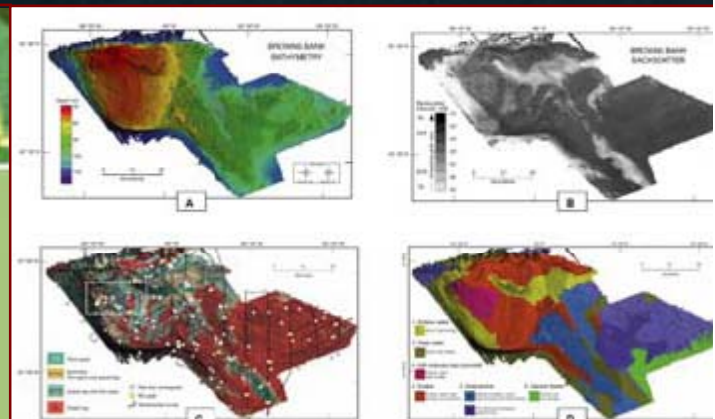


Remoted operation vehicle



# Subjects – for Biological Oceanography Division

- Deep sea organism 、 ecology and evolution
- Benthic habitat mapping and marine organism distributional pattern around Taiwan
- Database on barcodes of life





# Subjects –for Research Ship Management Division

**Building and operation of a 2700 ton New R/V**

**Contractor: Jong Shyn Shipbuilding Co-LTD**

**It is scheduled to be delivered by Mid of 2012**



續航力.....8000多海里  
 可續航.....30天  
 巡航速度.....12節  
 最大船速.....約14.3節  
 最低速度.....0節  
 (本船具DP動態定位系統，可定  
 點定位)

全長.....約72.60 公尺  
 垂標間長.....66.60 公尺  
 船寬(模寬) ...15.40 公尺  
 船深(模深) ....8.00 公尺  
 總噸位.....2700 ~ 3000 總噸  
 最大模吃水.....5.50 公尺  
 設計模吃水.....5.10公尺  
 甲板.....5 層  
 人員配置：48人(船員18人、研究員30人)



# Agenda

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**A. Introduction of TORI**

**B. Long Term Observation**

**C. Introduction of Headquarter**





# CODAR System –for surface current observation

Coastal Ocean Dynamics Applications Radar, CODAR

## CODAR OCEAN SENSORS

### SeaSonde® General Specifications†



Transmitter

Receiver

SeaSonde Configuration:	Standard	Hi-Res	Long-Range
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#### Spatial Range (typical)

Alongshore:	20-60 km	15-30 km	100-220 km
Offshore:	20-75 km	15-20 km	140-220 km

• Ranges achieved vary with environmental conditions and antenna placement. Note: Two radars are normally required for creating 2-D surface current maps of direction and speed.

#### Range Resolution

500 m - 3 km	200-500 m	3-12 km
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• Resolution is user selectable.

**Angular Resolution:** 1-5 degree grid; user selectable.

**Current Accuracy:** Varies with environment. Comparisons with ADCPs located in close proximity to the surface are typically < 7 cm/s of the total current velocity and 1-2 cm/s of the tidal component.

**Wavefield Products** (measured at each radar): Local on-shore wave conditions in ring centered ~3 km from coast around each radar. Significant Waveheight: typical accuracy: 7-15%; Dominant On-Shore Direction: typical accuracy: 5 degrees -12 degrees; Dominant Wave Period: typical accuracy: 0.6 s; Other spectral wave parameters available. Wave information is limited by environmental conditions and operating frequency.

#### Frequency Range (antennae tuned to operate within):

Standard	Hi-Res	Long-Range
one of either: 11.5-14 MHz or 24-27 MHz	one of either: 24-27 MHz or 40-44 MHz	4.3-5.4 MHz

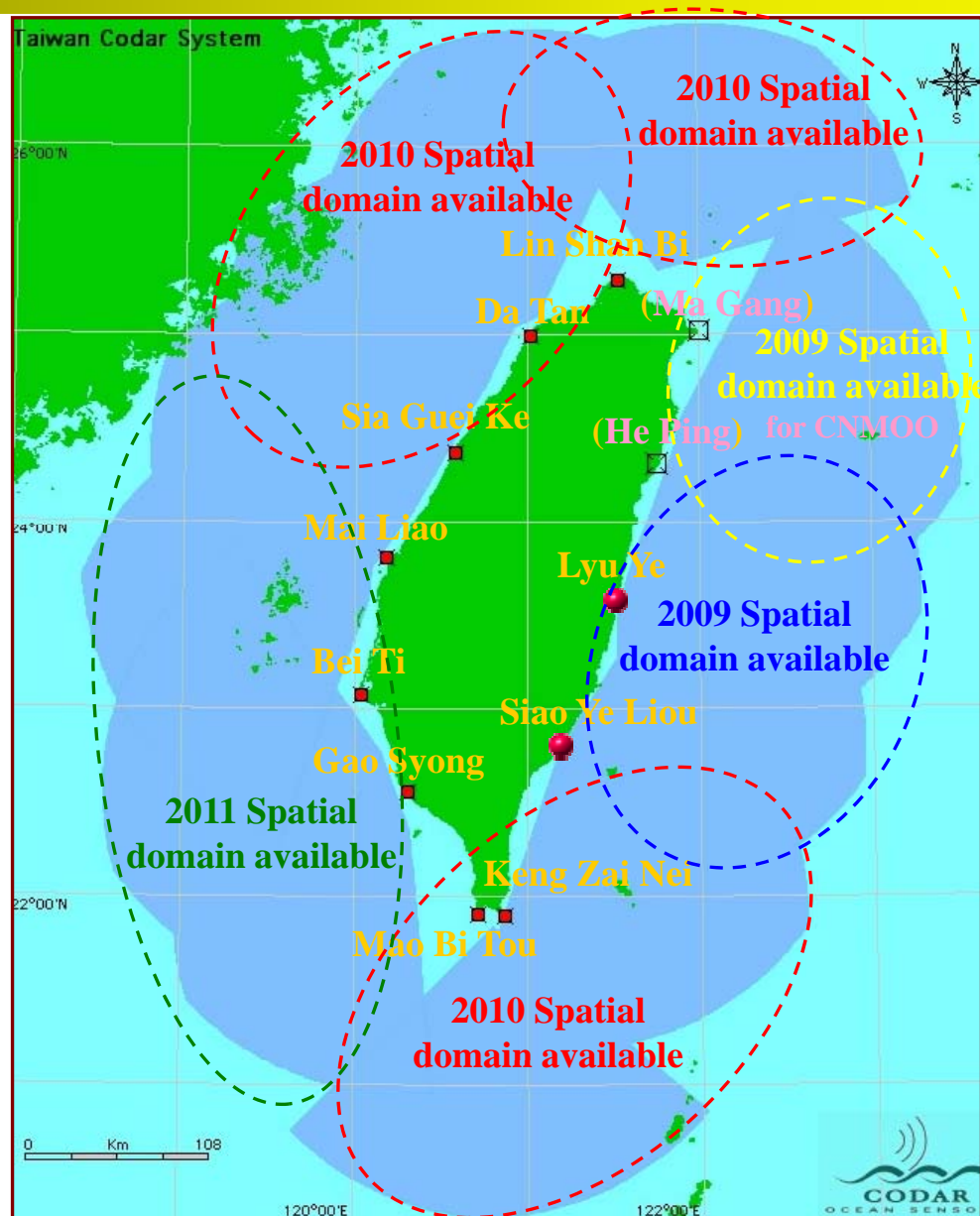


Transmit Antenna



Receive Antenna

# Scheduled Establishment –for radar station



A project to establish radar station within four years was performed from 2008 to 2011



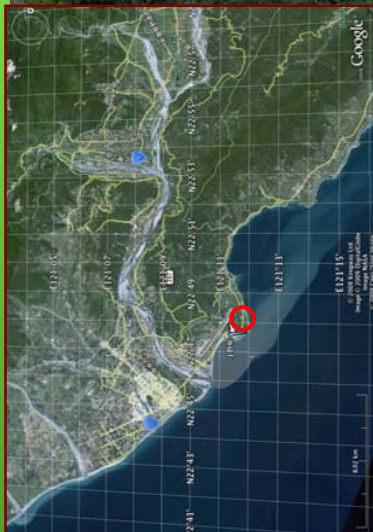


# Siao Ye Liou Station—established on 2009, 10, 2



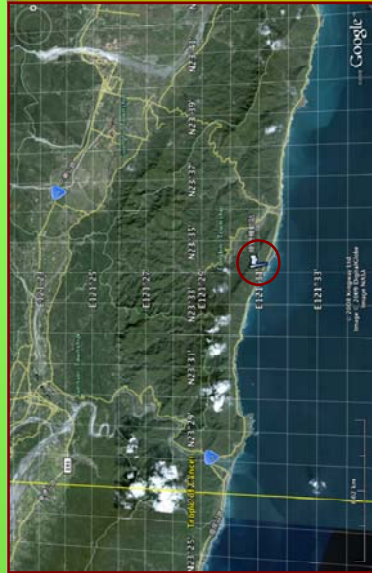
**Transmit Antenna**

**Receive Antenna**





# Lyu Ye Station—established on 2009, 10, 3



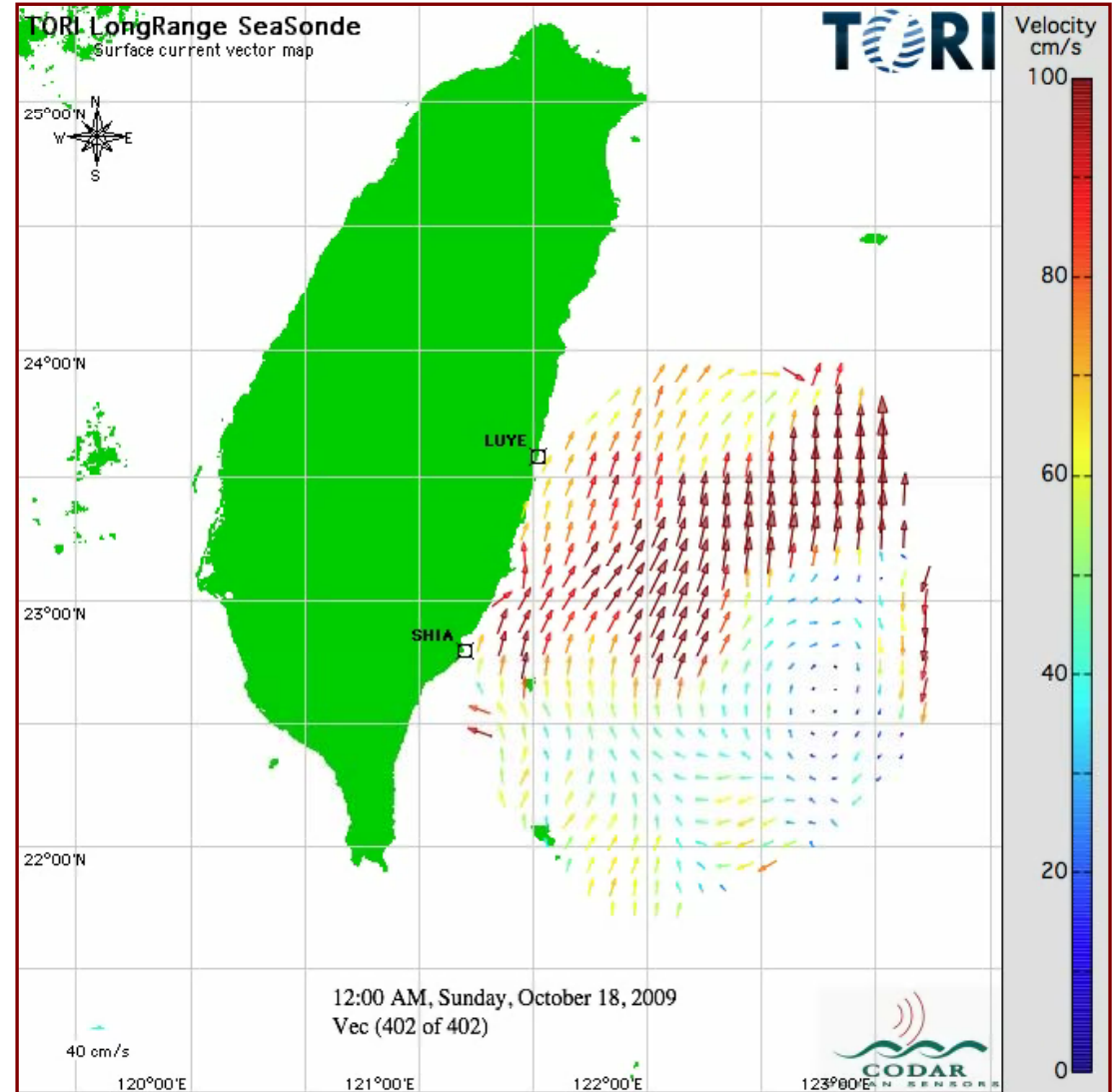
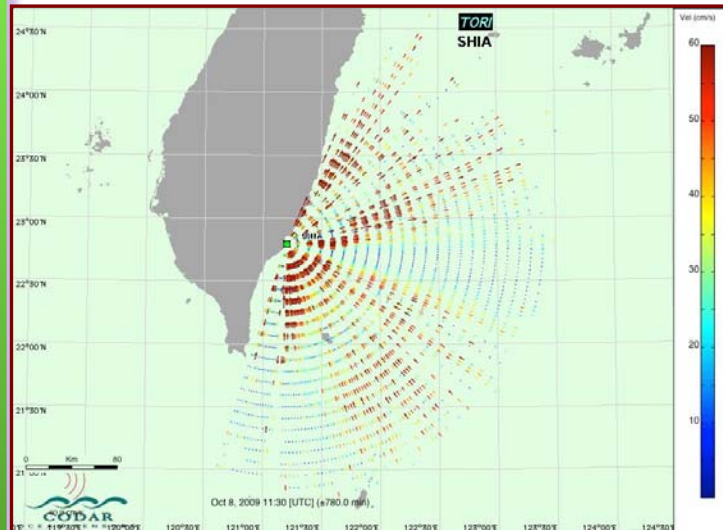
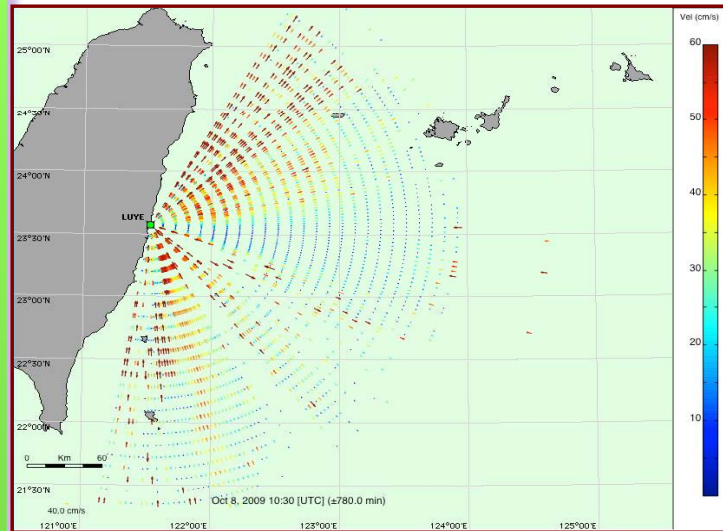
Receive Antenna

Transmit Antenna

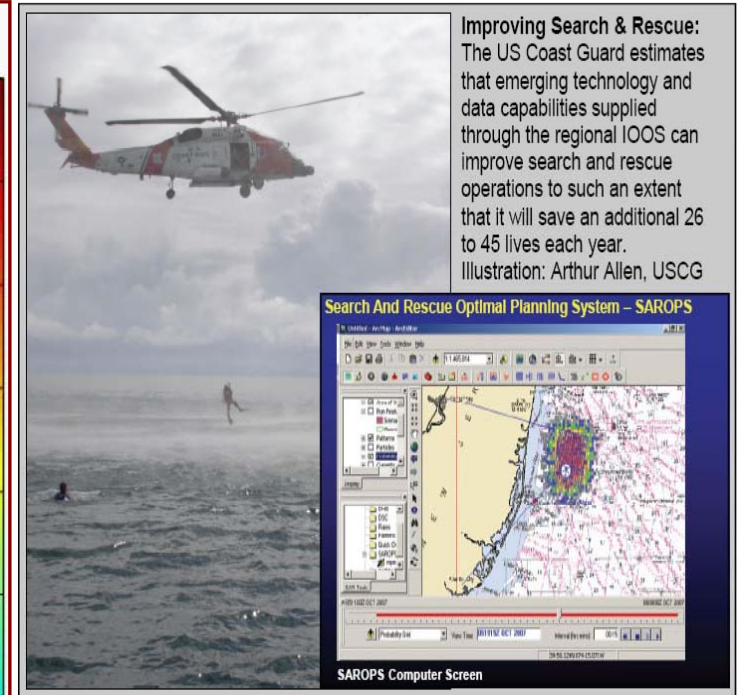
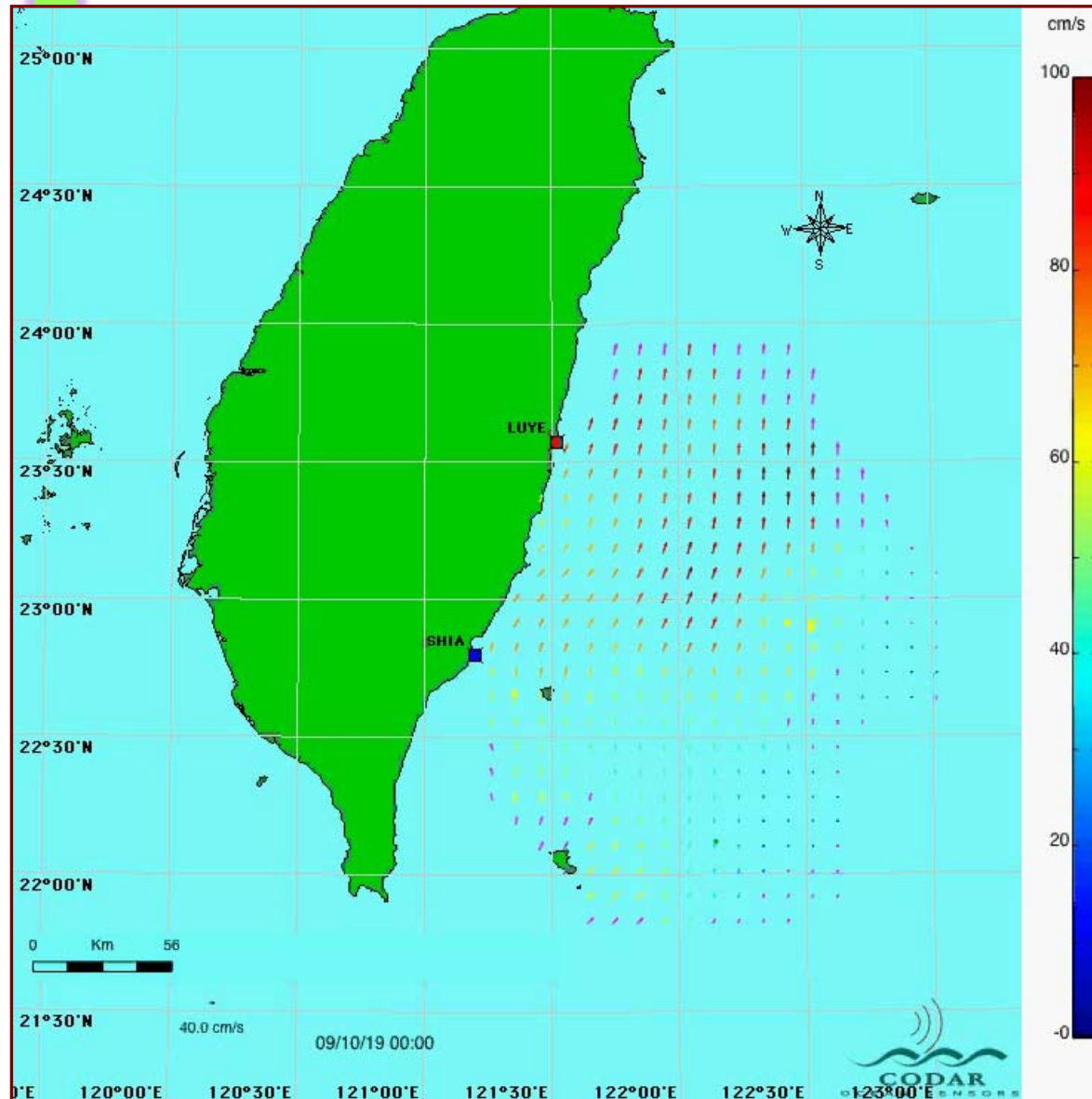




# Observed Surface Current—for two established stations

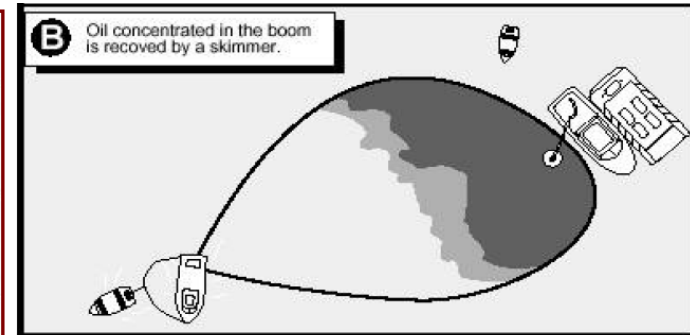
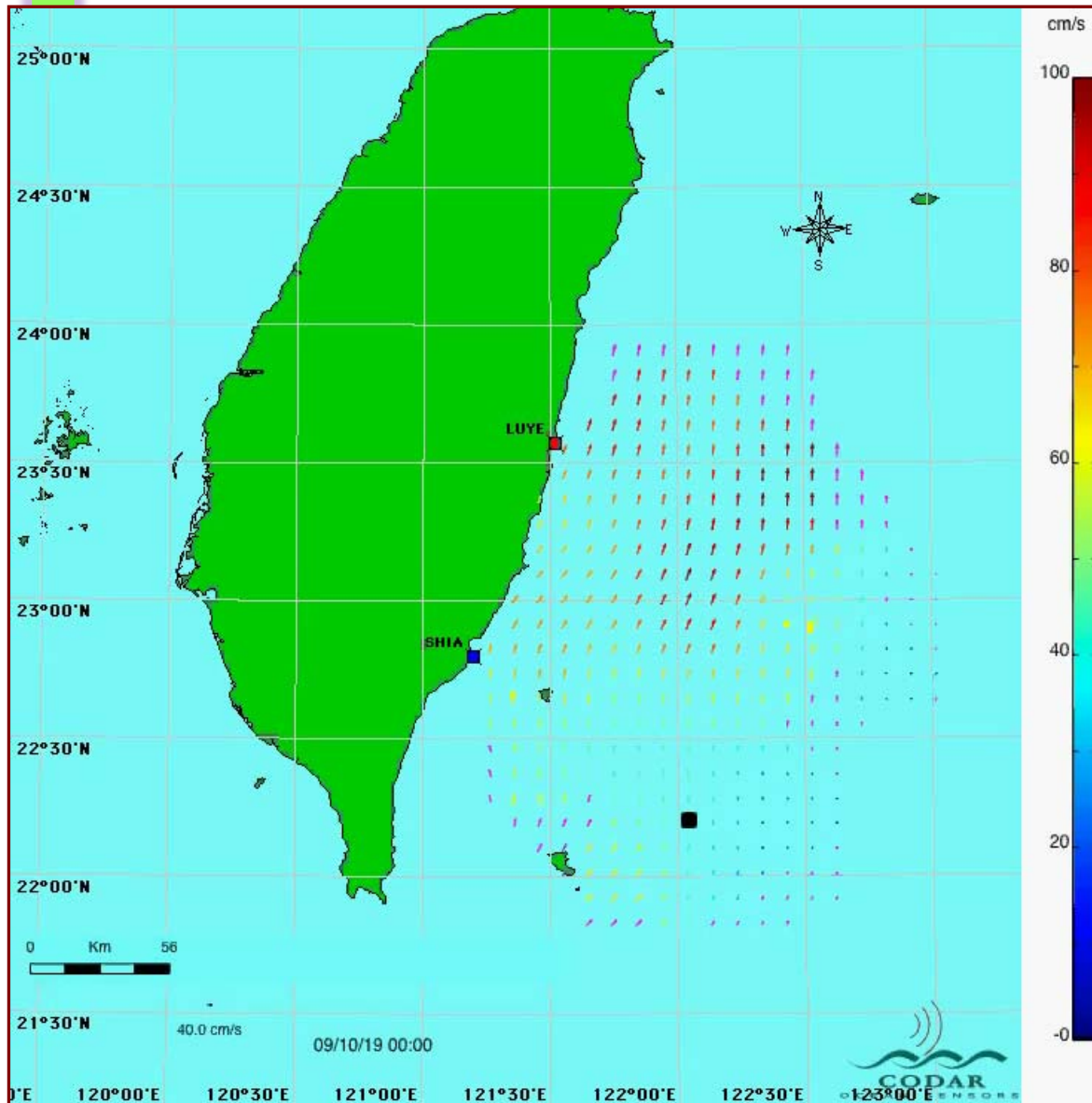


# Application for marine rescue



當海難發生時，利用系統之漂流軌跡計算，可聚焦救難目標，達到急難救助之功效。

# Application for marine pollution control



當發生海洋漏油事件時，利用系統之污染傳輸計算，可得知其傳輸範圍，提供海洋污染防治採取必要措施。





# Buoy System

Real-time, long-term ocean and atmosphere monitoring in open ocean by moorings.

Scientific and societal applications:

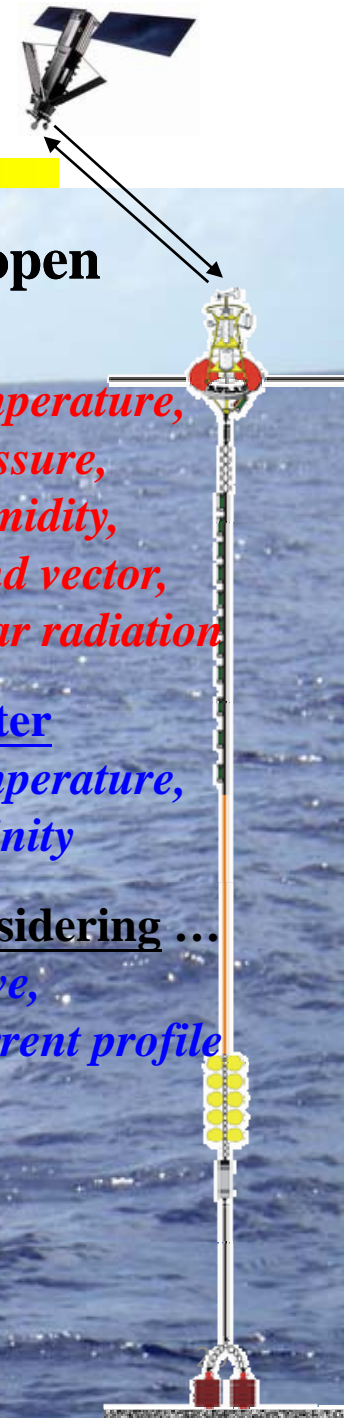
- *Air-sea interaction,*
- *Extreme weather monitoring/forecasting,*
- *Tracking changes in ocean climate*
- *Natural hazards monitoring/mitigation*

Air  
*Temperature,  
Pressure,  
Humidity,  
Wind vector,  
Solar radiation*

Water  
*Temperature,  
Salinity*

considering ...  
*Wave,  
Current profile*

Real-Time data transmission via Iridium satellite network

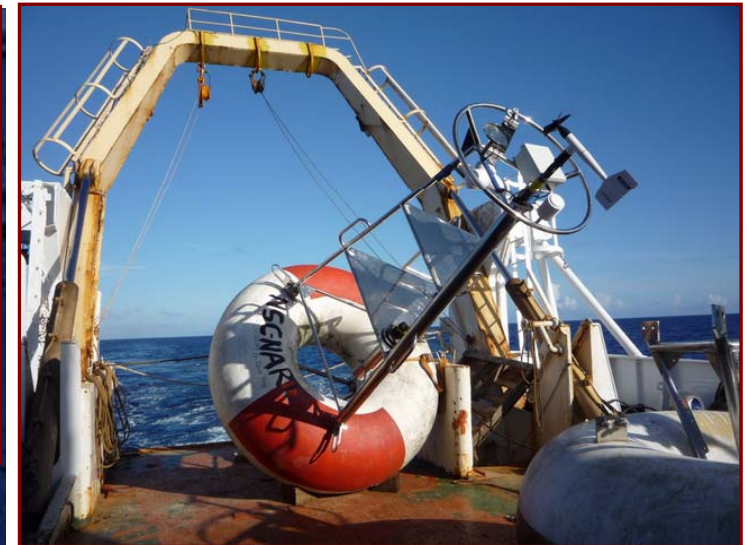
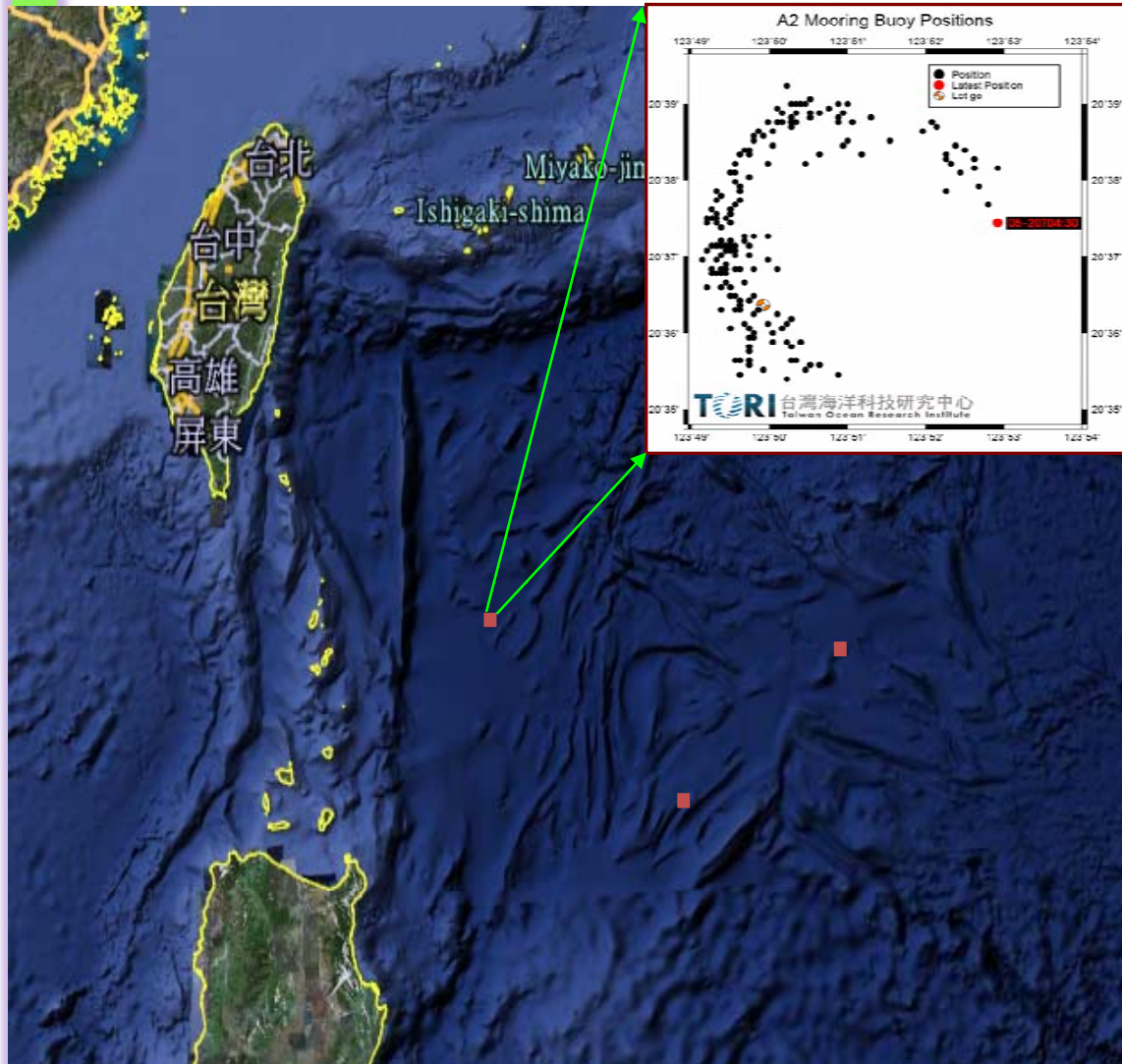




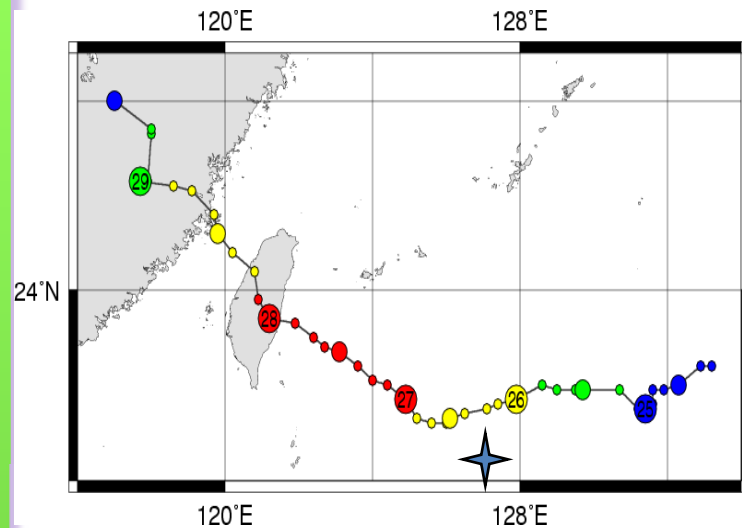


# ITOP Project

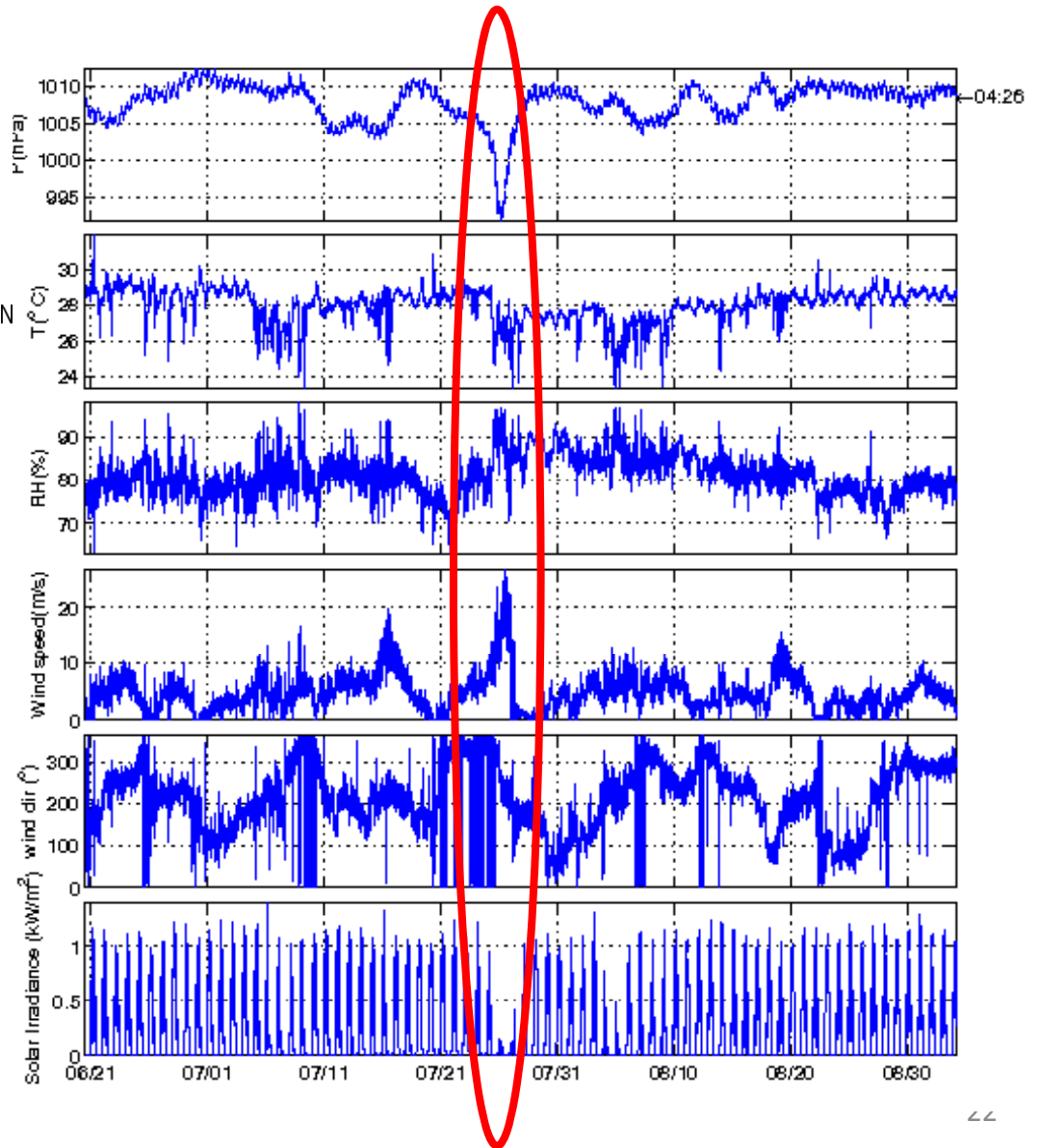
Integration of **T**yphoon-**O**cean **P**rogram (**ITOP**) was performed from 2008, and cooperated with National Taiwan University (NTU).



# Observed Result of ITOP –for Fung-Wong Typhoon

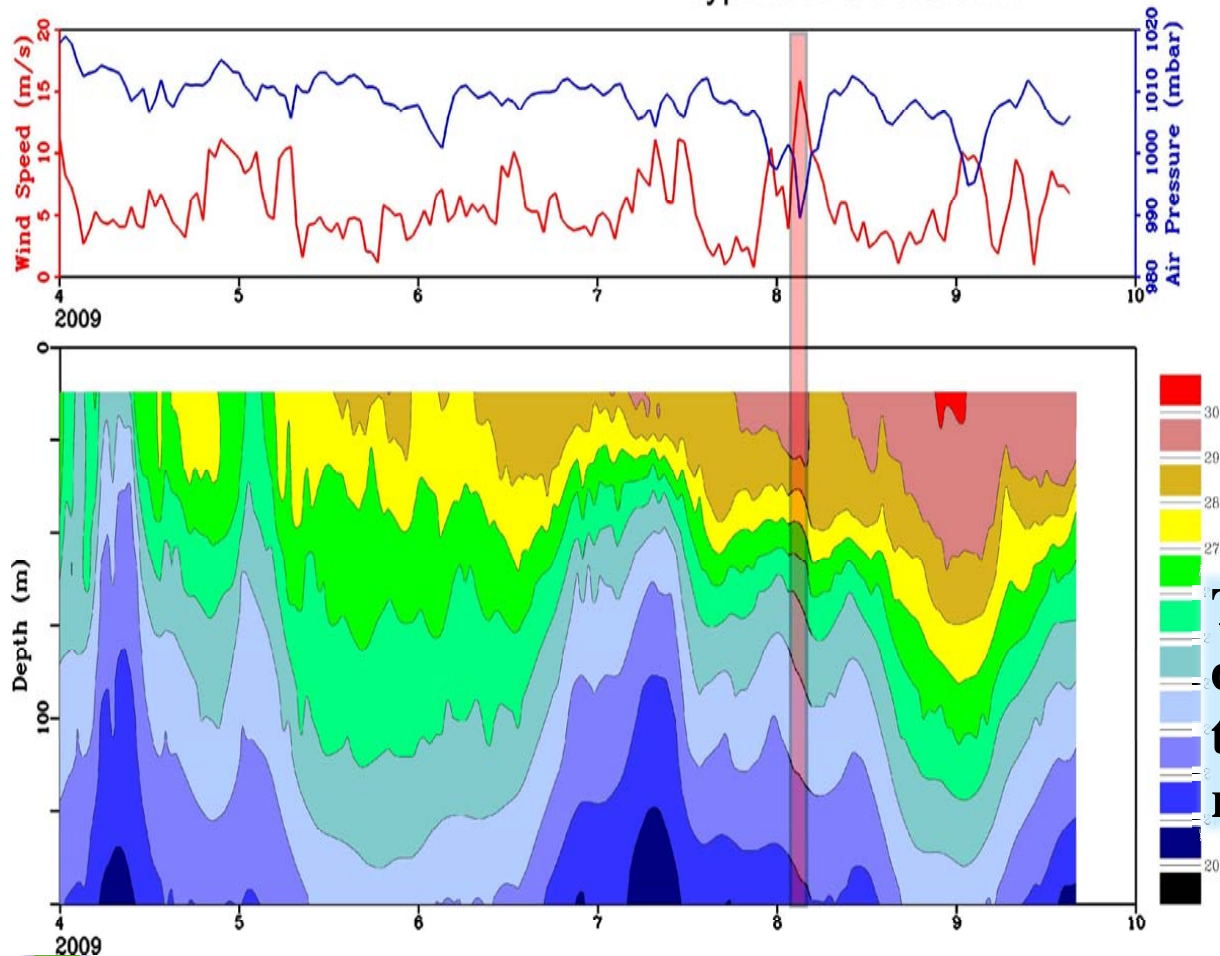


**Typhoon Fung-Wong (No.8, 2008) passed by the buoy on July 26 and the recorded data were transmitted successfully.**



# Observed Result of ITOP –for Morakot Typhoon

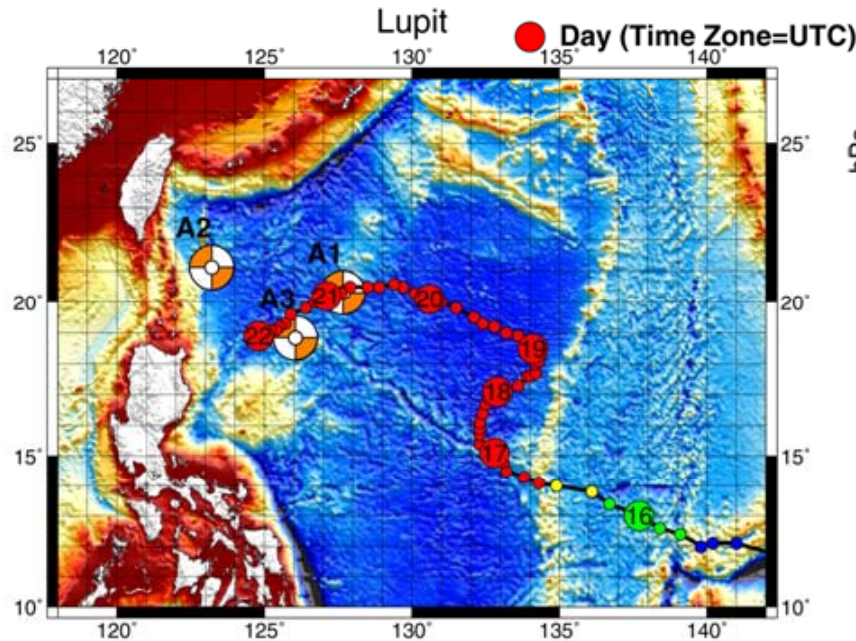
Typhoon #8 Morakot



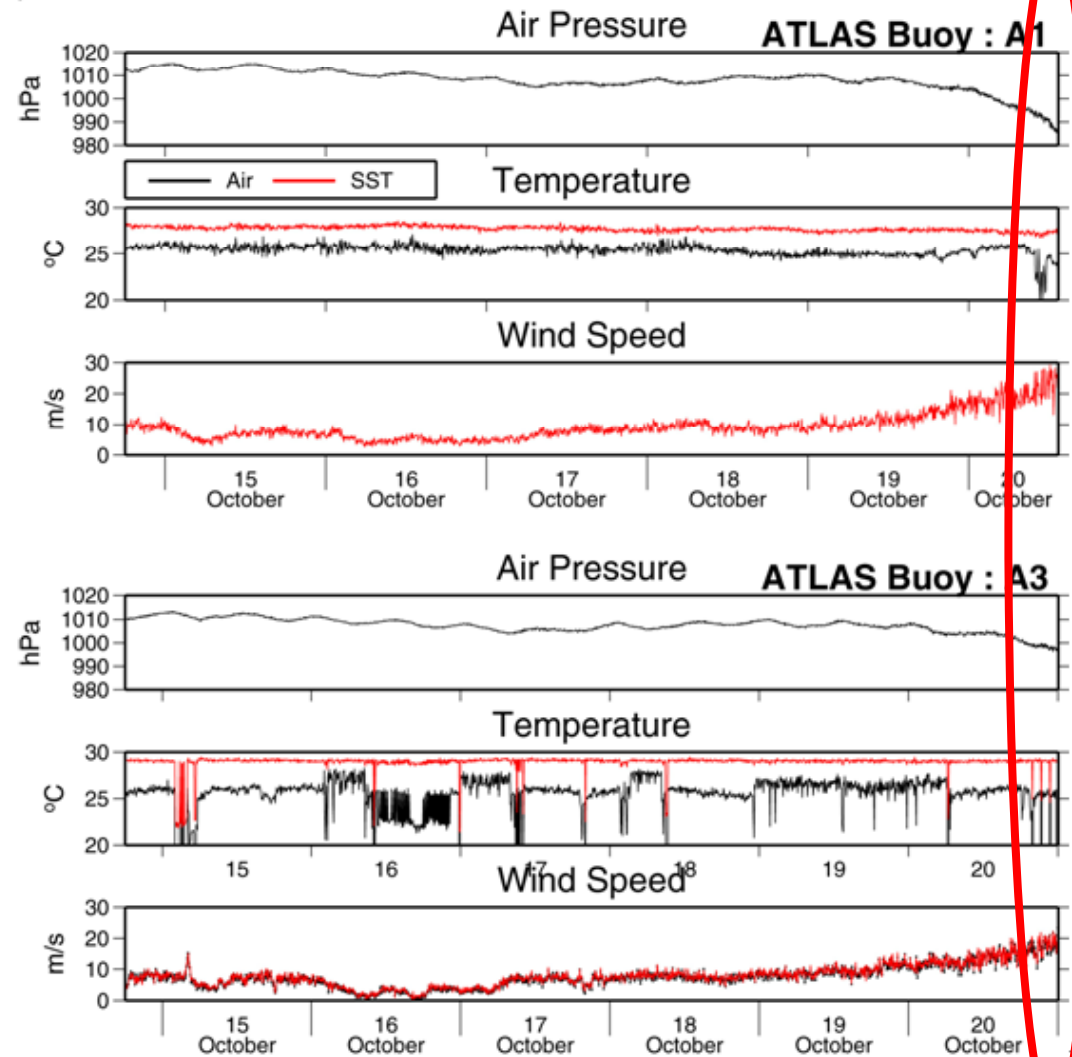
**Typhoon Morakot (No.8, 2009)**  
 did not pass by the buoy, but  
 the recorded data still  
 reflected the message.



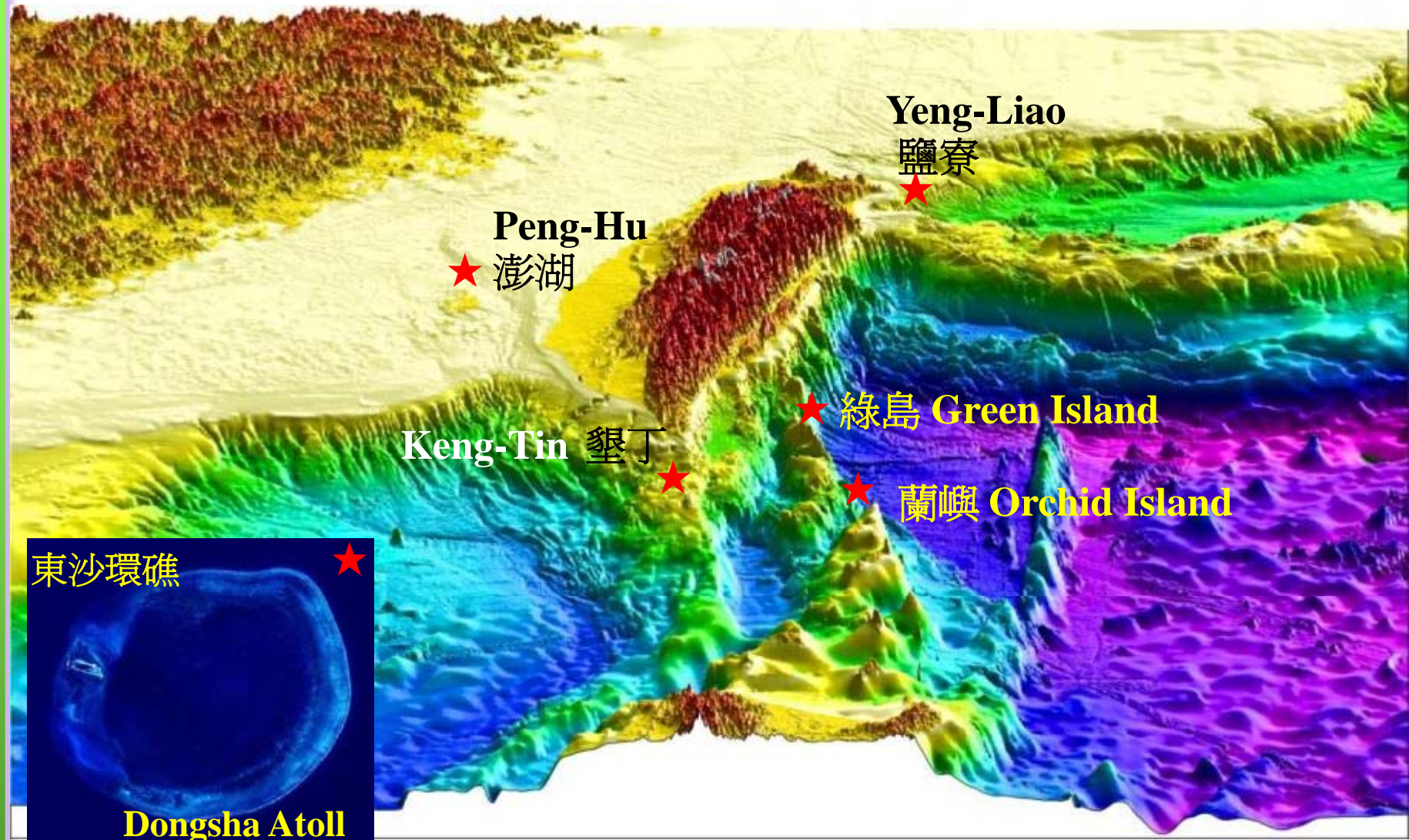
# Observed Result of ITOP –for Lupit Typhoon



**Typhoon Lupit (No.20, 2009) passed by the buoy on October 22 and the recorded data were transmitted successfully.**



# Locations of Coral Reef in Taiwan





# Coral Reef and Fishes in Orchid Island



2008/07/05



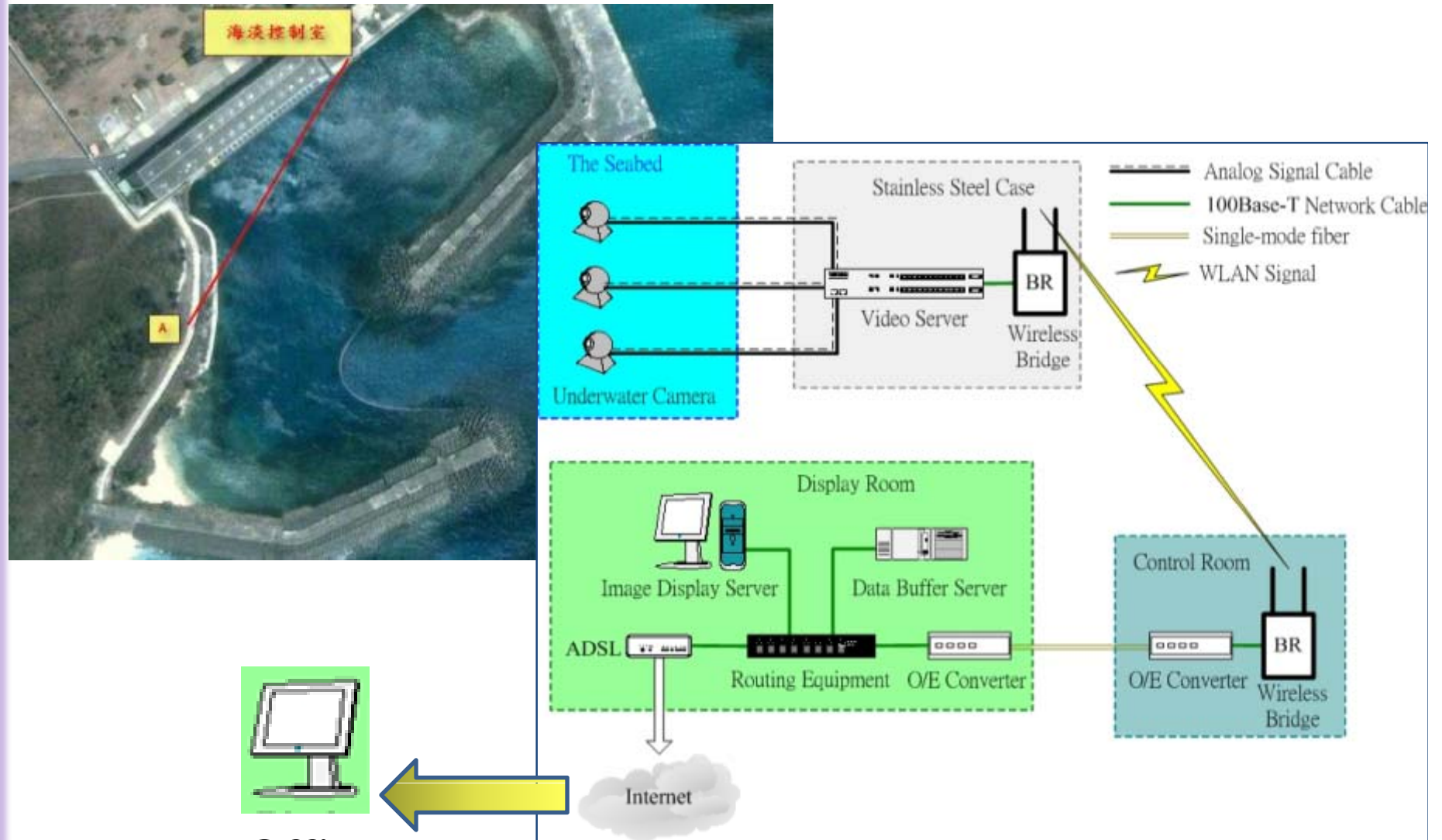
**Dr. J.P. Chen (Associate  
Research Fellow in TORI)**



# Coral Reef and Fishes in Orchid Island



# Coral Reef Observation Station at Keng-Tin



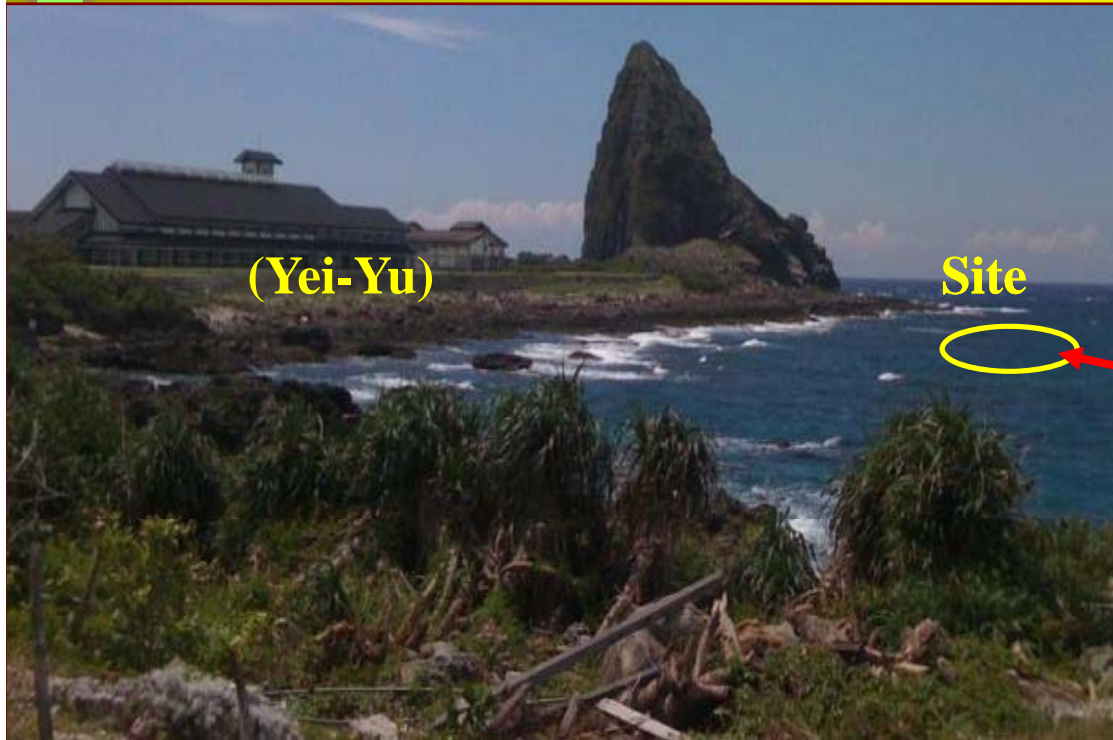
Office

Cooperate with NMMBA and NCHC



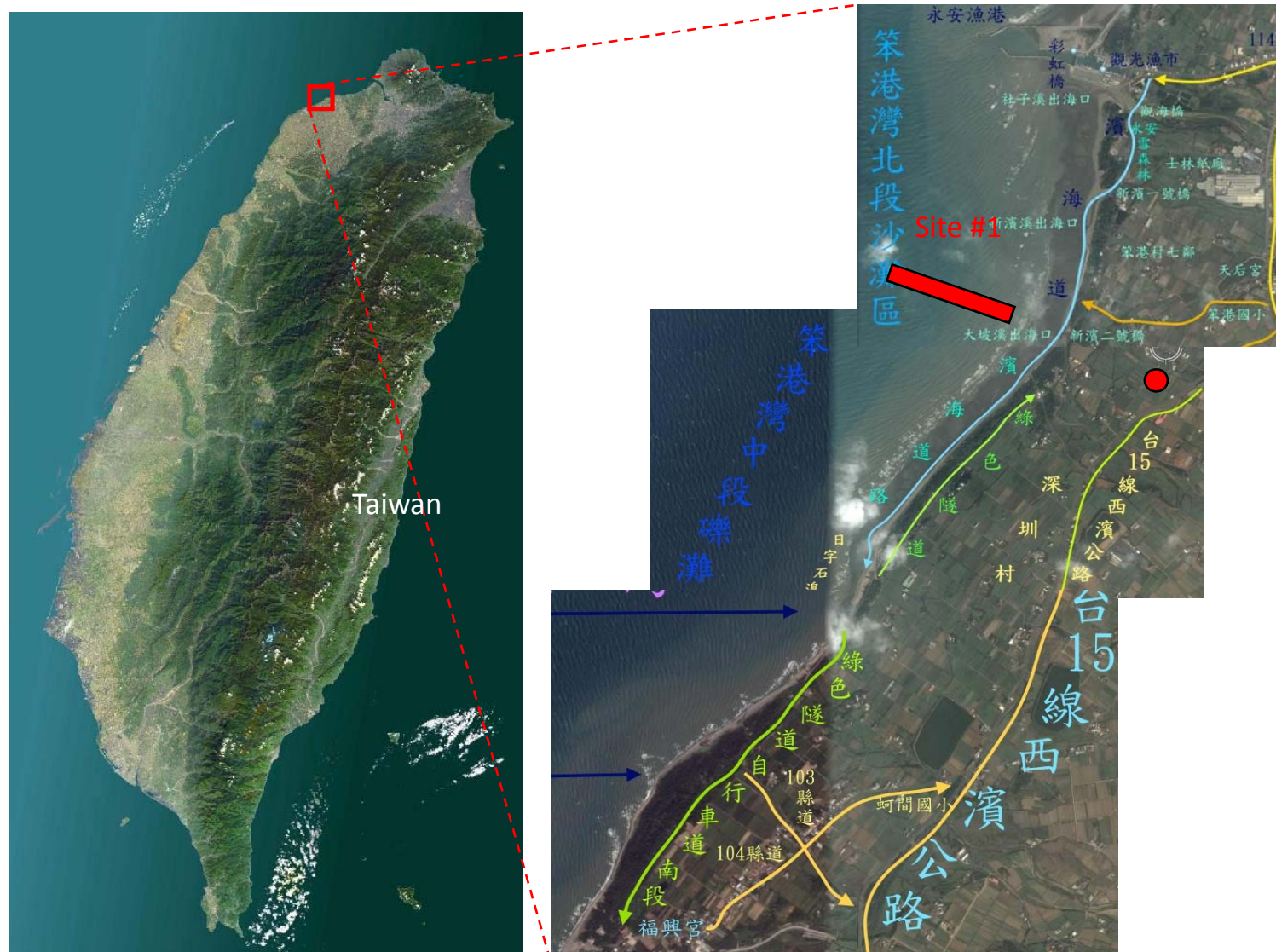


# Coral Reef Observation Station at Orchid Island





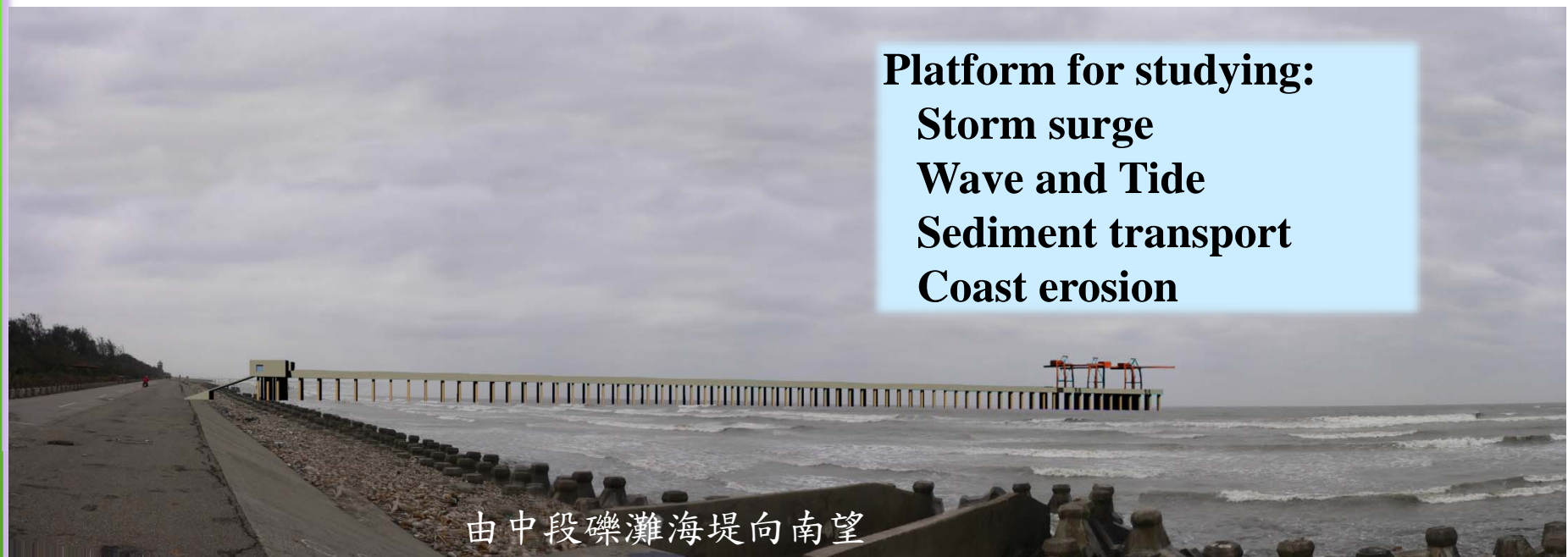
# Location for TaiCOAST and possible site



# Candidate Site and Virtual Image of TaiCOAST



由永安漁港南側停車場向南望



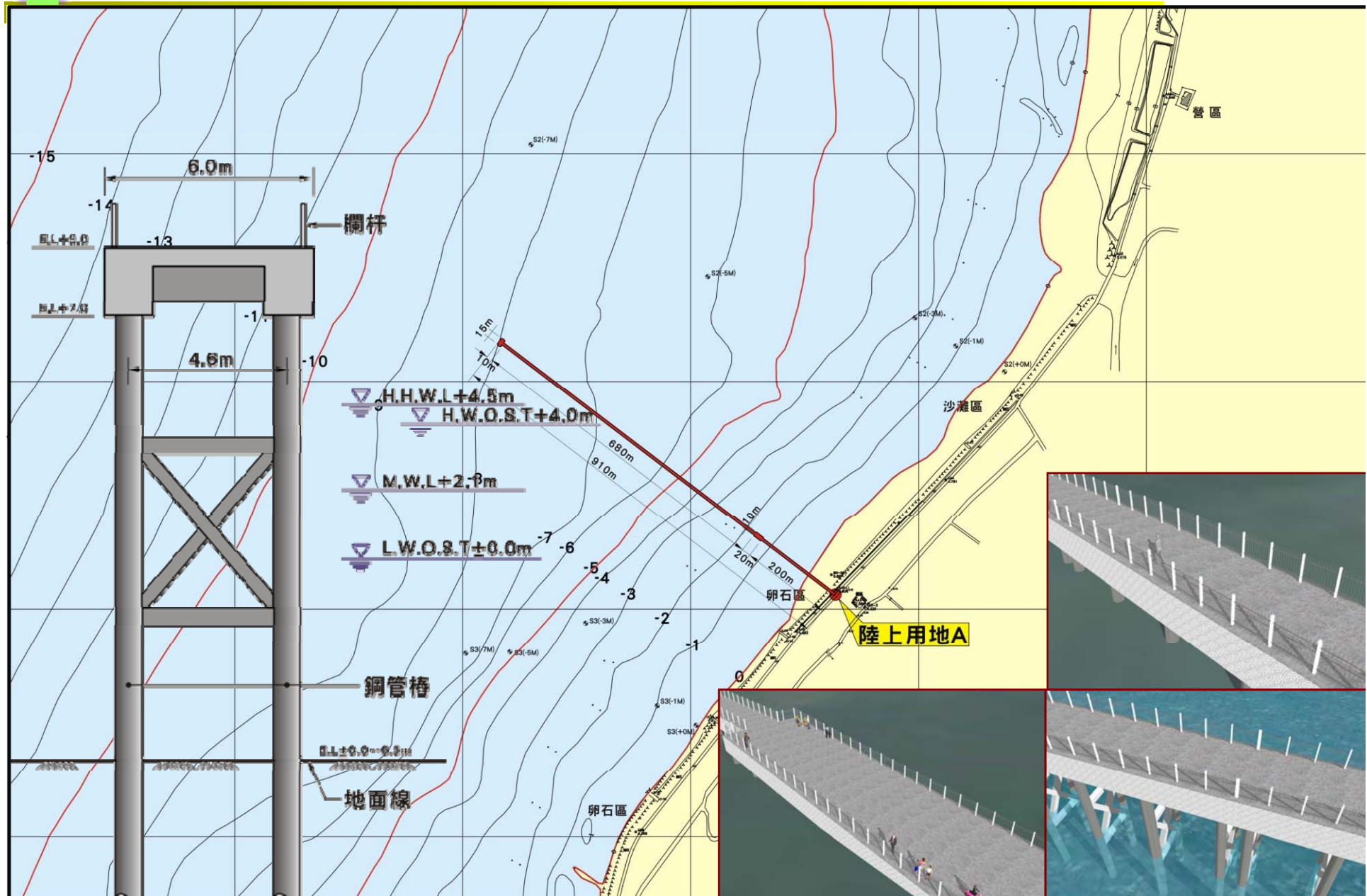
**Platform for studying:**  
**Storm surge**  
**Wave and Tide**  
**Sediment transport**  
**Coast erosion**

由中段礫灘海堤向南望

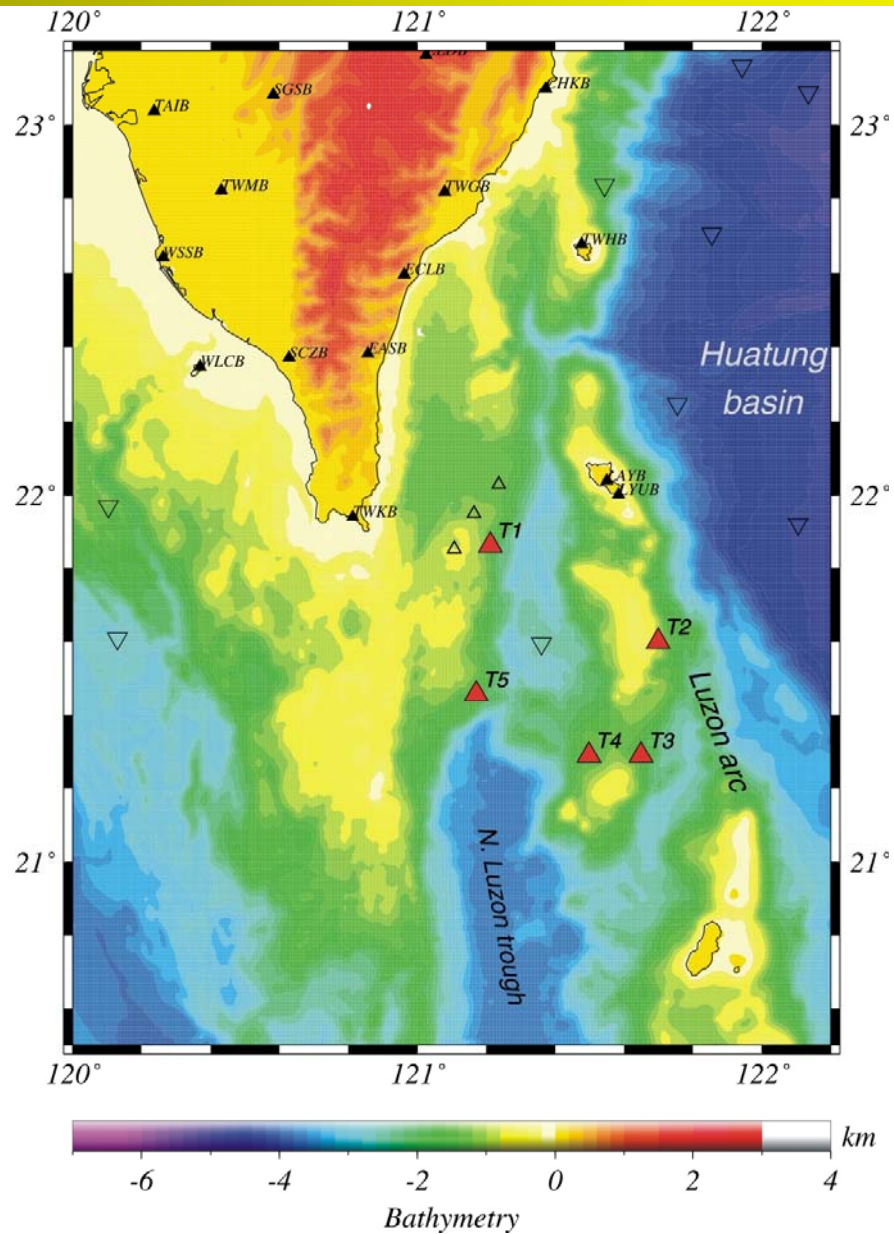




# Site and Preliminary design for TaiCOAST



# BOS deployment—on Sep. 15~17, 2009



Cooperated with SINICA

Period to deploy: 10 momths

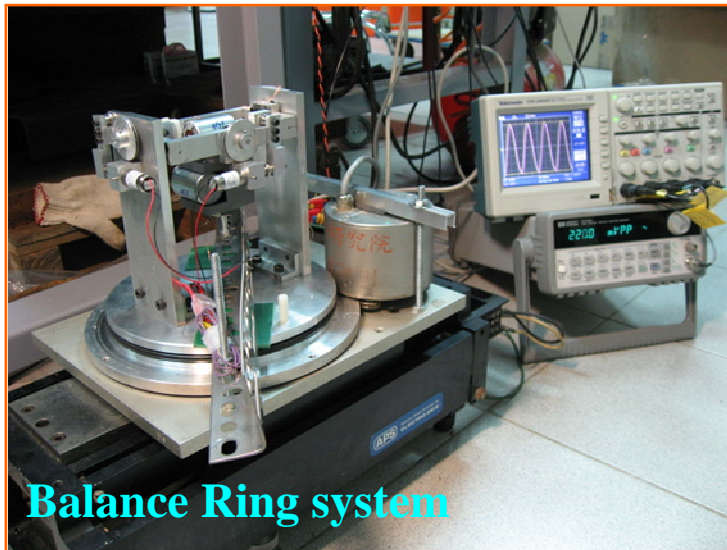


# BOS system – development



Manufactured by TORI

One project is to develop and manufacture BOS system, and cooperate with SINICA team.

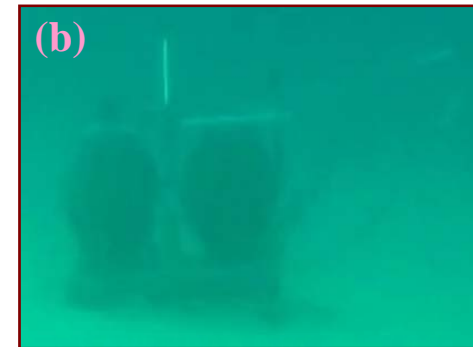
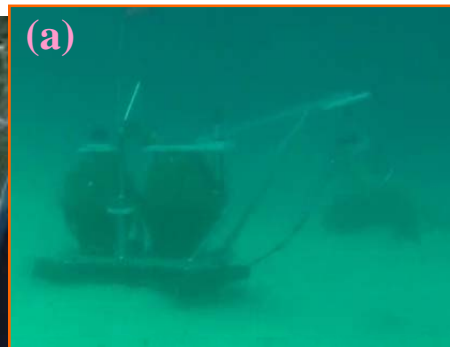
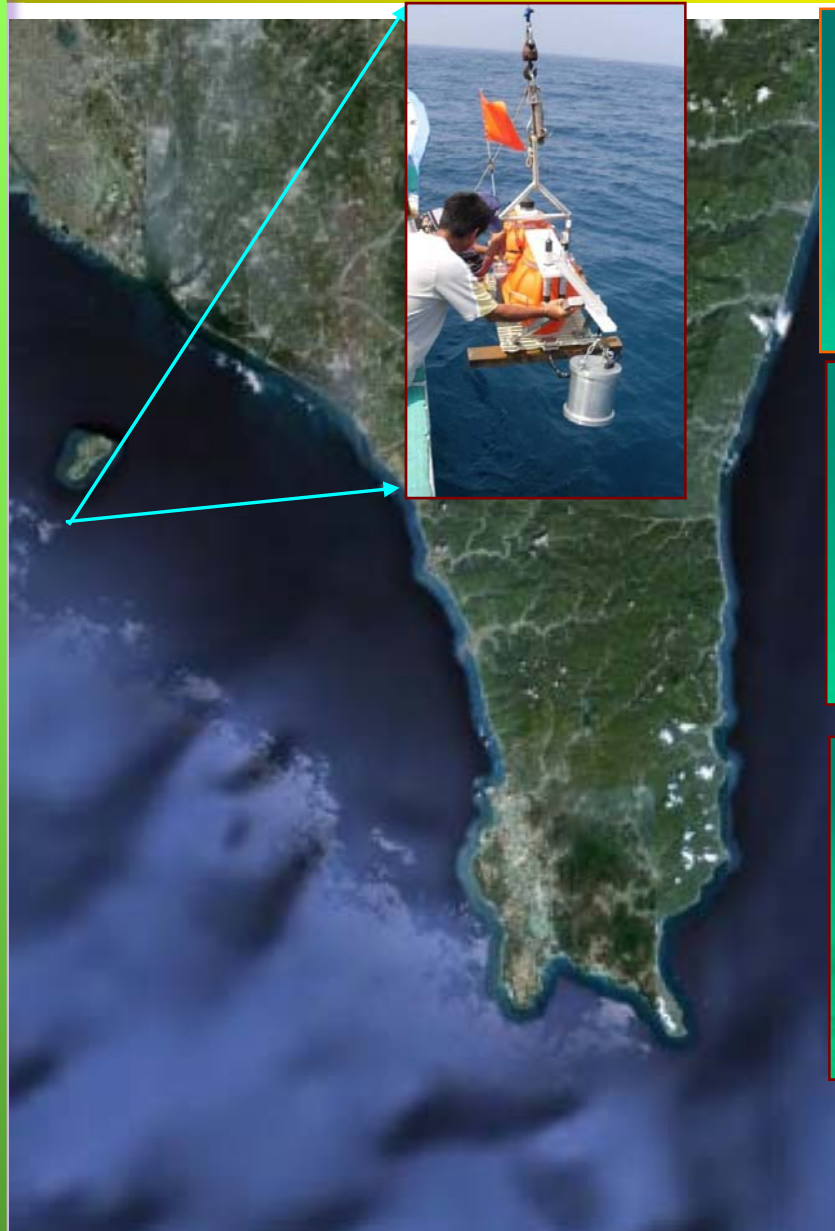


Balance Ring system

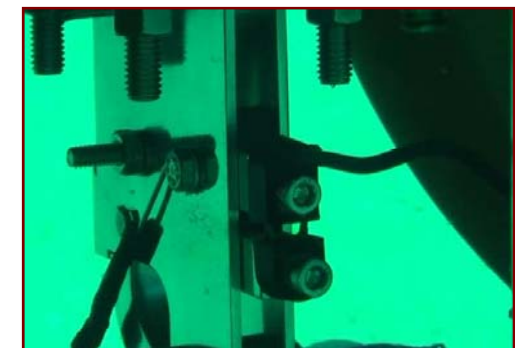


Manufactured by SINICA

# Self-made BOS system test— on Oct. 14, 2009



**Test for stability of OBS system during process of rising with velocity 0.3 m/s and sinking with velocity 0.7 m/s**

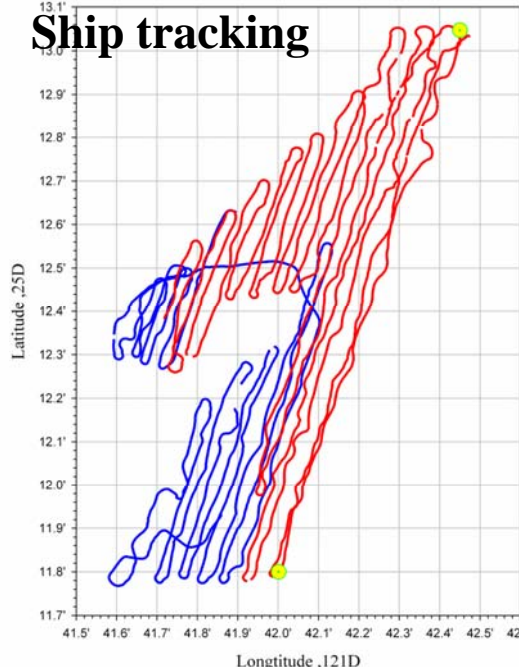
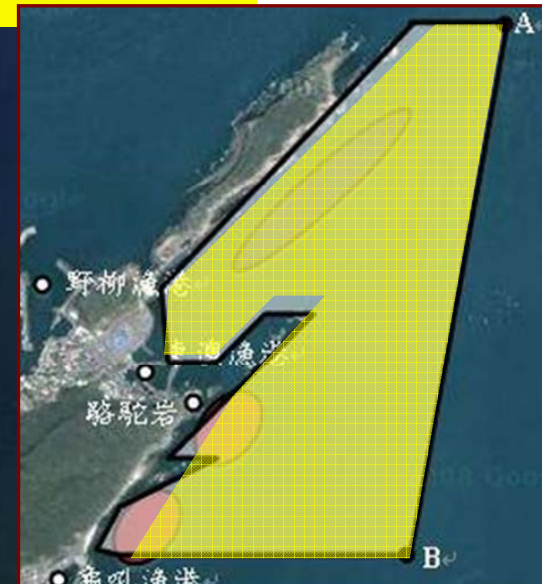


**Test for stability of OBS system during process of settling down and release**



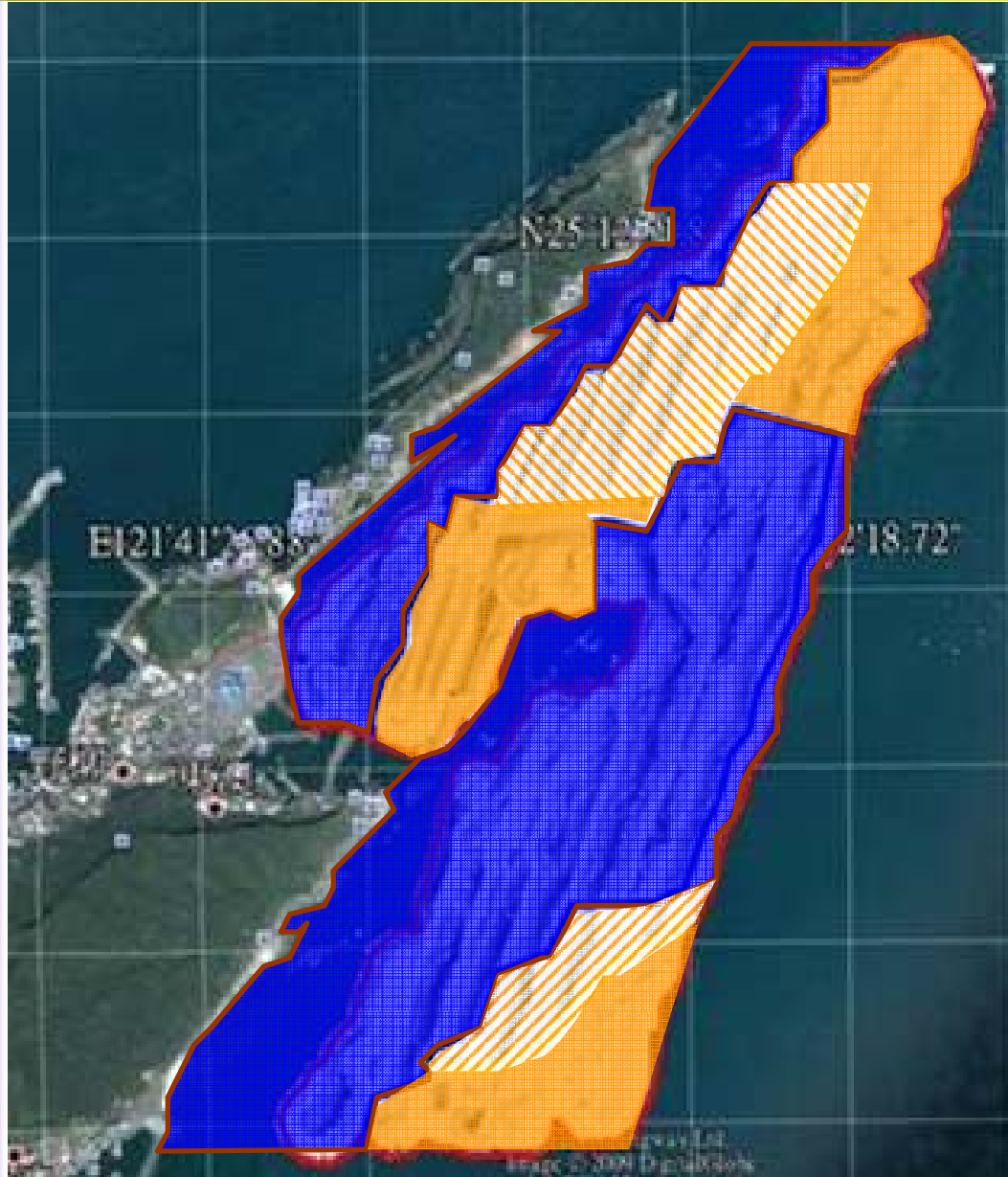
# Investigation of geomorphology – at Yeh-Liu Cap

Yeh-Liu Cape is ecologically sensitive place in northern Taiwan.





# Seafloor Classification – at Yeh-Liu Cap

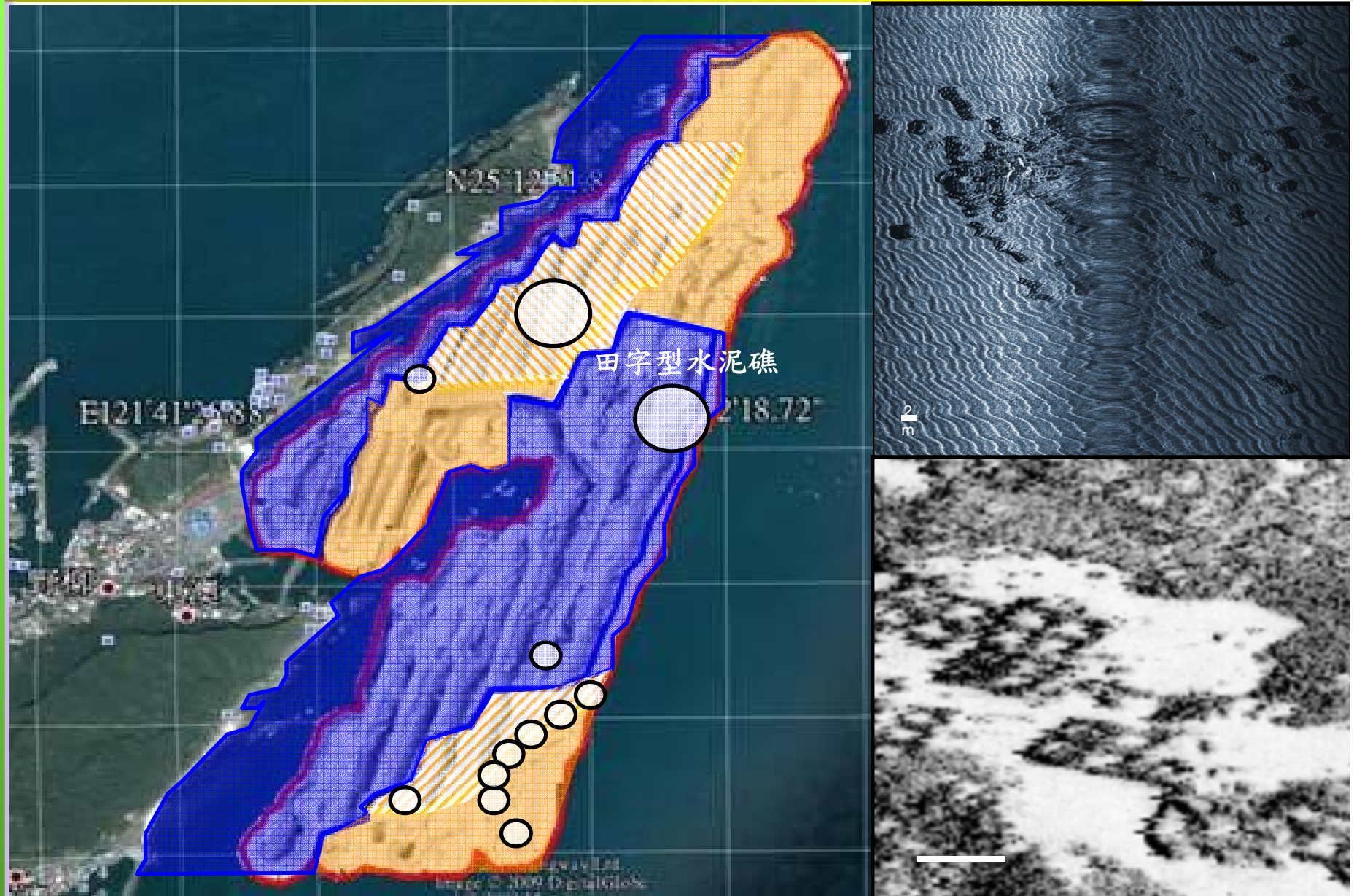


## Seafloor classification

- Rock / Reef
- Sandripple
- Sand



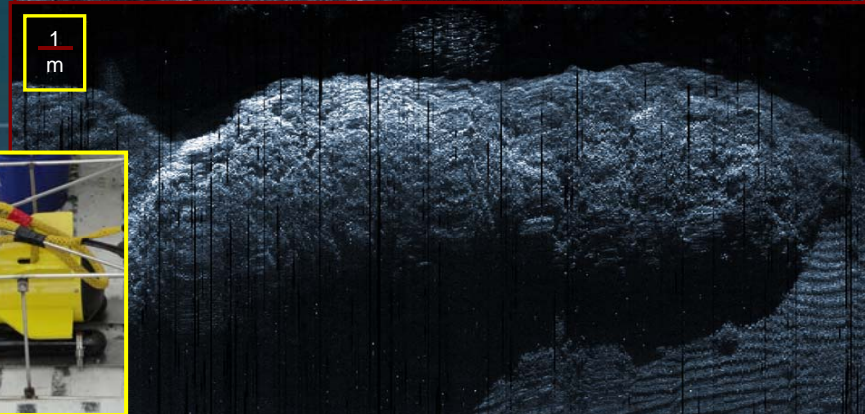
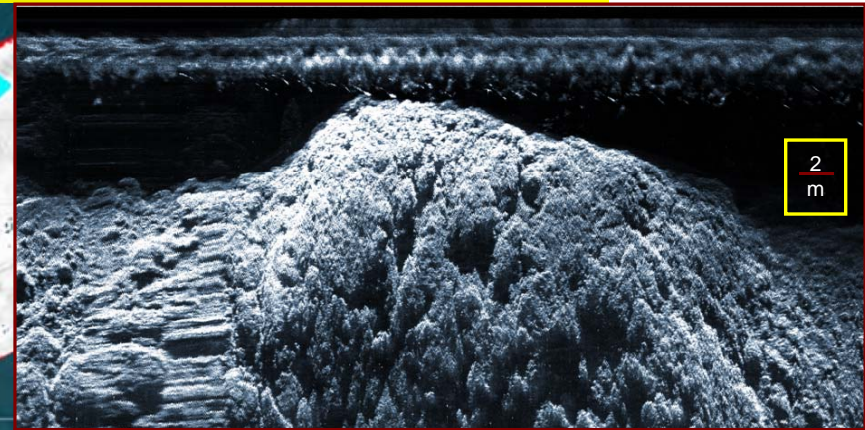
# Sonar image





# Verification by photo image

- 第二次海域作業
- 影像資料驗證
  - 人工目標物
  - 自然目標物 (地形及生物)



Towed underwater camera

# Agenda

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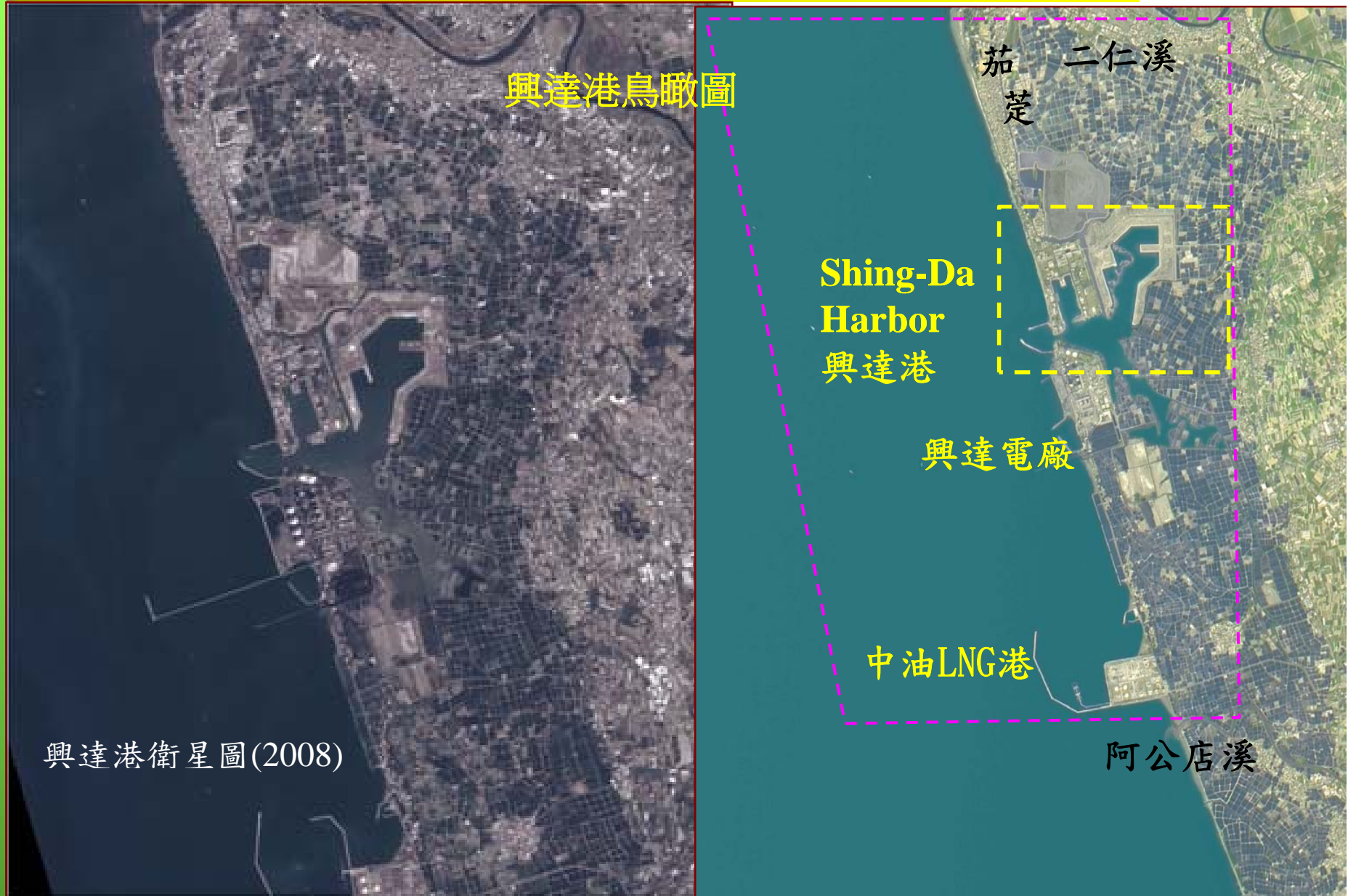
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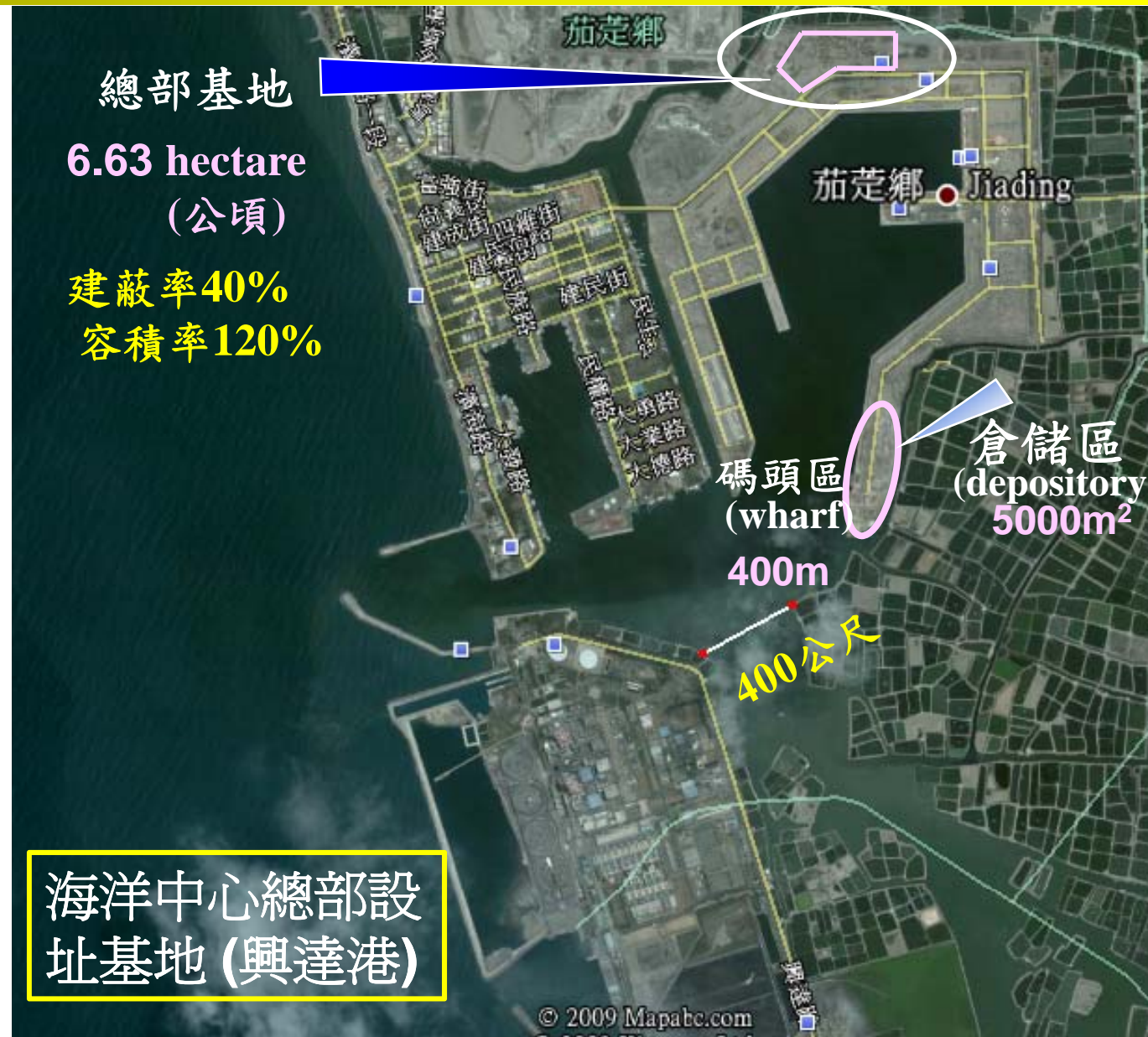
**C. Introduction of Headquarter**



# Aeroview of Shing-Da Harbor — for headquarter



# Site of Headquarter





**Thanks  
for Your Attention !**