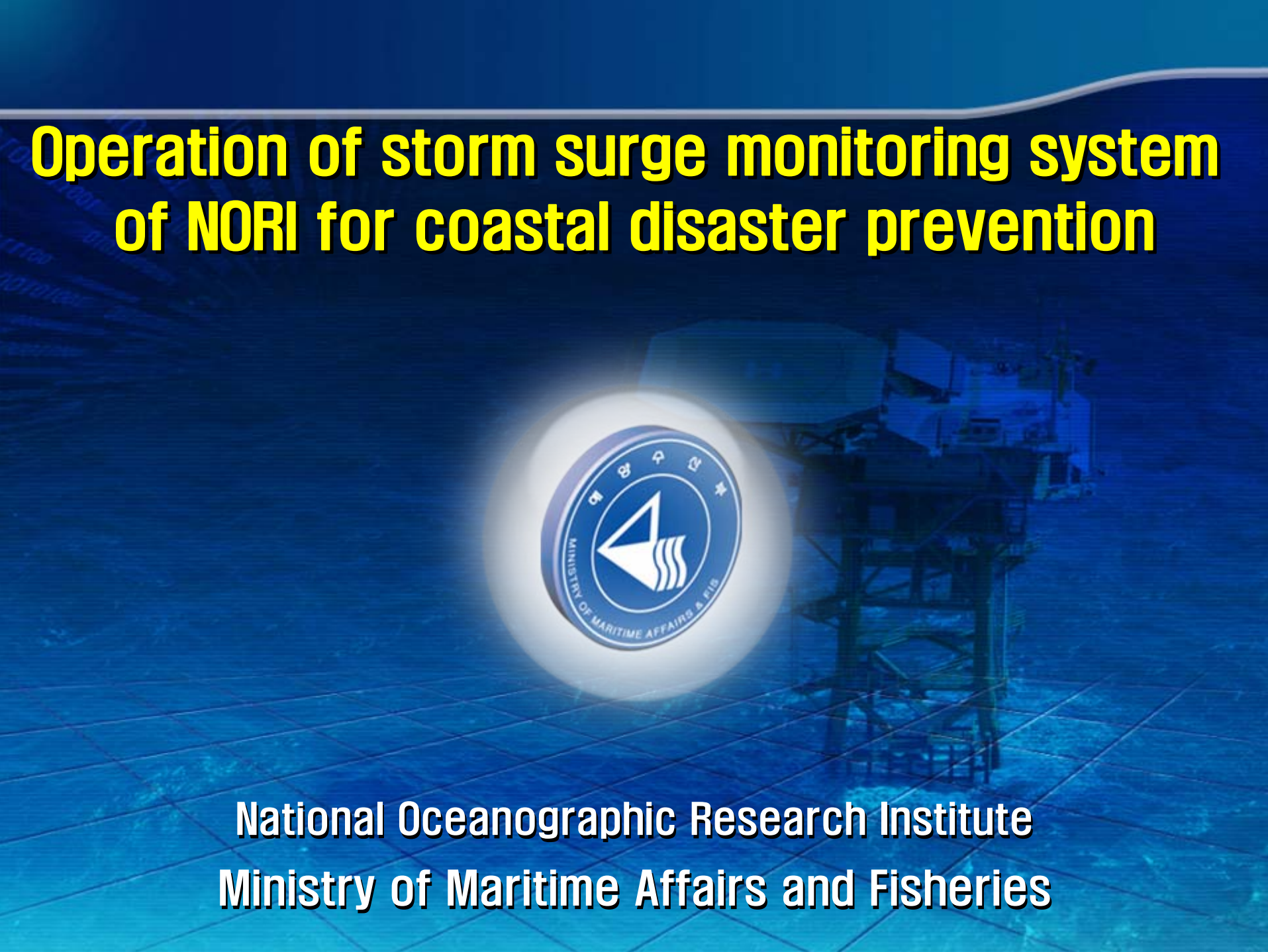
Operation of storm surge monitoring system of NORI for coastal disaster prevention



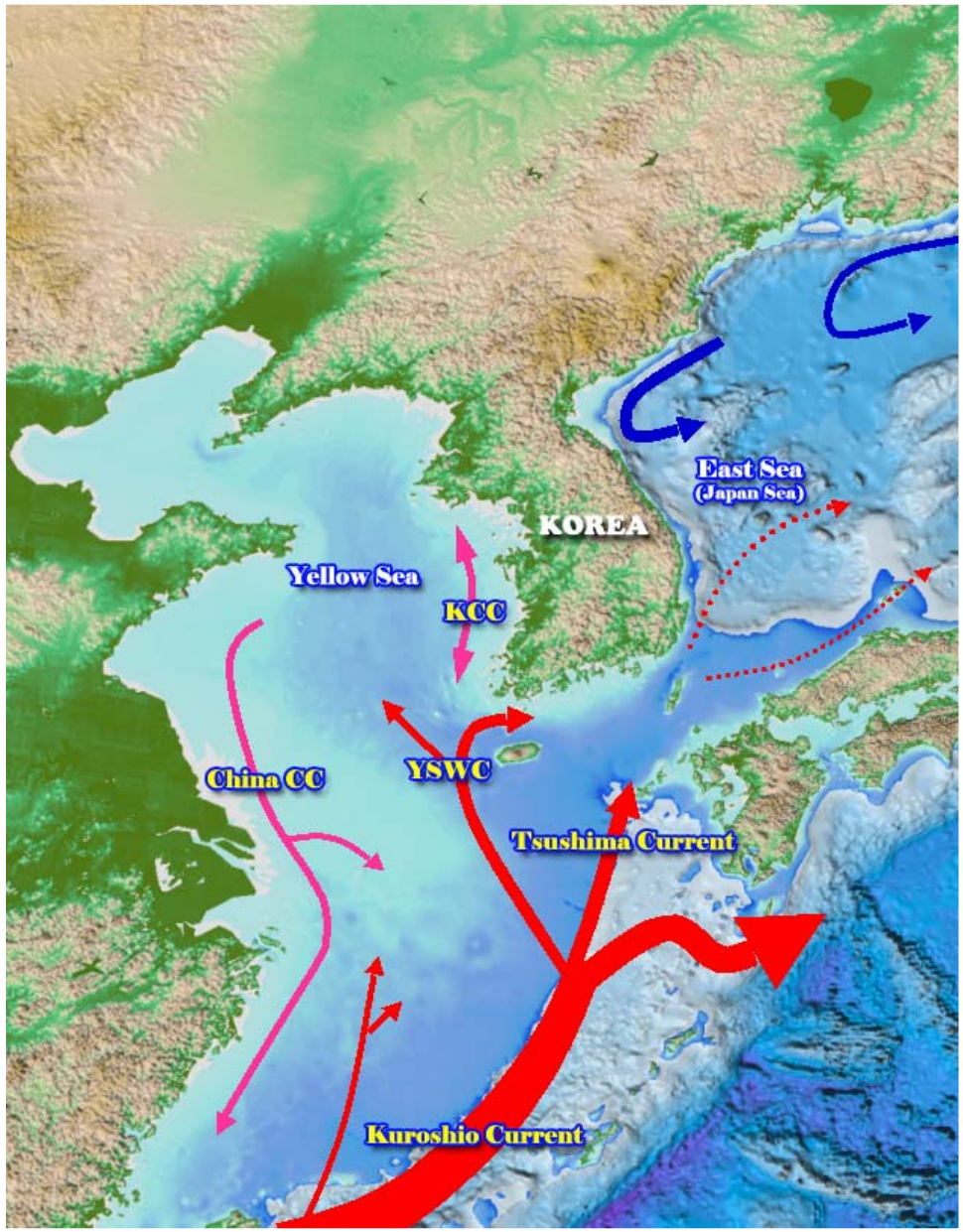
National Oceanographic Research Institute

Ministry of Maritime Affairs and Fisheries

Contents

I. STATUS OF OCEAN OBSERVATION

Ocean Characteristics of the Korean Peninsula



- Surrounded by the Yellow Sea, East China Sea and East Sea
- Different bottom topography
- Different coastline shape
- Distinct Seasonal change
- Each coast show very distinguished tidal pattern
- Affected by the Kuroshio
- Affected by a typhoon every year

National Real-Time Ocean Observation Network

- ✓ July 2001 : A Basic Plan for the establishment of the National Ocean Observation Network was set up.
- ✓ July 2002 : A Long-term Plan for the operation of Ieodo Ocean Station was decided
- ✓ June 2003 : Construction of Ieodo Ocean Station
- ✓ Feb. 2006 : Internal Plan of the transfer of all ocean observation stations to NORI was fixed.
- ✓ 2007 now : NORI operate all ocean observation stations including Ieodo Ocean Station.

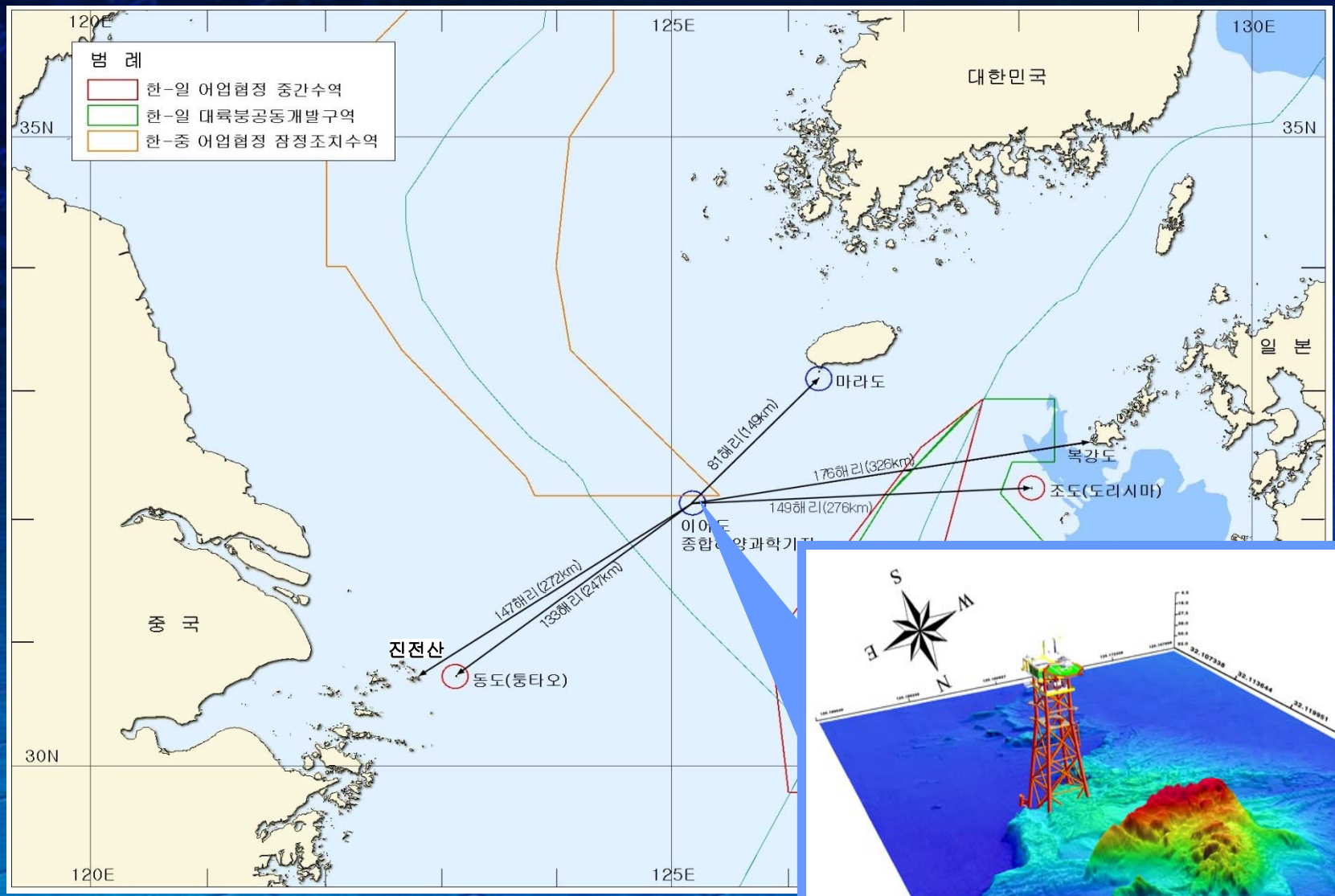
National Real-Time Ocean Observation Network

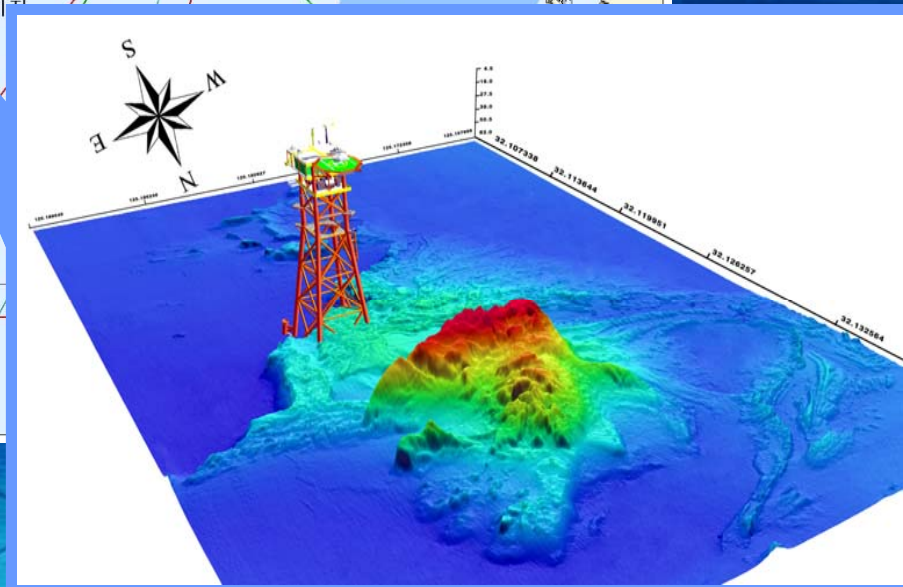
○ 91 observing stations will be established by 2010 (59 stations , 2006)

- Ocean observation base : 5
- Lighthouse observatory : 20
- Dolphin observatory : 20
- Ocean buoy : 8
- Tidal station : 38

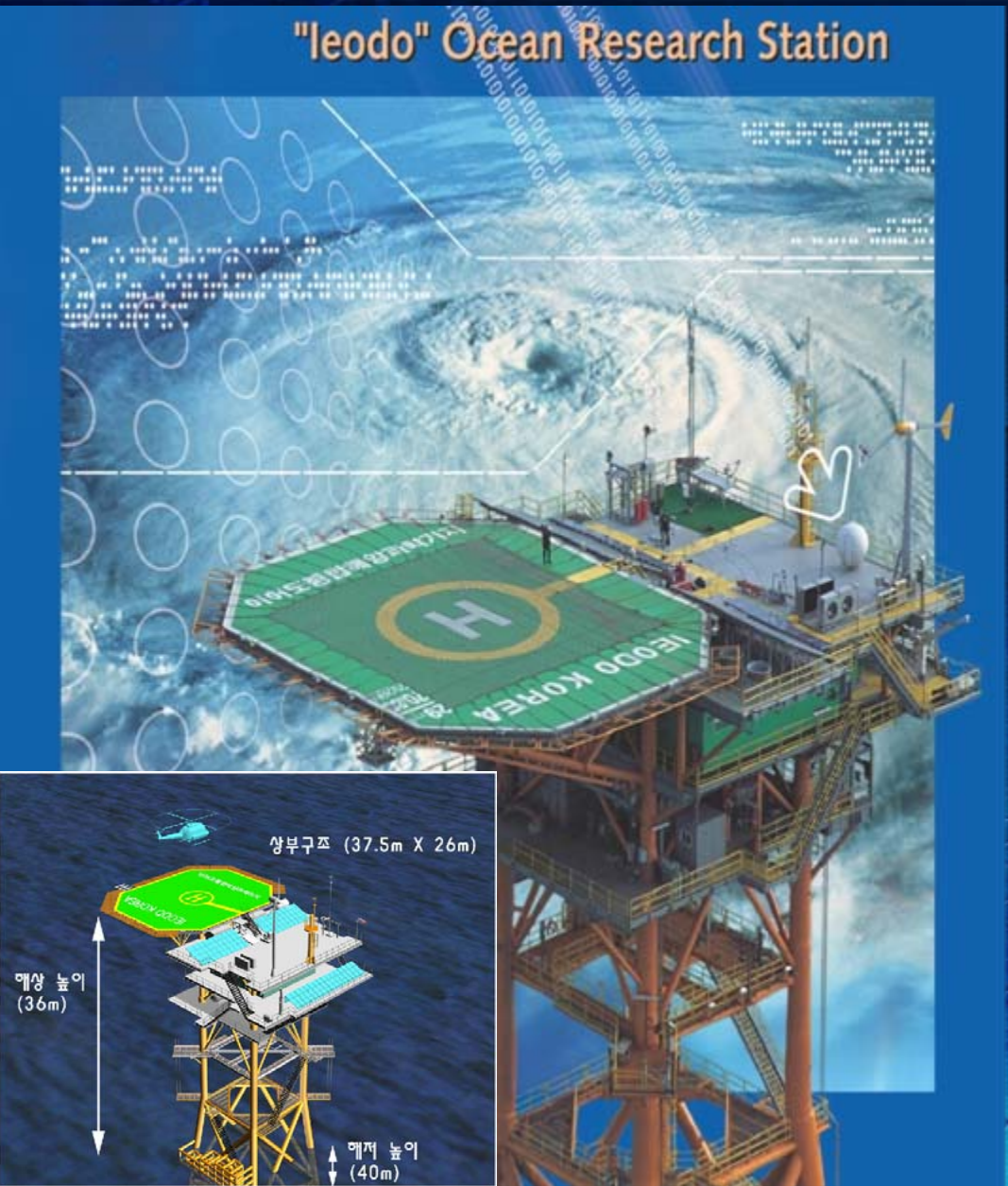
○ Ocean phenomenon such as tide, wave, water temperature, current and weather, etc.systematically is observed and provided in real-time

Ieodo Location





Ieodo Ocean Research Station



- Total Height: 77m (underwater : 40m)
- Total weight: 3,400t
- Main Deck: lab, seminar room, bed, etc
- Cellar Deck: generator, battery room
- Equipment: 108 (44 types)
  - Atmos. obs. : 41 (14 types)
  - Ocean obs. : 40 (21 types)
  - Structure safety obs. : 19 (4 types)
  - Environment obs. : 8 (5 types)

wave radar

ADCP

weather sensor

CTD

Ocean Observation – Ocean Buoy

Ocean Monitoring Buoy

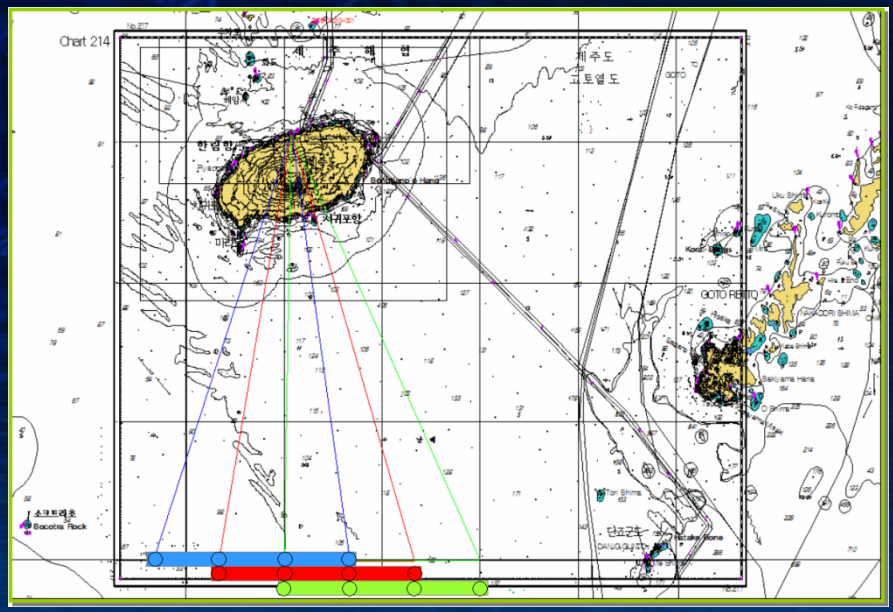
○ Introduction

- Provide boundary conditions for surge prediction
- Complementary data supply for ocean current observation
- Acquisition of weather data in bad weather, such as typhoon and Produce current data

○ Application plan

- Provide calibration and verification data for ship-mounted ADCP
- Calculation of boundary conditions
- Long and short-term prediction of tidal and ocean current

Ocean Observation – ARGOS Buoy



ARGOS Buoy

○ Introduction

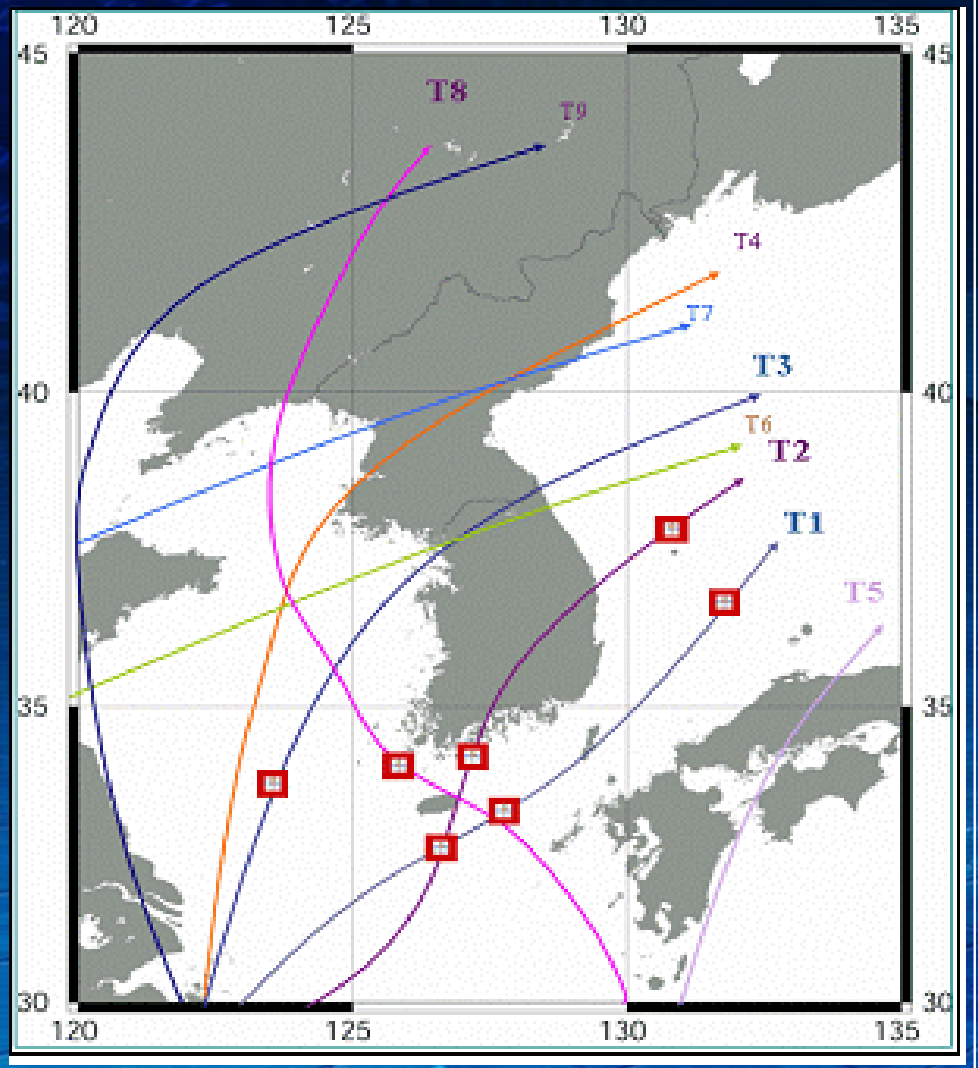
- Observe typhoon using minimets and barometer drifters
- Deploy the instrument using airplane (e.g. Helicopter)

○ Application

- Provide SST, wind speed and air pressure at typhoon core for typhoon prediction
- Provide calibration and verification data for storm surge model
- Long & short-term prediction of ocean current

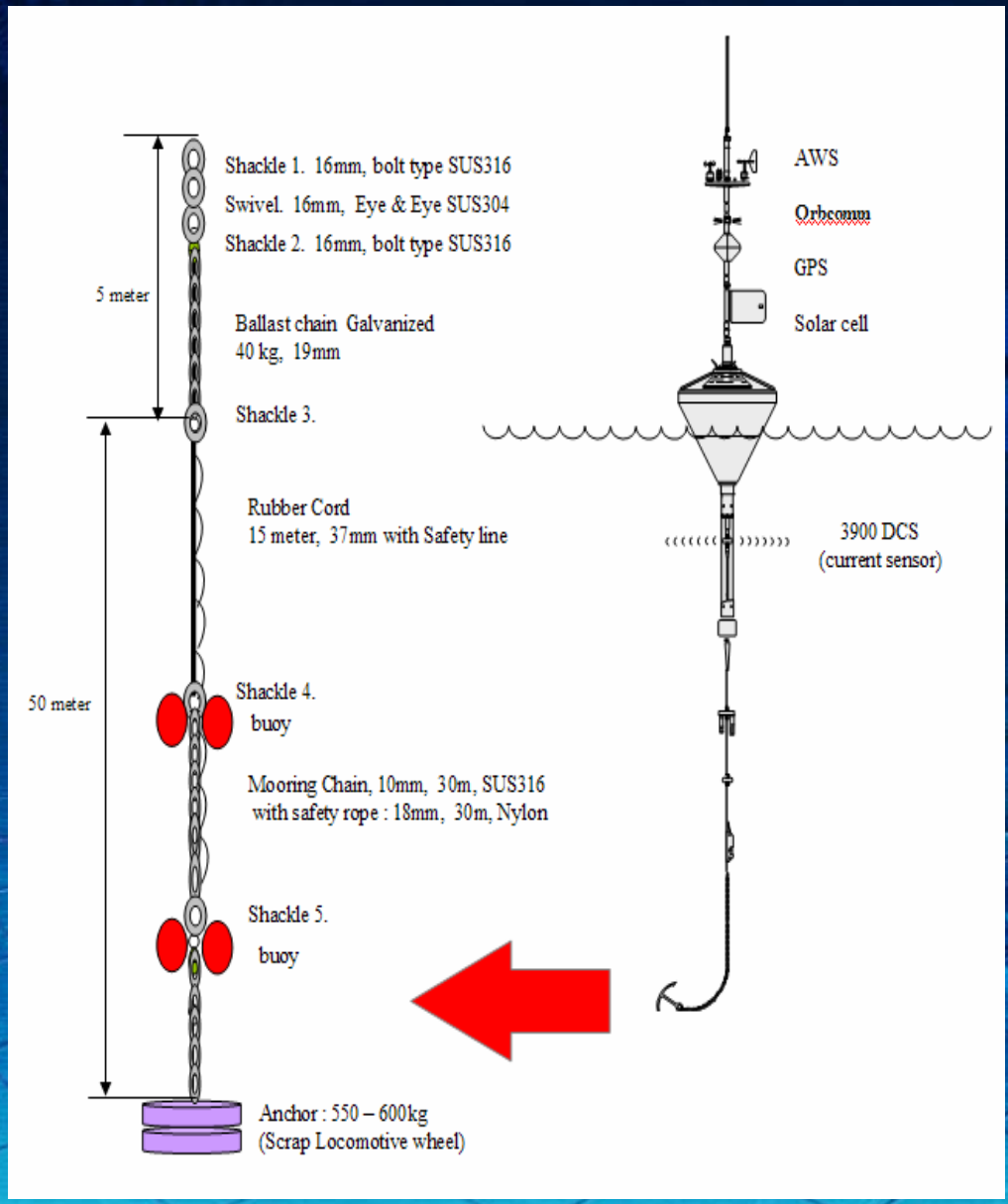
II. Ocean Monitoring Buoy

Decision of buoy installation position



<Typhoon Track distribution map>

Ocean monitoring buoy installation



Meteorological Sensors

Wind Direction Sensor

Wind Speed Sensor

MIRA Visibility Sensor

Air Pressure Sensor

Air Temperature Sensor

Hydrological Sensors

Wave Height Sensor

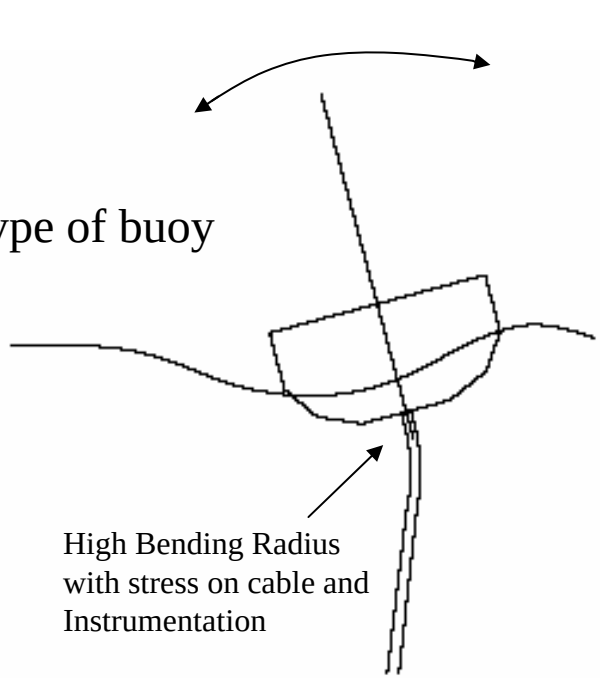
Buoy Orientation Sensor

C/T Sensor

Doppler Current Sensor

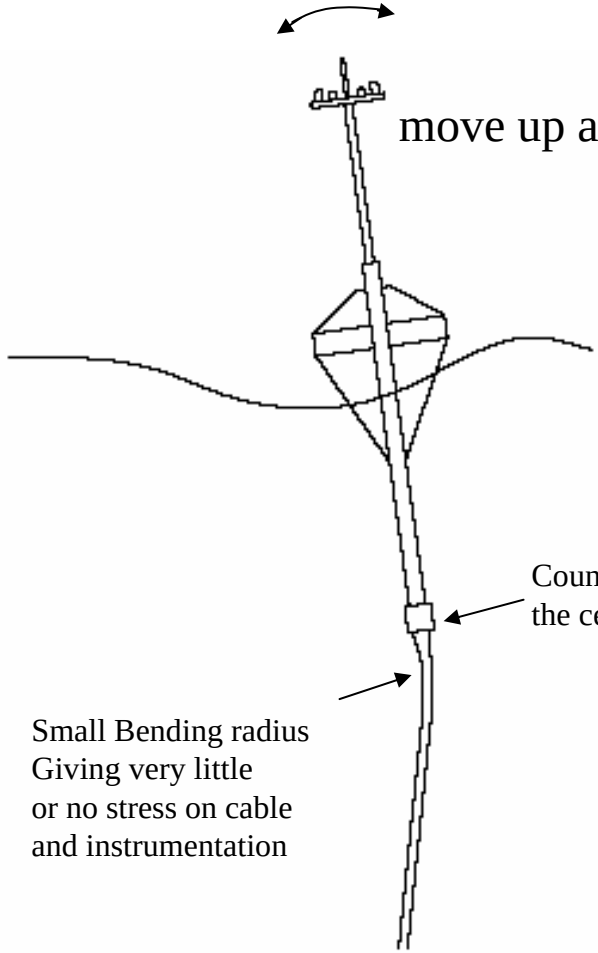
Acorn buoy is shaped for sub sea installations and to handle waves and swells

General type of buoy



High Bending Radius
with stress on cable and
Instrumentation

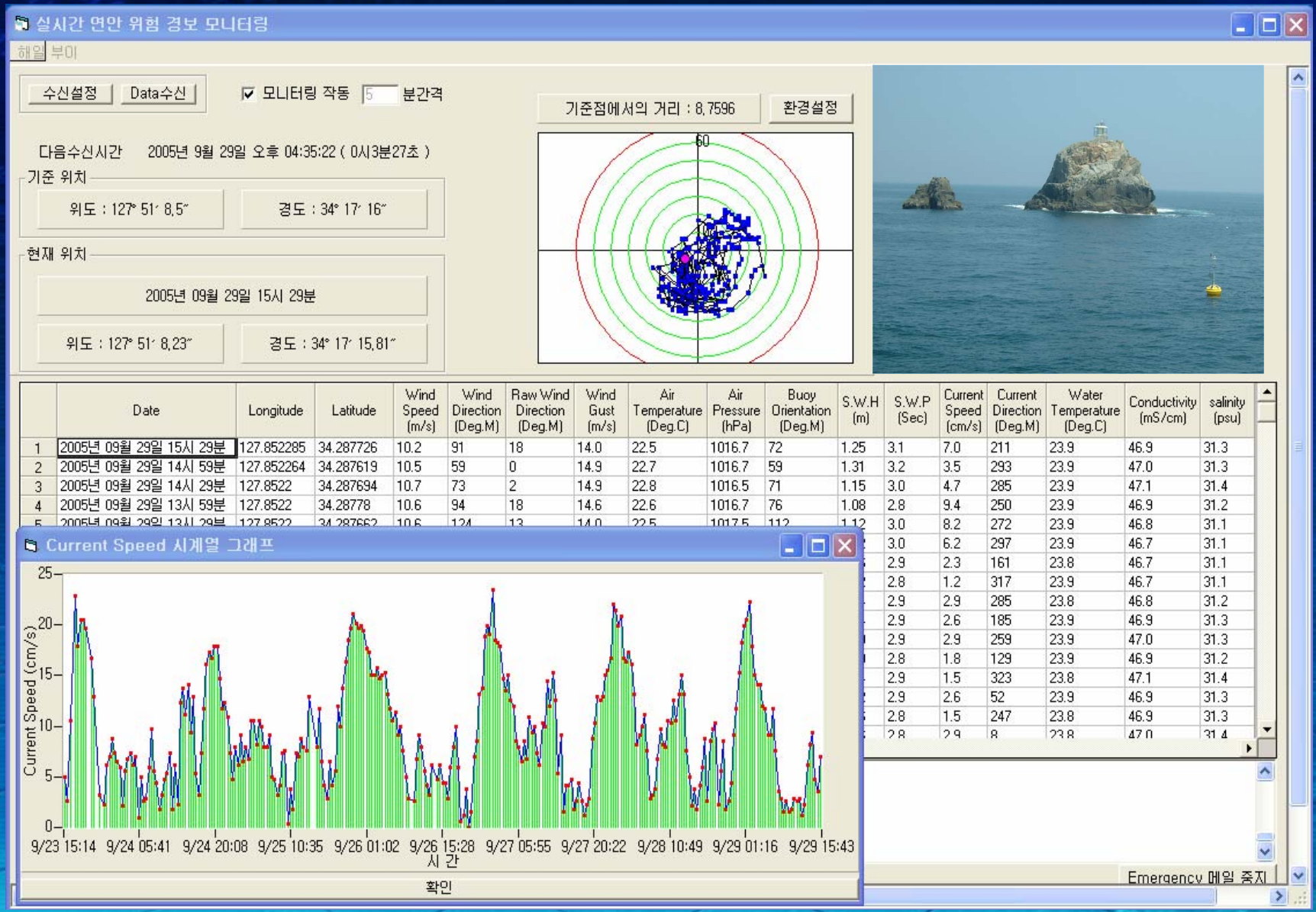
move up and down vertically

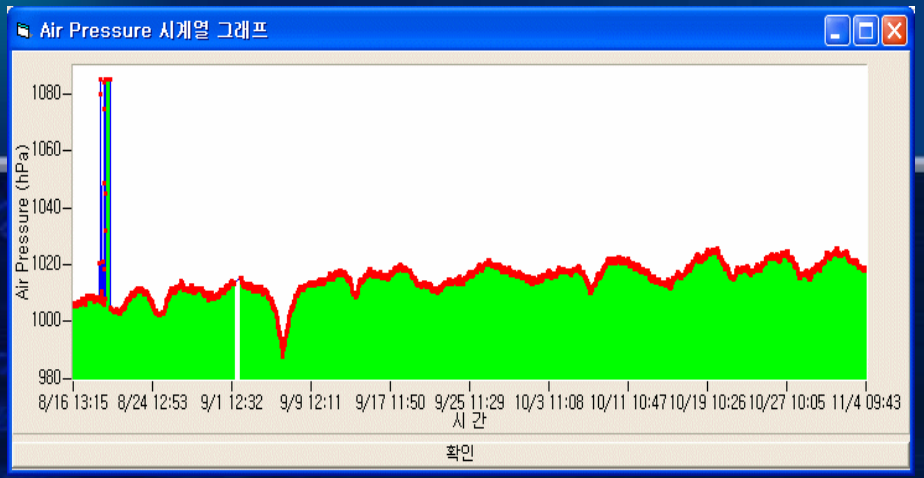


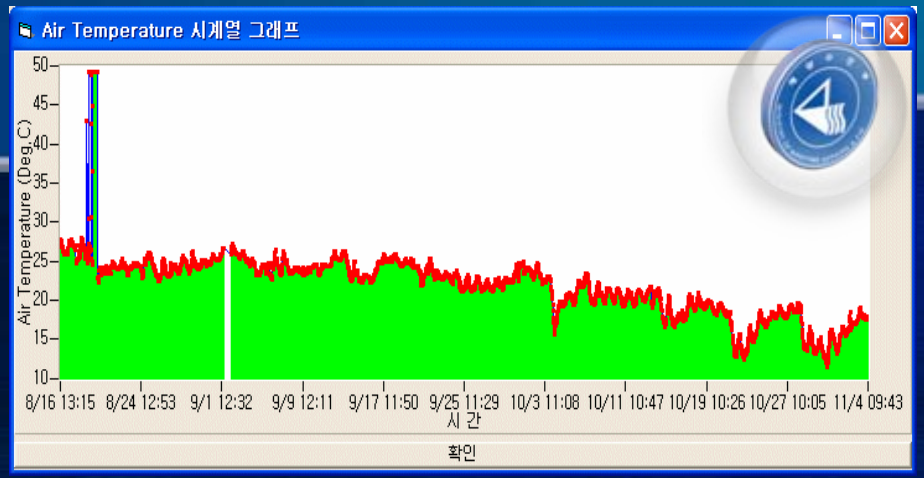
Counter weight lowering
the center of gravity

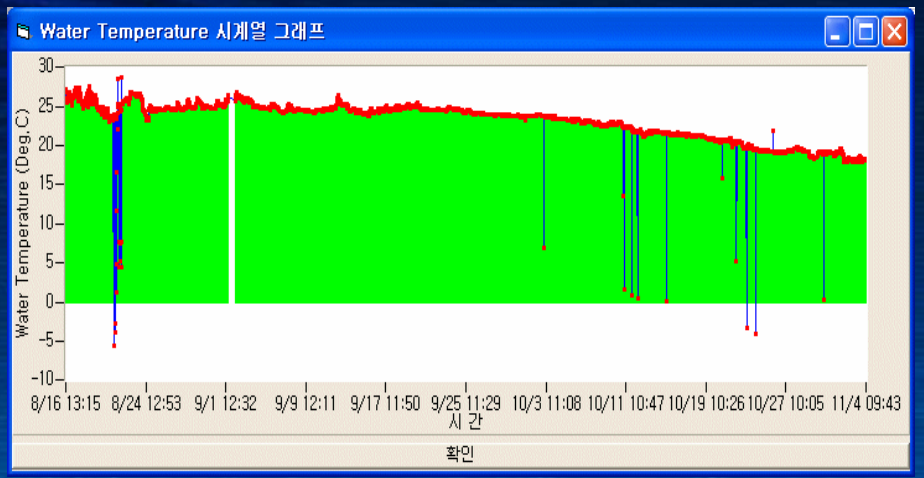
Small Bending radius
Giving very little
or no stress on cable
and instrumentation

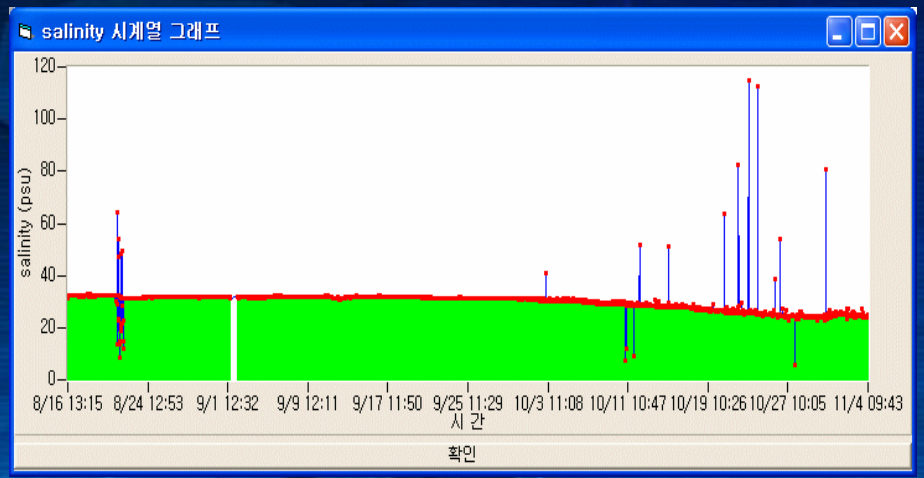
Buoy monitoring Program

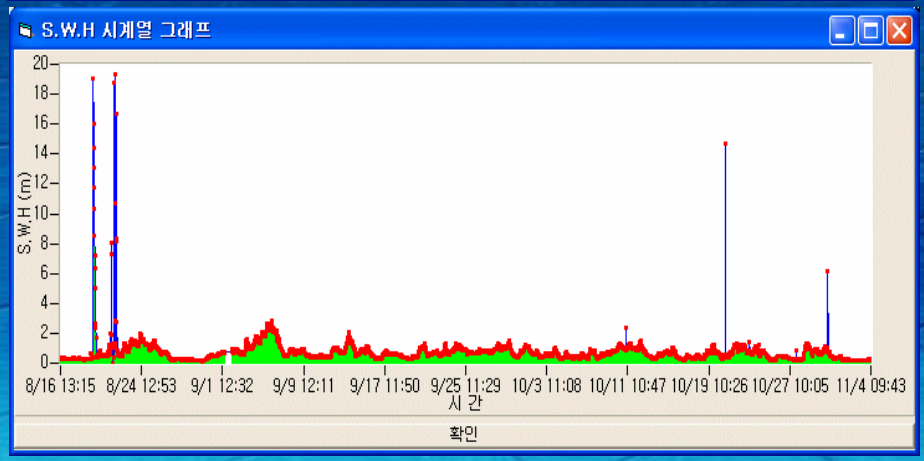


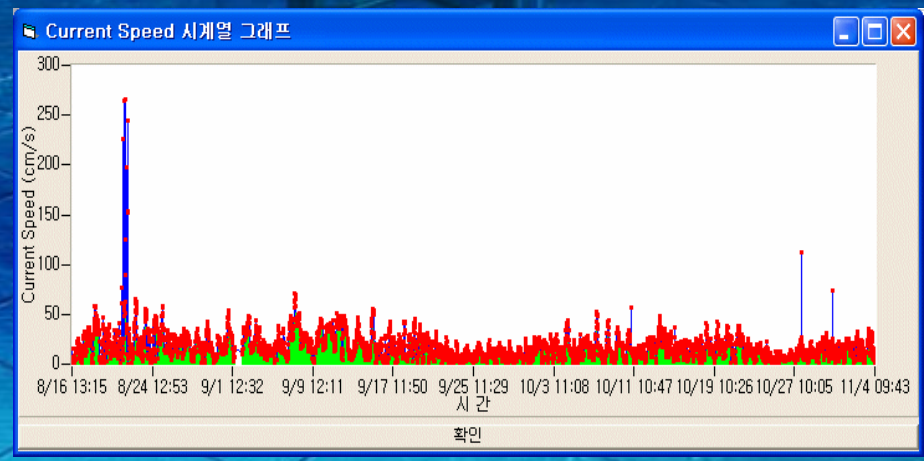

Air Pressure 시계열 그래프
Air Pressure (hPa)
1080
1060
1040
1020
1000
980
8/16 13:15 8/24 12:53 9/1 12:32 9/9 12:11 9/17 11:50 9/25 11:29 10/3 11:08 10/11 10:47 10/19 10:26 10/27 10:05 11/4 09:43
시 간
확인


Air Temperature 시계열 그래프
Air Temperature (Deg.C)
50
45
40
35
30
25
20
15
10
8/16 13:15 8/24 12:53 9/1 12:32 9/9 12:11 9/17 11:50 9/25 11:29 10/3 11:08 10/11 10:47 10/19 10:26 10/27 10:05 11/4 09:43
시 간
확인

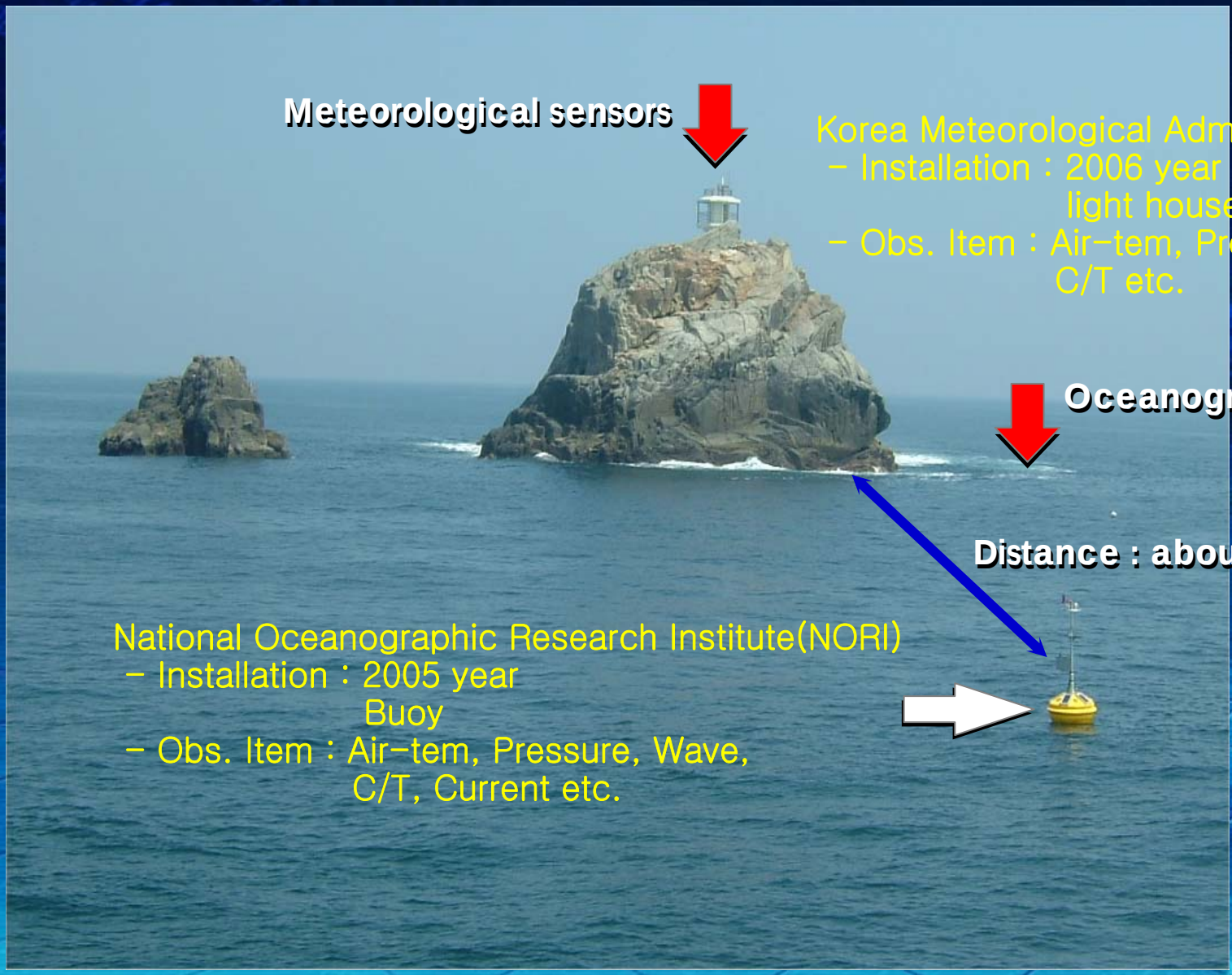

Water Temperature 시계열 그래프
Water Temperature (Deg.C)
30
25
20
15
10
5
0
-5
-10
8/16 13:15 8/24 12:53 9/1 12:32 9/9 12:11 9/17 11:50 9/25 11:29 10/3 11:08 10/11 10:47 10/19 10:26 10/27 10:05 11/4 09:43
시 간
확인


salinity 시계열 그래프
salinity (psu)
120
100
80
60
40
20
0
8/16 13:15 8/24 12:53 9/1 12:32 9/9 12:11 9/17 11:50 9/25 11:29 10/3 11:08 10/11 10:47 10/19 10:26 10/27 10:05 11/4 09:43
시 간
확인

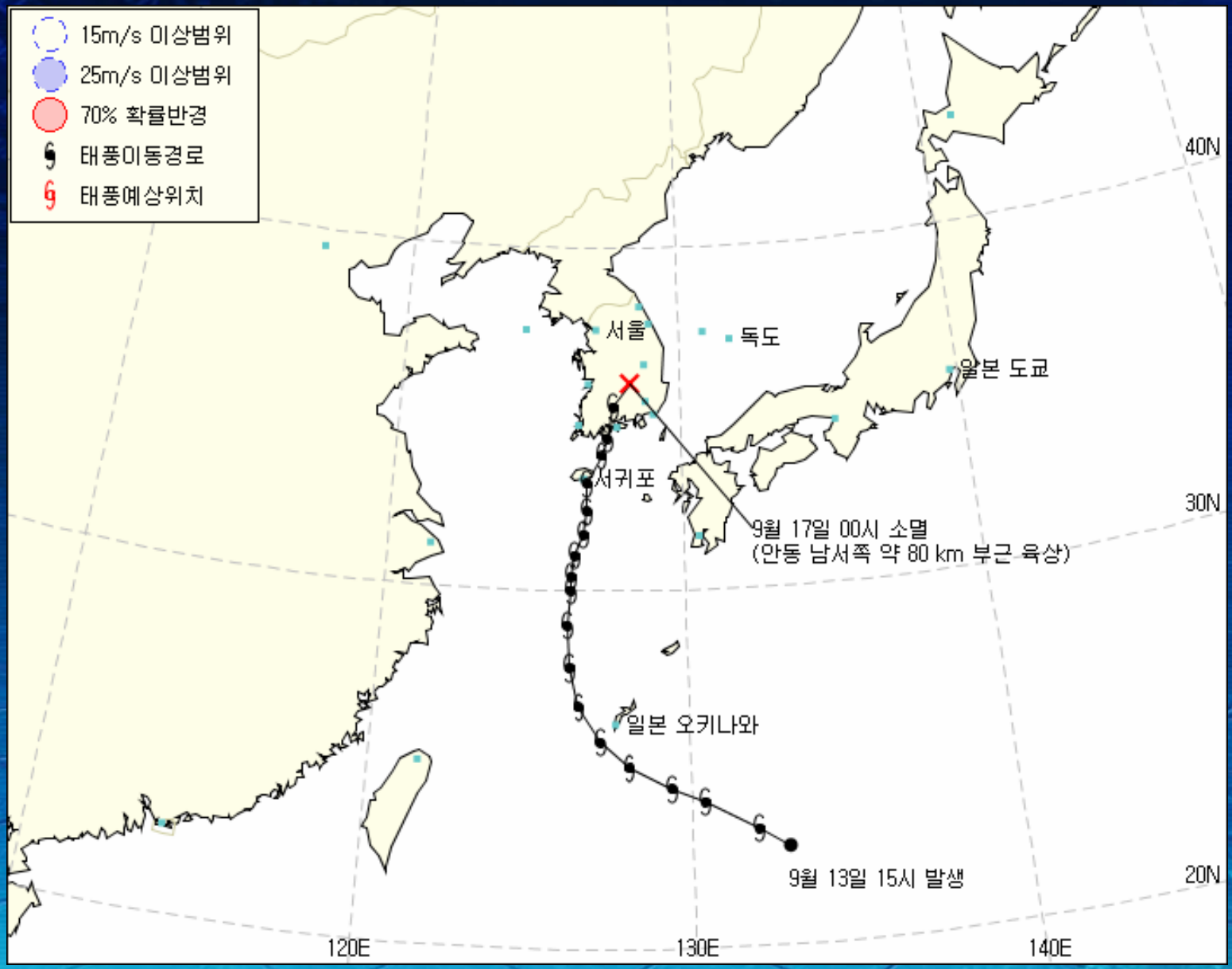

S.W.H 시계열 그래프
S.W.H (m)
20
18
16
14
12
10
8
6
4
2
0
8/16 13:15 8/24 12:53 9/1 12:32 9/9 12:11 9/17 11:50 9/25 11:29 10/3 11:08 10/11 10:47 10/19 10:26 10/27 10:05 11/4 09:43
시 간
확인

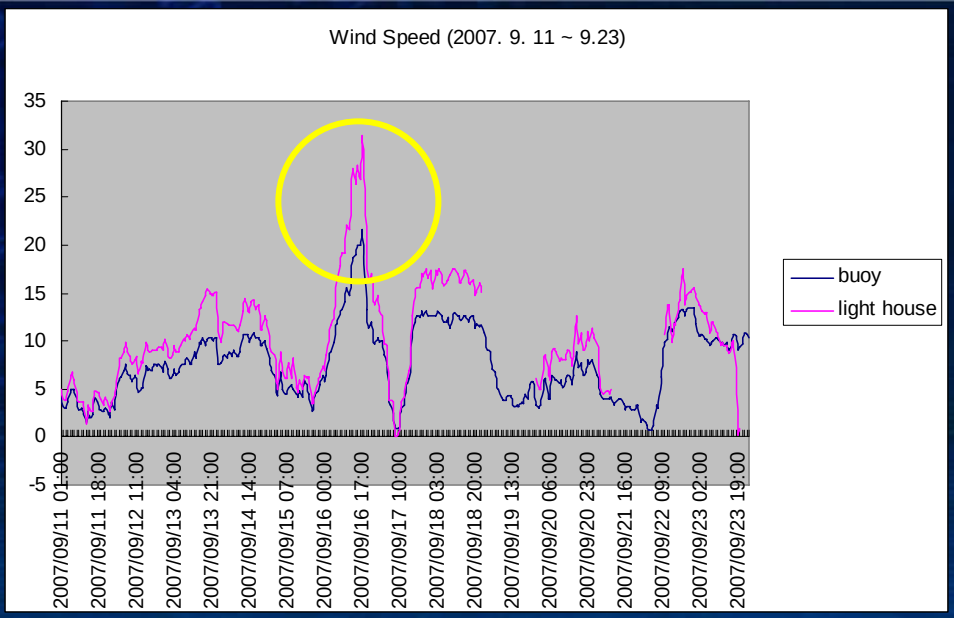

Current Speed 시계열 그래프
Current Speed (cm/s)
300
250
200
150
100
50
0
8/16 13:15 8/24 12:53 9/1 12:32 9/9 12:11 9/17 11:50 9/25 11:29 10/3 11:08 10/11 10:47 10/19 10:26 10/27 10:05 11/4 09:43
시 간
확인

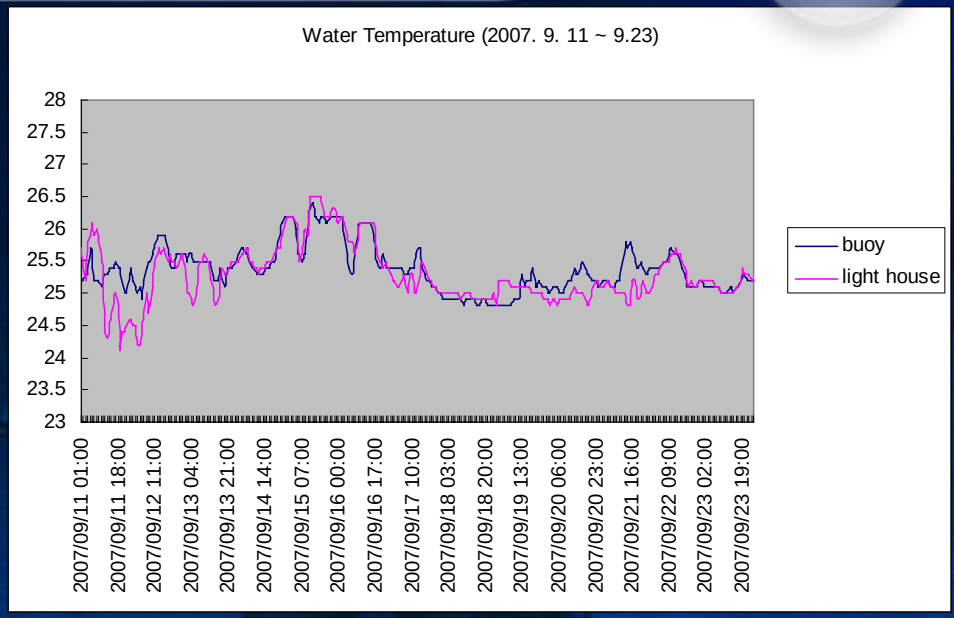
Data comparison

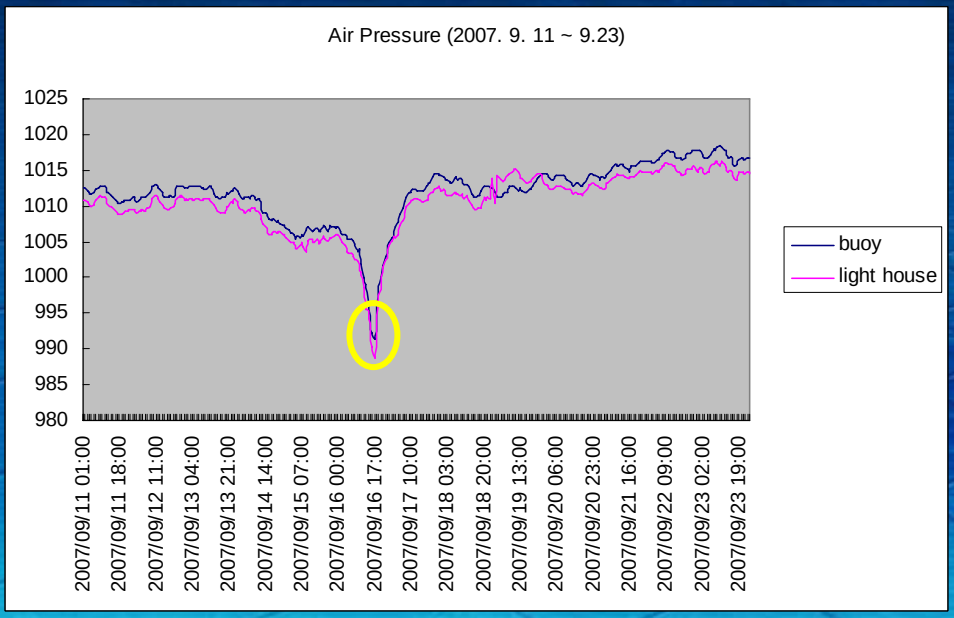


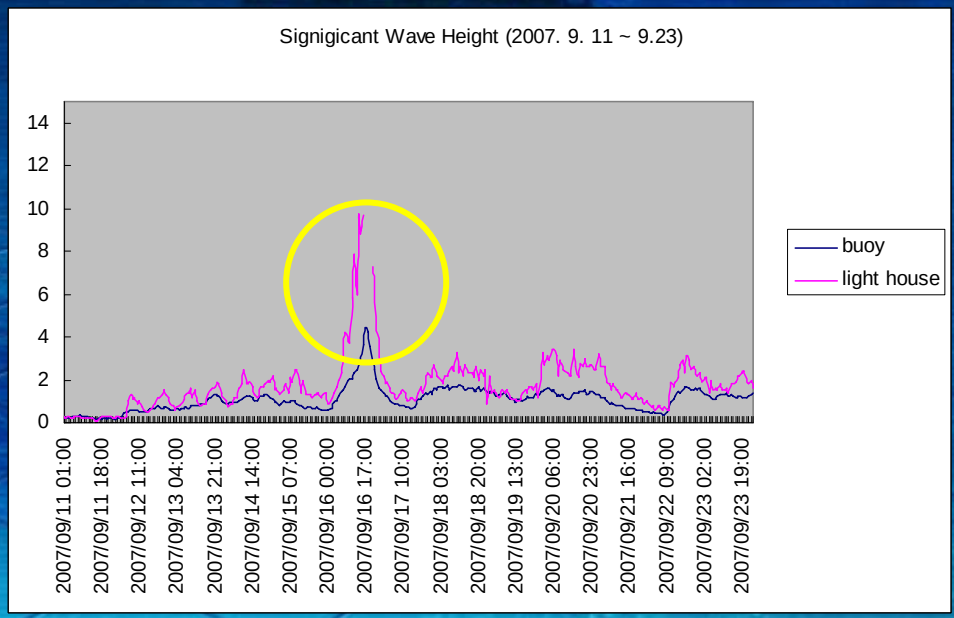
No. 11 Typhoon "NARI" Track - 2007




Wind Speed (2007. 9. 11 ~ 9.23)
35
30
25
20
15
10
5
0
-5
2007/09/11 01:00
2007/09/11 18:00
2007/09/12 11:00
2007/09/13 04:00
2007/09/13 21:00
2007/09/14 14:00
2007/09/15 07:00
2007/09/16 00:00
2007/09/16 17:00
2007/09/17 10:00
2007/09/18 03:00
2007/09/18 20:00
2007/09/19 13:00
2007/09/20 06:00
2007/09/20 23:00
2007/09/21 16:00
2007/09/22 09:00
2007/09/23 02:00
2007/09/23 19:00
buoy
light house


Water Temperature (2007. 9. 11 ~ 9.23)
28
27.5
27
26.5
26
25.5
25
24.5
24
23.5
23
2007/09/11 01:00
2007/09/11 18:00
2007/09/12 11:00
2007/09/13 04:00
2007/09/13 21:00
2007/09/14 14:00
2007/09/15 07:00
2007/09/16 00:00
2007/09/16 17:00
2007/09/17 10:00
2007/09/18 03:00
2007/09/18 20:00
2007/09/19 13:00
2007/09/20 06:00
2007/09/20 23:00
2007/09/21 16:00
2007/09/22 09:00
2007/09/23 02:00
2007/09/23 19:00
buoy
light house


Air Pressure (2007. 9. 11 ~ 9.23)
1025
1020
1015
1010
1005
1000
995
990
985
980
2007/09/11 01:00
2007/09/11 18:00
2007/09/12 11:00
2007/09/13 04:00
2007/09/13 21:00
2007/09/14 14:00
2007/09/15 07:00
2007/09/16 00:00
2007/09/16 17:00
2007/09/17 10:00
2007/09/18 03:00
2007/09/18 20:00
2007/09/19 13:00
2007/09/20 06:00
2007/09/20 23:00
2007/09/21 16:00
2007/09/22 09:00
2007/09/23 02:00
2007/09/23 19:00
buoy
light house


Signigicant Wave Height (2007. 9. 11 ~ 9.23)
14
12
10
8
6
4
2
0
2007/09/11 01:00
2007/09/11 18:00
2007/09/12 11:00
2007/09/13 04:00
2007/09/13 21:00
2007/09/14 14:00
2007/09/15 07:00
2007/09/16 00:00
2007/09/16 17:00
2007/09/17 10:00
2007/09/18 03:00
2007/09/18 20:00
2007/09/19 13:00
2007/09/20 06:00
2007/09/20 23:00
2007/09/21 16:00
2007/09/22 09:00
2007/09/23 02:00
2007/09/23 19:00
buoy
light house

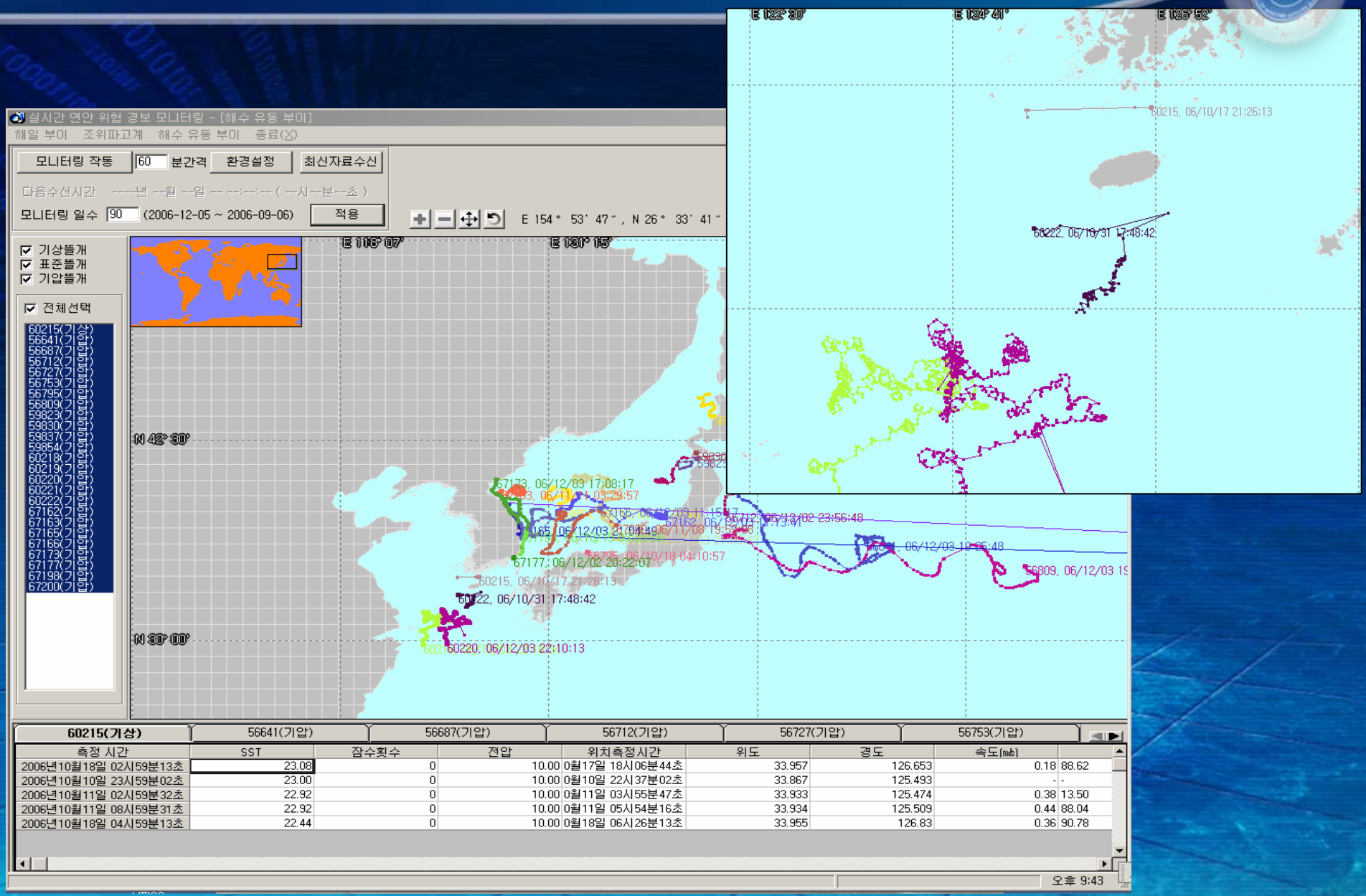
III. ARGOS Buoy

ARGOS Location

<Dropping position & way of a Drifting Buoy>

- ○ Dropping line of a buoy with Blue, Red, Green according to a path of a typhoon
- ○ A buoy keeps 30km interval and drops
- ○ A dropping of a buoy uses a parachute

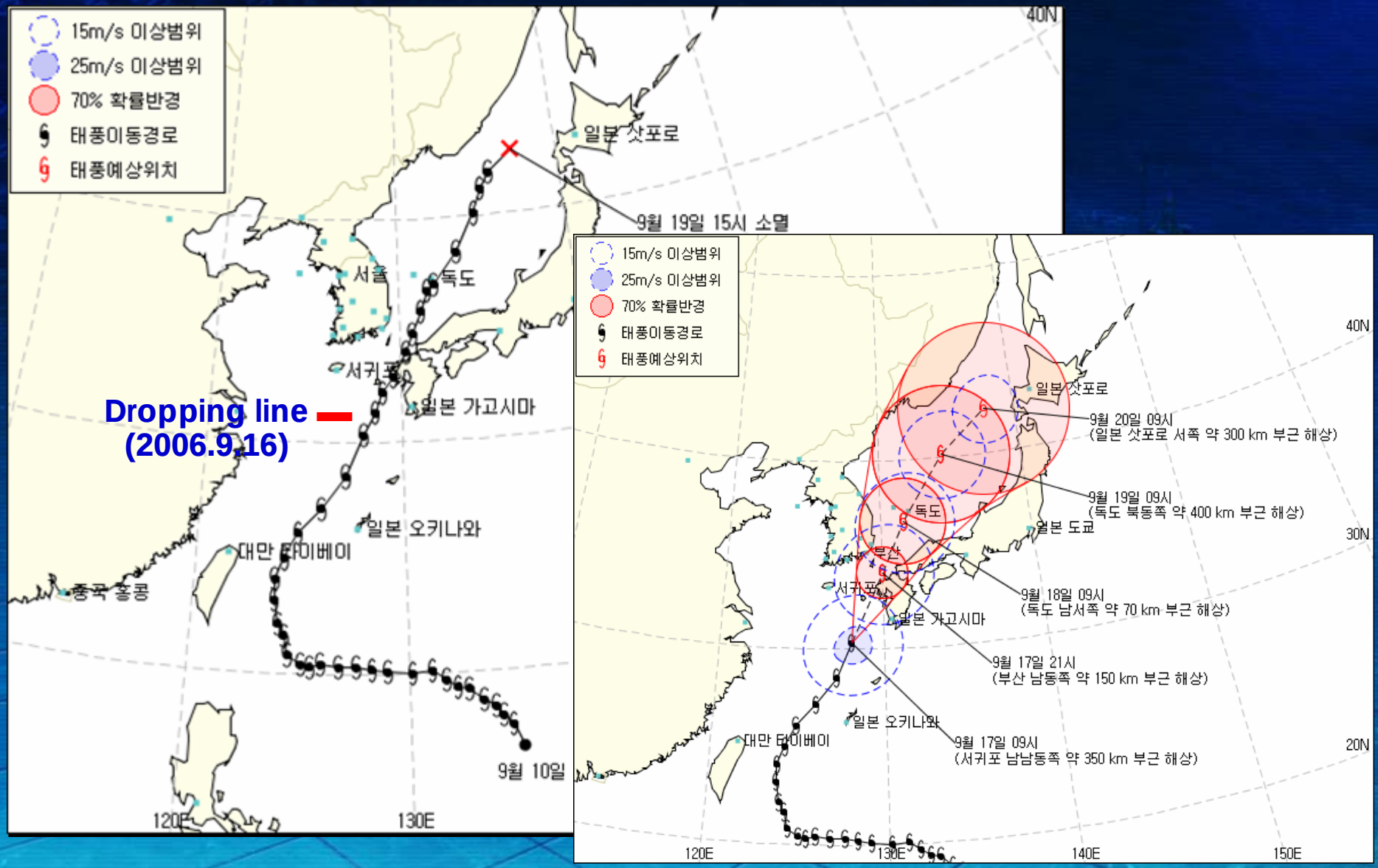
ARGOS Monitoring program

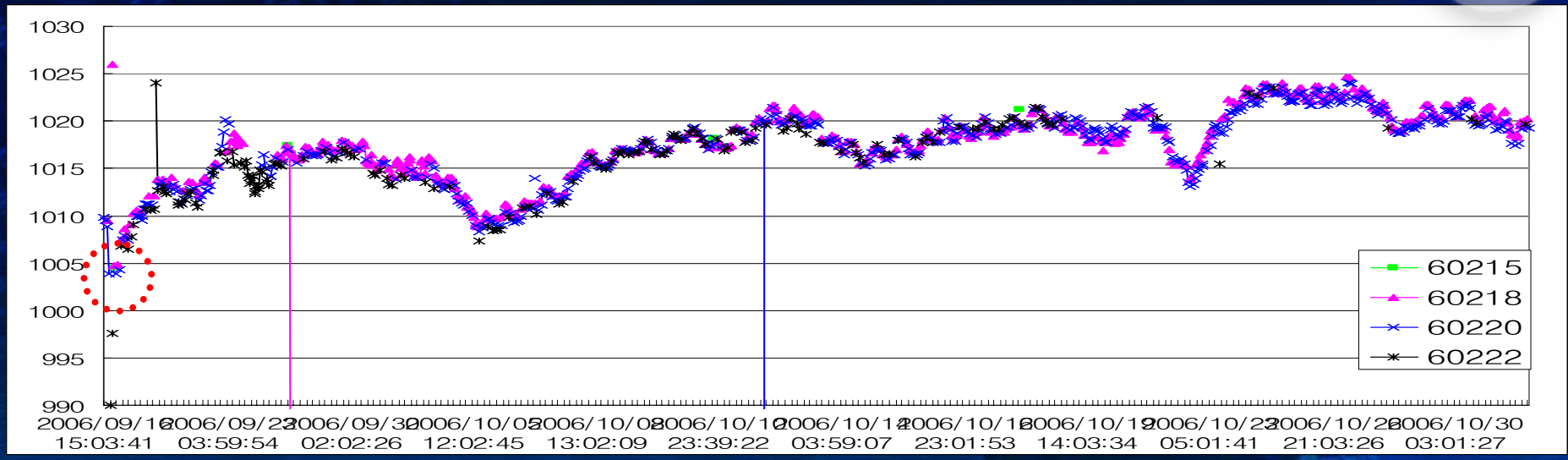


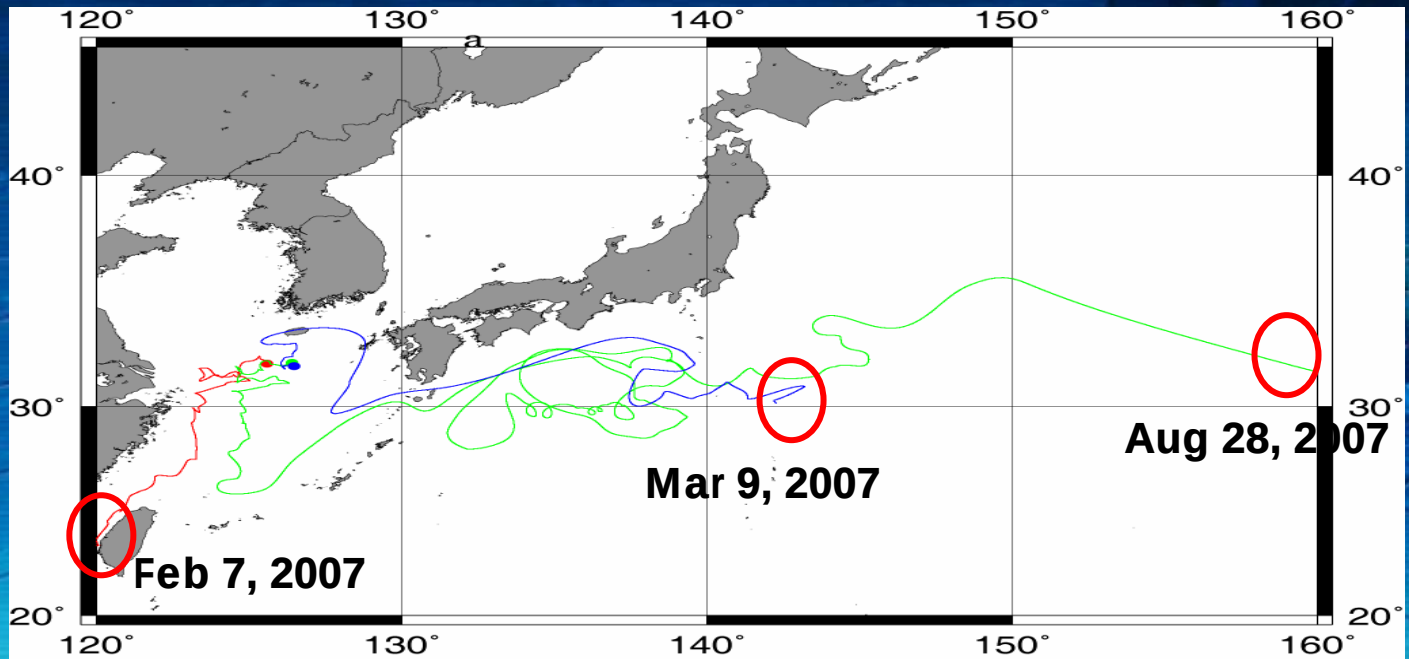
60215(기상) | 56641(기압) | 56687(기압) | 56712(기압) | 56727(기압) | 56753(기압)

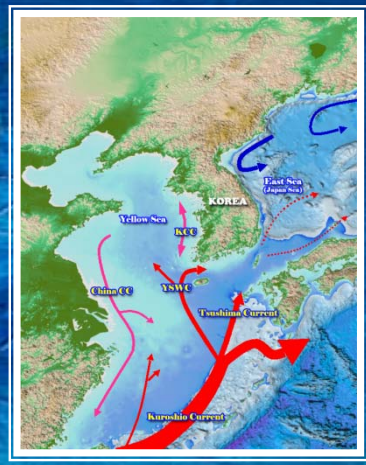
측정 시간	SST	잠수횟수	전압	위치측정시간	위도	경도	속도(m/s)	
2006년10월18일 02시59분13초	23.08	0	10.00	0월17일 18시06분44초	33.957	126.653	0.18	88.62
2006년10월10일 23시59분02초	23.00	0	10.00	0월10일 22시37분02초	33.867	125.493	-	-
2006년10월11일 02시59분32초	22.92	0	10.00	0월11일 03시55분47초	33.933	125.474	0.38	13.50
2006년10월11일 08시59분31초	22.92	0	10.00	0월11일 05시54분16초	33.934	125.509	0.44	88.04
2006년10월18일 04시59분13초	22.44	0	10.00	0월18일 06시26분13초	33.955	126.83	0.36	90.78

No. 13 Typhoon "SHANSHAN" Track




1030
1025
1020
1015
1010
1005
1000
995
990
2006/09/16 15:03:41
2006/09/22 03:59:54
2006/09/30 02:02:26
2006/10/05 12:02:45
2006/10/08 13:02:09
2006/10/12 23:39:22
2006/10/14 03:59:07
2006/10/16 23:01:53
2006/10/19 14:03:34
2006/10/23 05:01:41
2006/10/26 21:03:26
2006/10/30 03:01:27
60215
60218
60220
60222

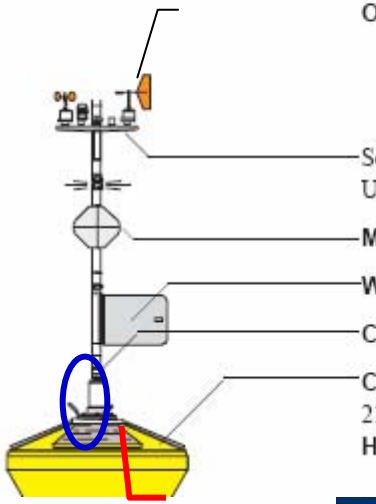

120°
130°
140°
150°
160°
40°
30°
20°
Feb 7, 2007
Mar 9, 2007
Aug 28, 2007


East Sea (Japan Sea)
KOREA
Yellow Sea
KCC
China CC
YSWC
Tsushima Current
Kuroshio Current

Ⅳ. Problem and improvement

Problem and Improvement

Old Design



Orbcomm & GPS

Sensors on **Sensor Ring 3868** for a wide range of meteorological parameters. Up to 6 parameters.

Mast Section with Flashing Light and Radar Reflector 3861.

Wind Vane 3273.

Control Unit 3850A with optional **Data Storage Unit 2990/2990E**

Central Buoy Module 3867A supporting **Datalogger 3860** and a 12V, 21Ah rechargeable battery. Also supporting optional sensors like **Wave Height Sensor 3595** and **Buoy Orientation Sensor 4164**.

New Design

THANK YOU