Integrated coastal monitoring system

through combination of *in situ* monitoring, remote sensing and 3-D numerical models

J.S. Park[1], J.R. Li[2], J.Y. Jin [1], D.Y. Lee[1], K.S. Lee[1], E. Hayter[3]

KORDI[1]

HHU[2]

USACE-CHL[3]

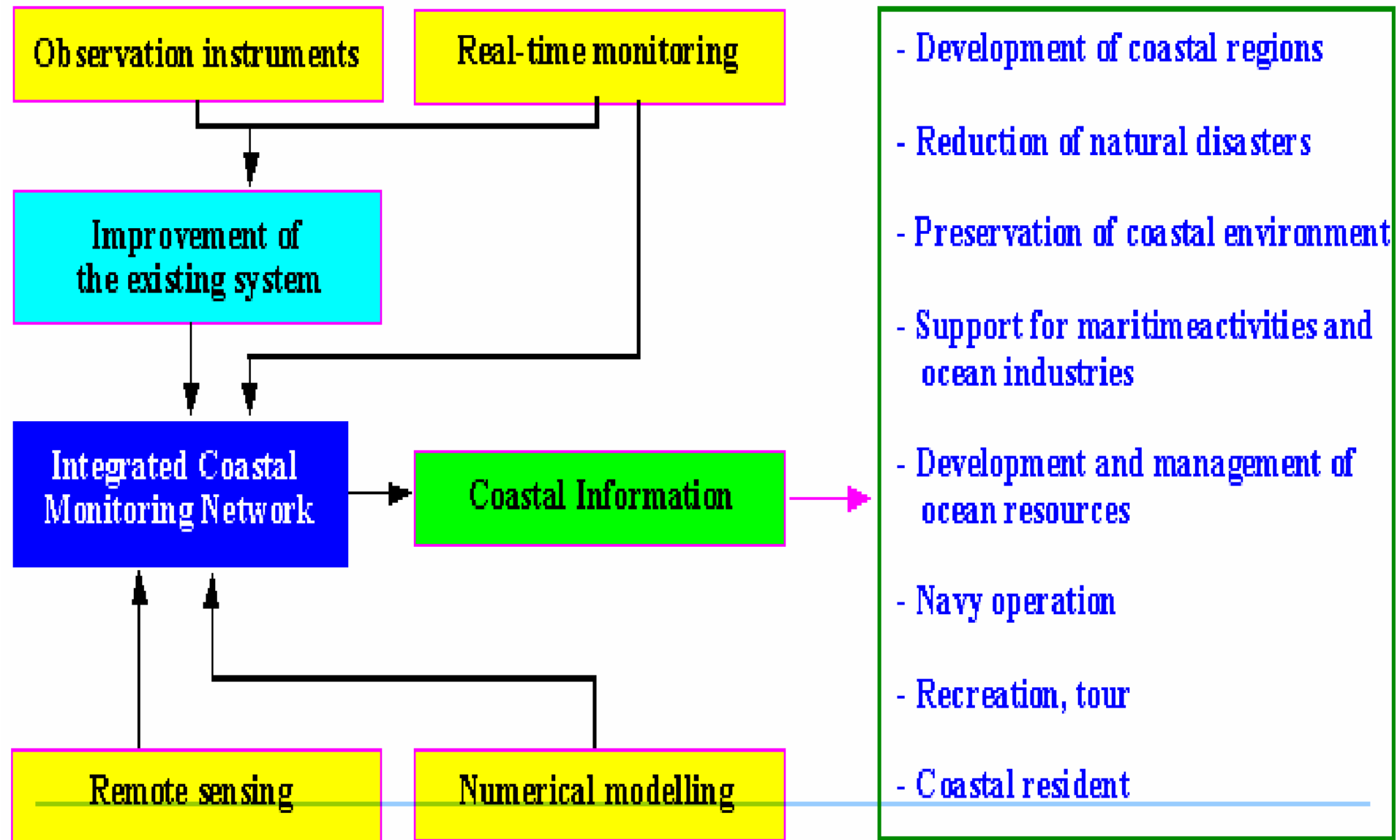# Contents

-Integrated Coastal Monitoring System

. In situ Monitoring

. Satellite Remote Sensing

. 3-D Numerical Modeling

-On-going and further research using in situ and
  Satellite Remote Sensing Data

Integrated Coastal Observing System for Operational Oceanography, 1990 KORDI

➢Gyeong-gi Bay, South Korea

- Tidal range: about 8 meters, inflow of Han River,

  mud and sand mixed sediment environment

⇒Coastal environmental parameters vary rapidly
  with time and space.

 3-D features of Coastal Environment
using Modern technologies

- in situ un-manned monitoring of vertical profiles

  - Geo-stationary satellite remote sensing

 - 3-D numerical models.
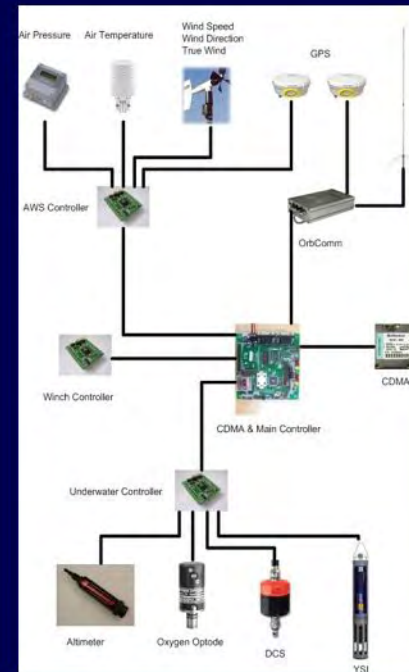
Intelligent Buoy System (INBUS)

- automatically measures the vertical profiles

 of more than 10 parameters

- every half an hour time interval

Combination of the in situ data from INBUS system with Geo-stationary Ocean Color satellite remote sensing allows us to produce accurate mapping of 2-D surface data set

Combination with 3D Numerical Model -> expend the information for 3D

Intelligent Buoy System (INBUS)

- automatically measures the vertical profiles
  of more than 10 parameters
- every half an hour interval
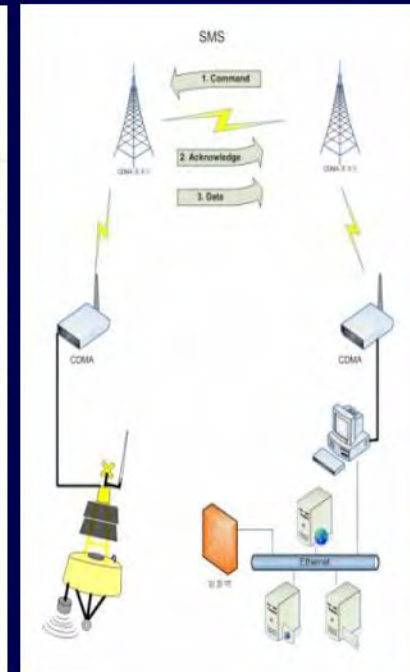
INBUS Sensors & Transmission System

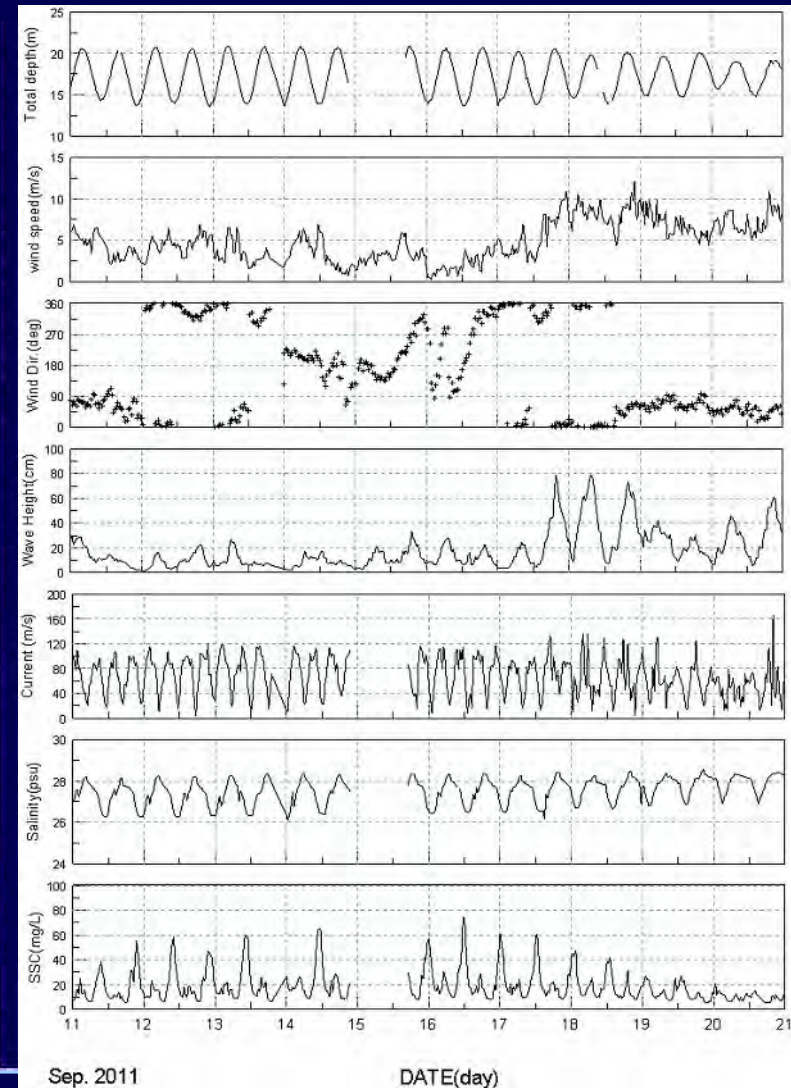❖ INBUS (Intelligent Buoy System) ? Design & Installation
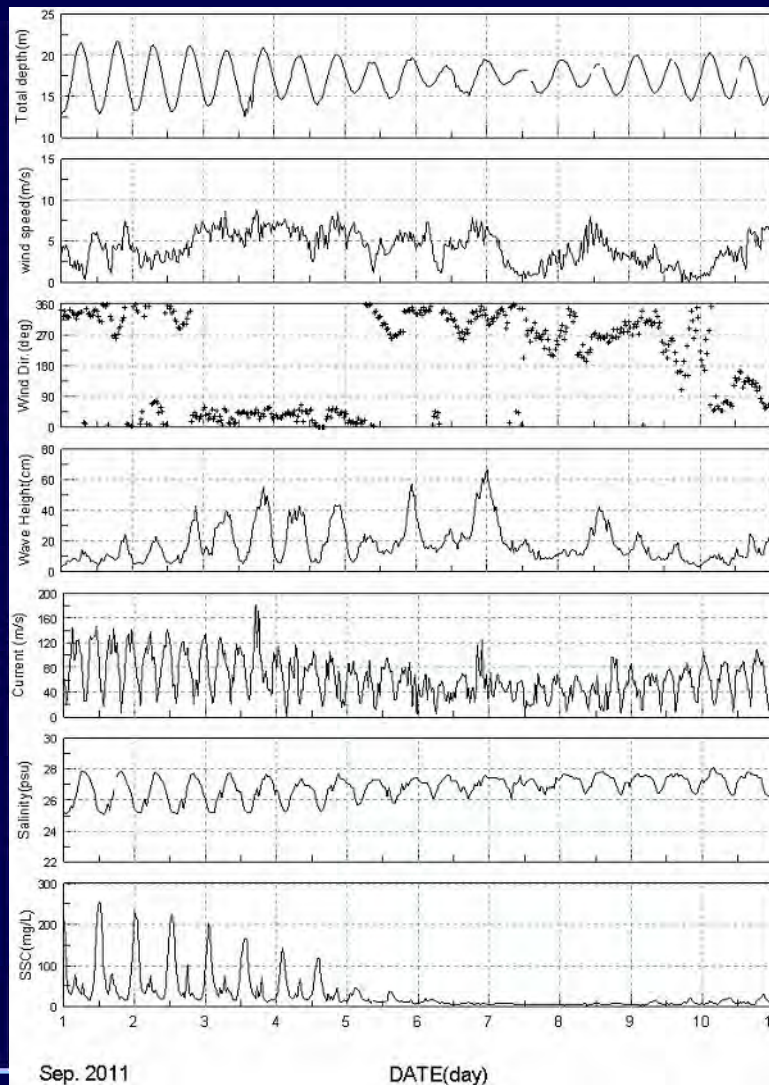
❖ SS Calibration
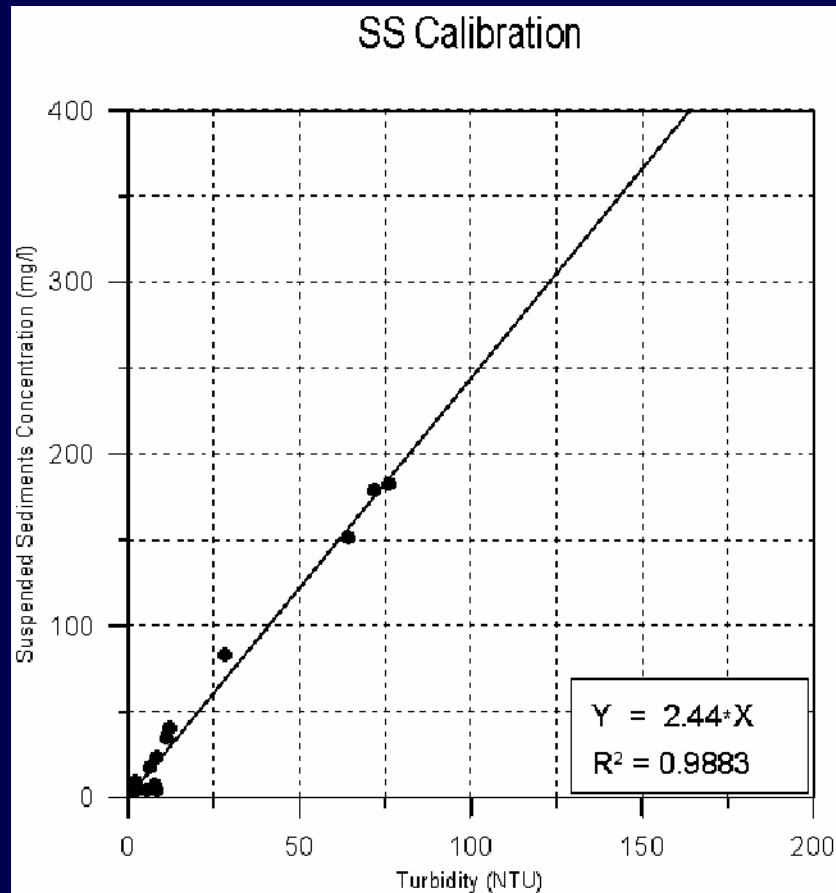
Turbidity-SS Calibration
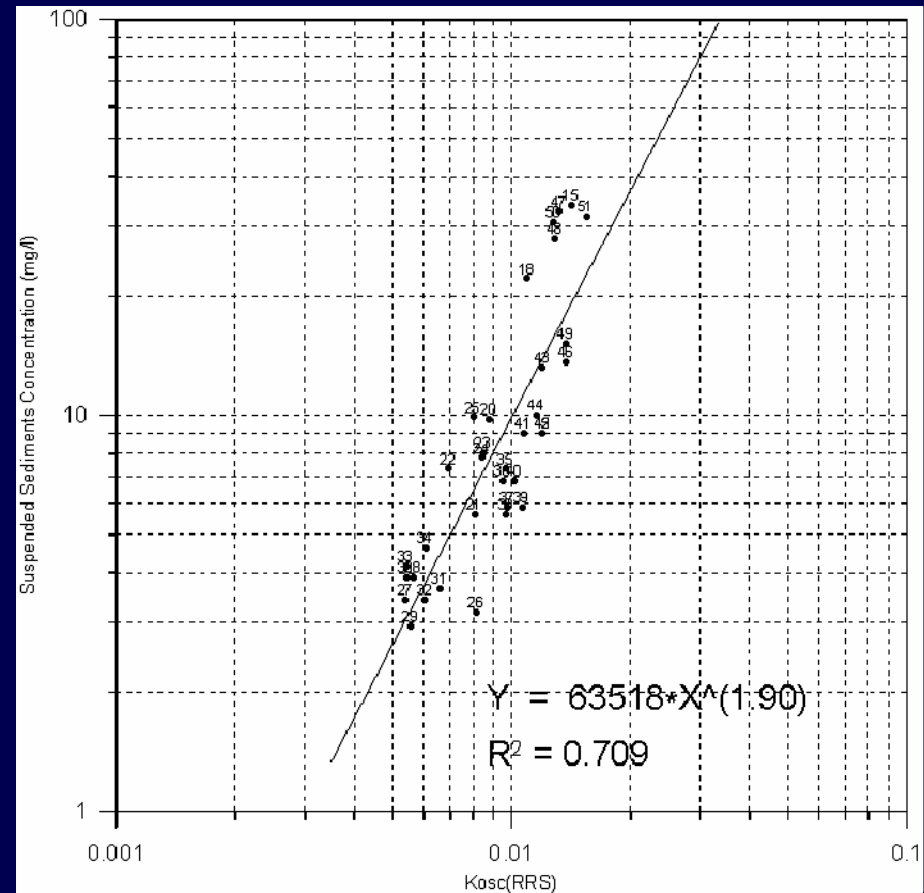
GOCI RRS-SS
Calibration

❖ INBUS(Intelligent Buoy System) – Result Example

➤ Wind, Wave, Tide, Tidal Current Speed, Salinity, Turbidity, D.O. etc

Ocean Color Satellite Remote Sensing Data

- Satellite Remote Sensing Data Receiving Stations
- Internet: LAADS, LPDAAC, Ocean Color, NSIDC, WebMODIS
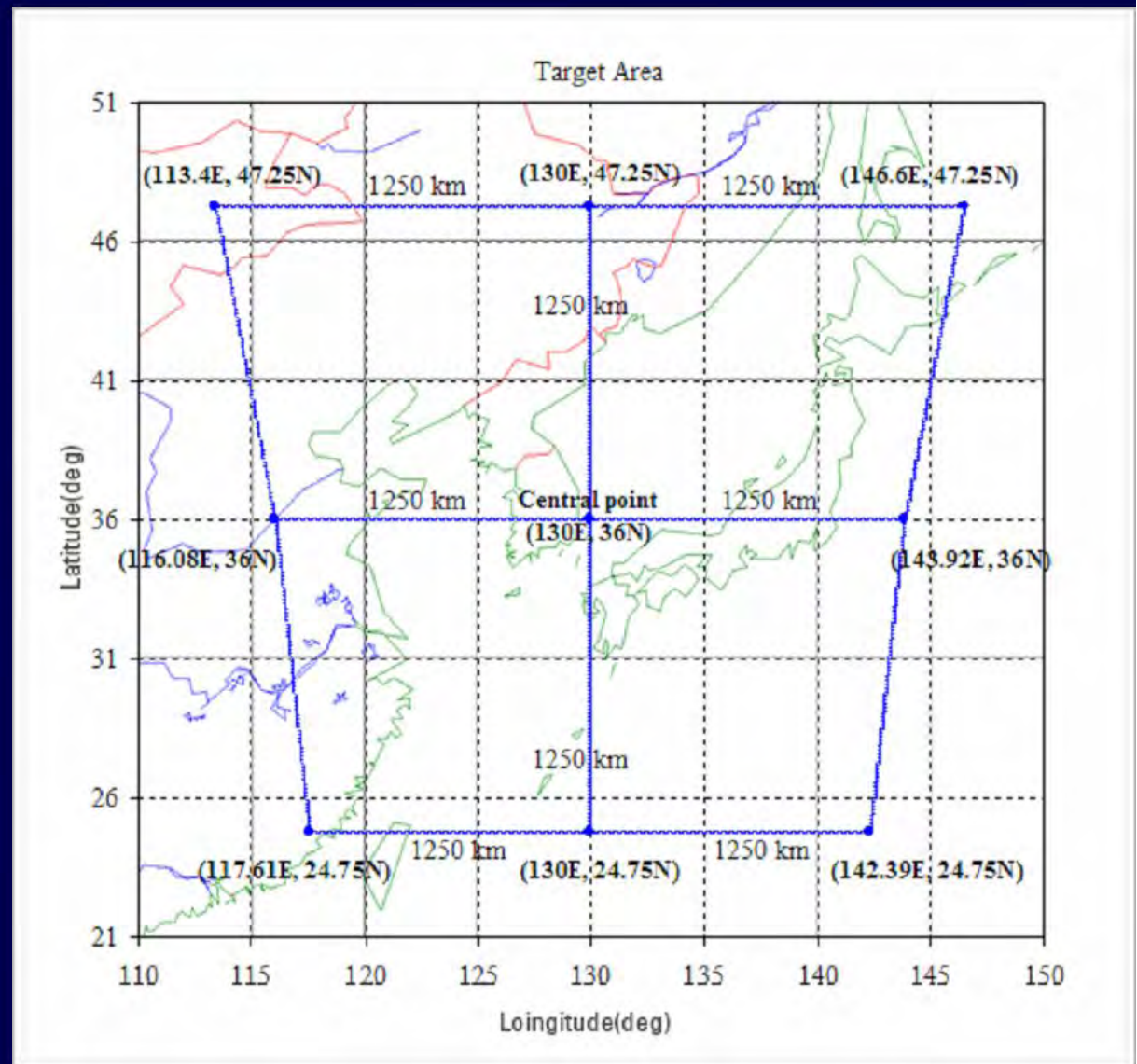
– Geo-Stationary Satellite

– (First Geo-stationary Ocean Color Sensor)

– 8 Bands

– High Space Resolution (500m x 500m)
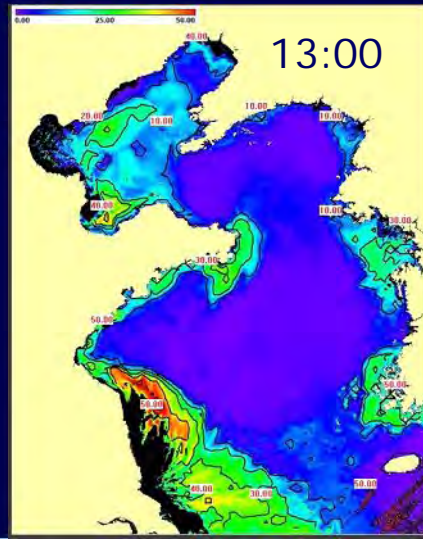
– Hourly data 9 AM-4 PM 8 times /day
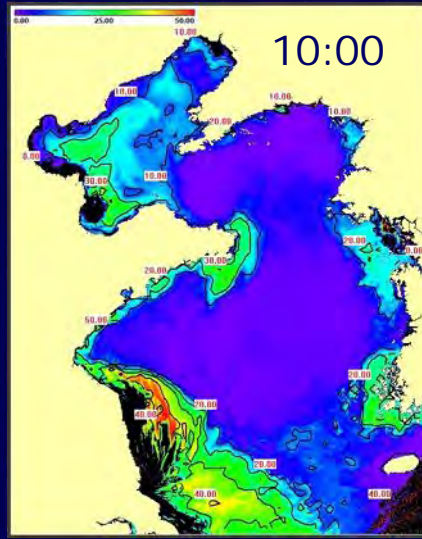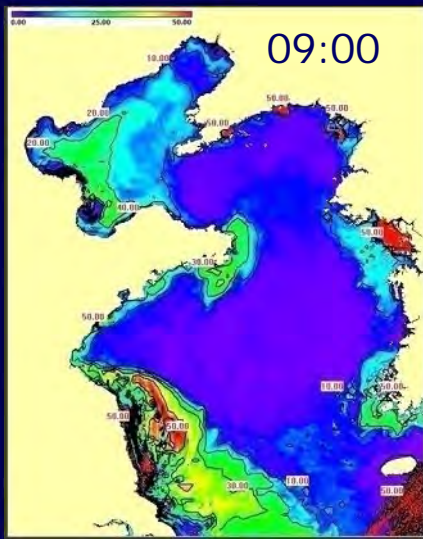
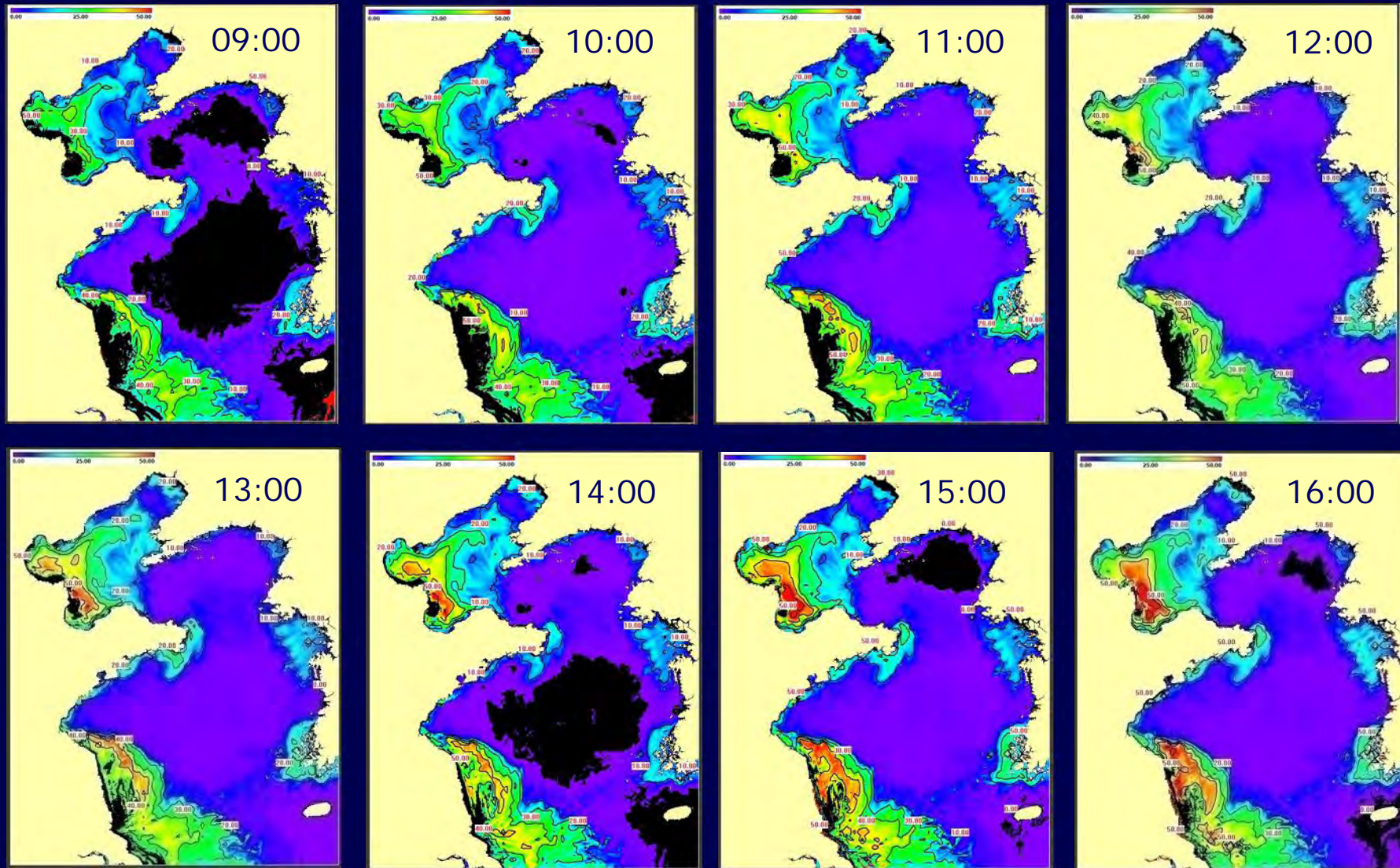– http://kosc.kordi.re.kr

❖ GOCI image Area

Target Area

high spatial resolution (500 × 500 m),
time interval (8 times per day)

❖ Surface Suspended Sediment Concentration from GOCI (April 5, 2011)
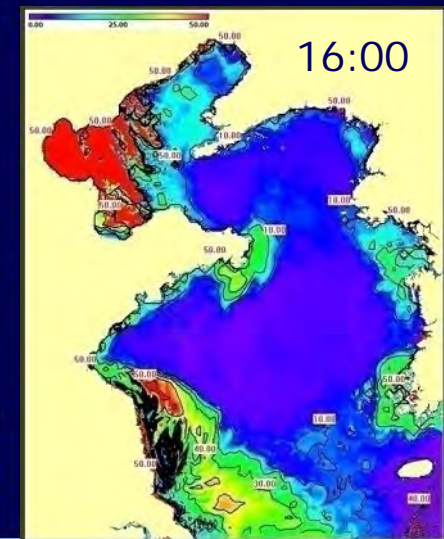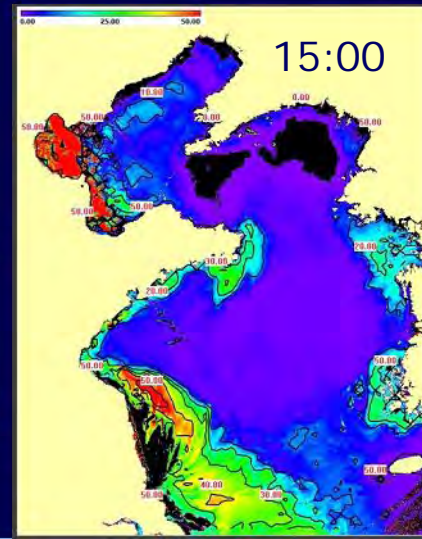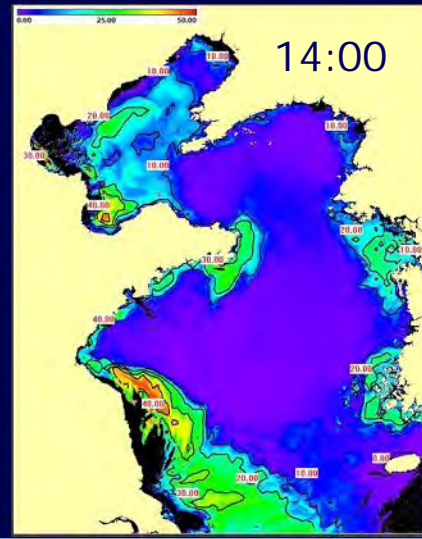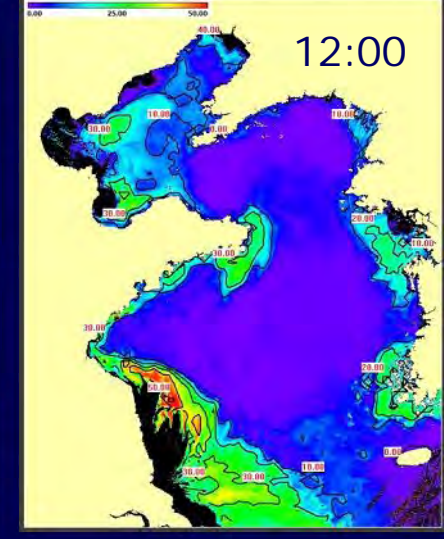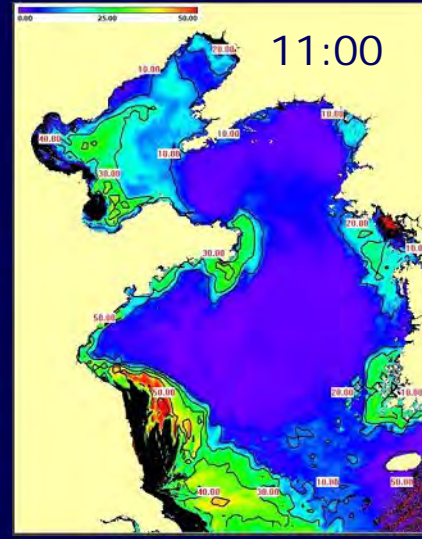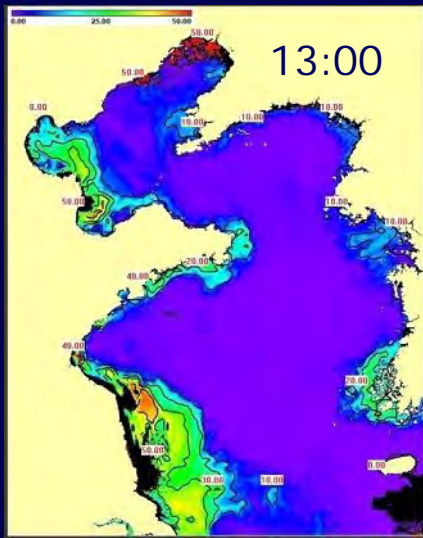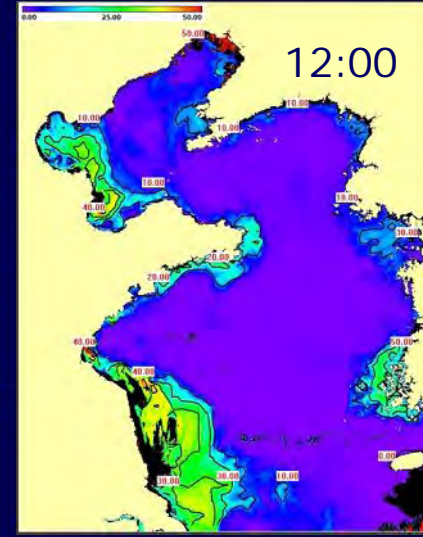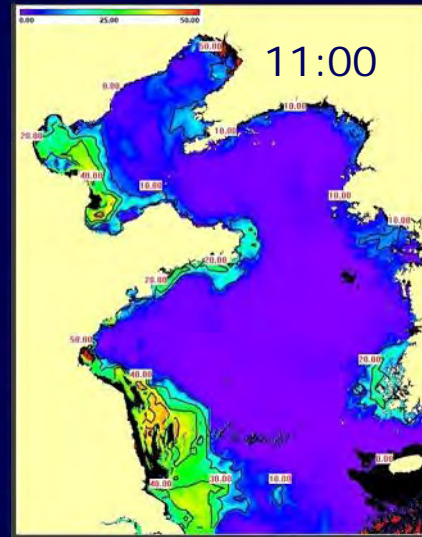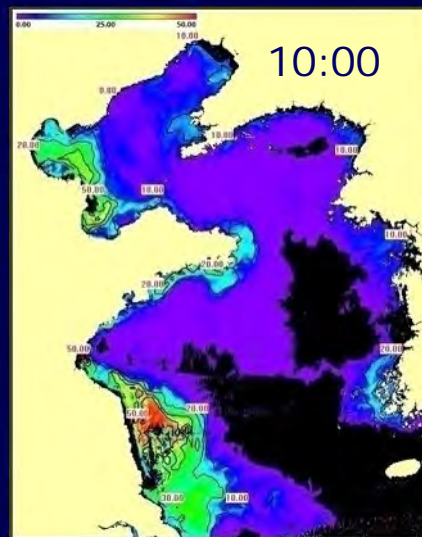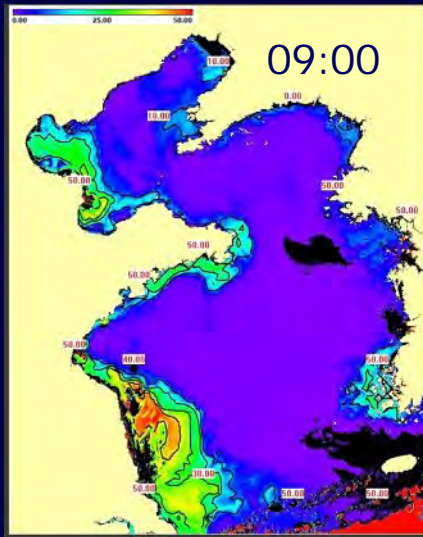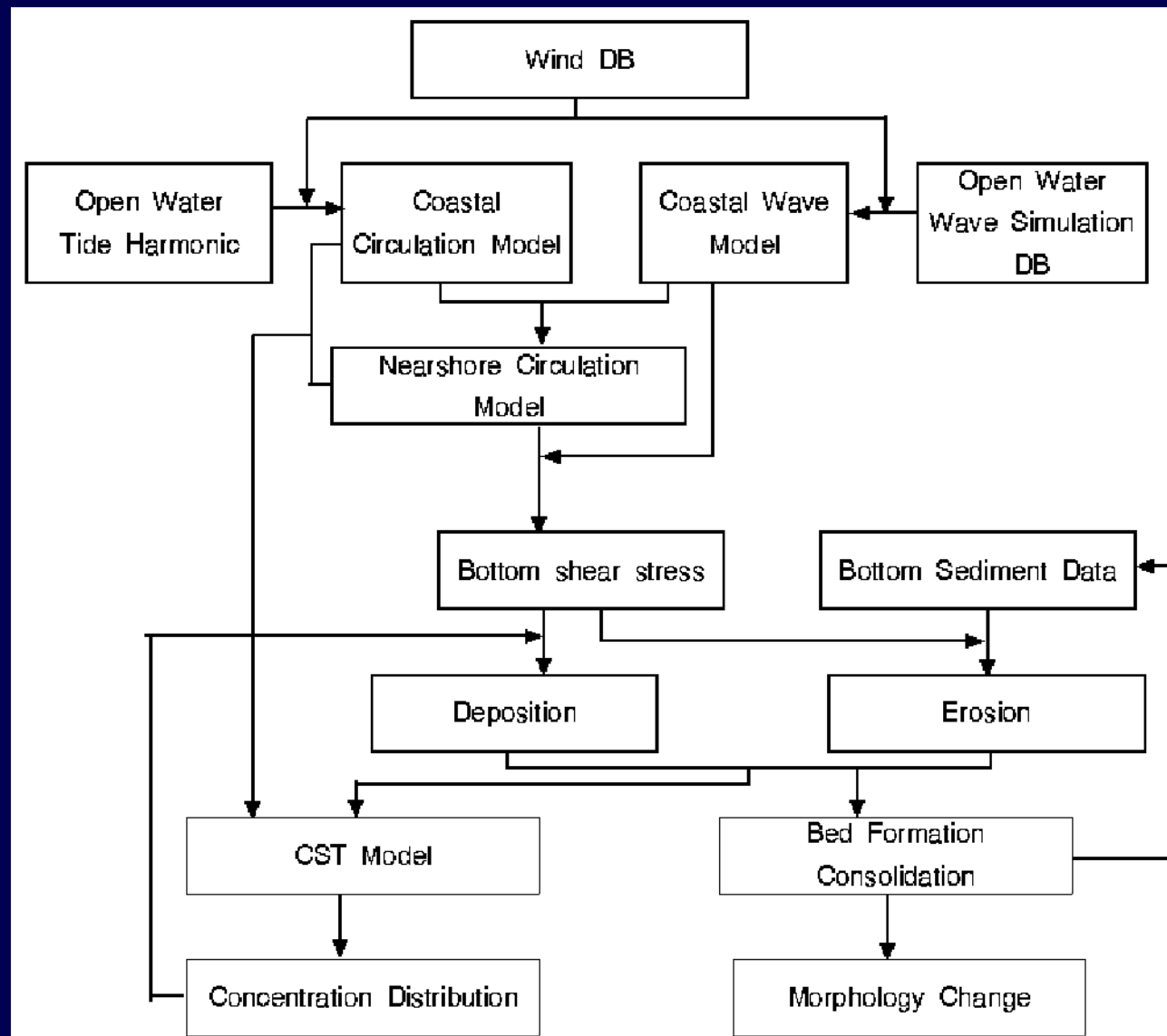
❖ Surface Suspended Sediment Concentration from GOCI (April 11, 2011)

Surface Suspended Sediment Concentration from GOCI (May 13, 2011)
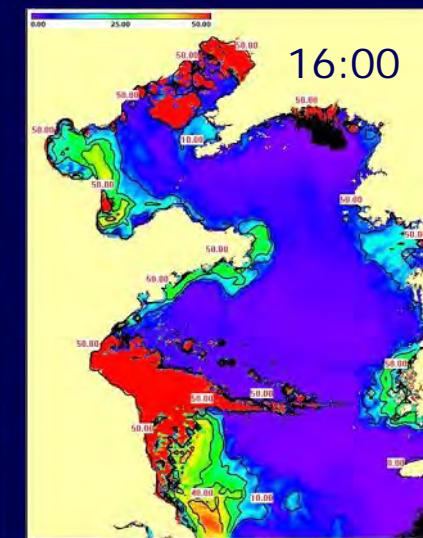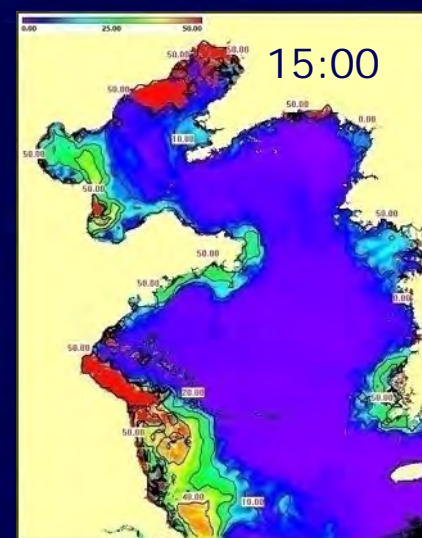
Modeling of Fine Sediment Transport

Fine Sediment Transport Modeling

➤ 3D Model : EFDC, MOHID, Delft 3D Model

➤ Coastal wave, circulation modeling
  (Tide, wind, pressure, wave induced, coupled..)

 Vertical Settling and Mixing

➤ Bottom bed properties

   Size, density, Thickness
    Critical deposition stress
    Critical erosion stress

➤ Initial Condition ? in situ & Remote Sensing

➤ Boundary condition

Example of Sediment Transport Modelling using Delft 3D
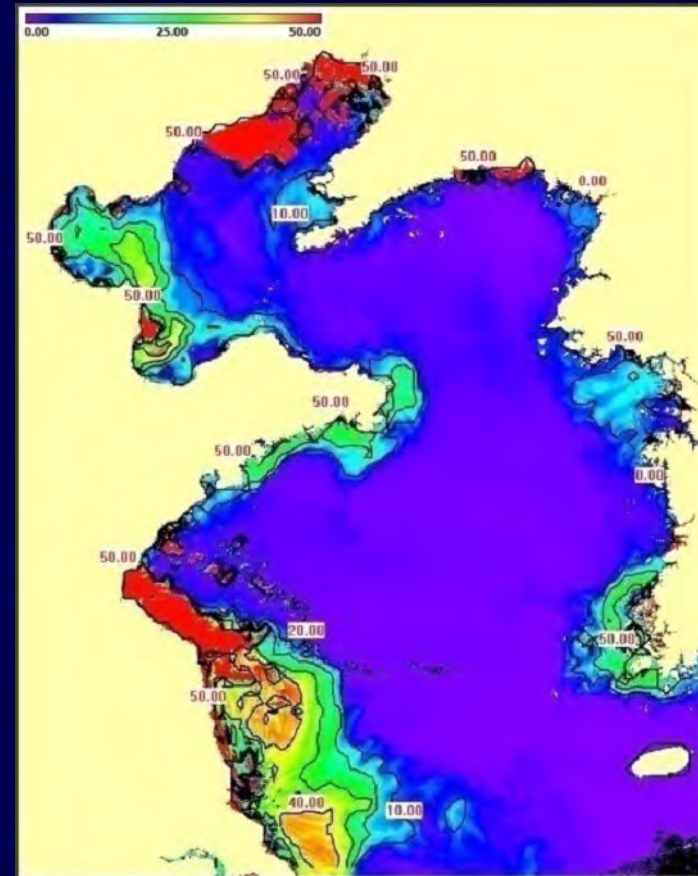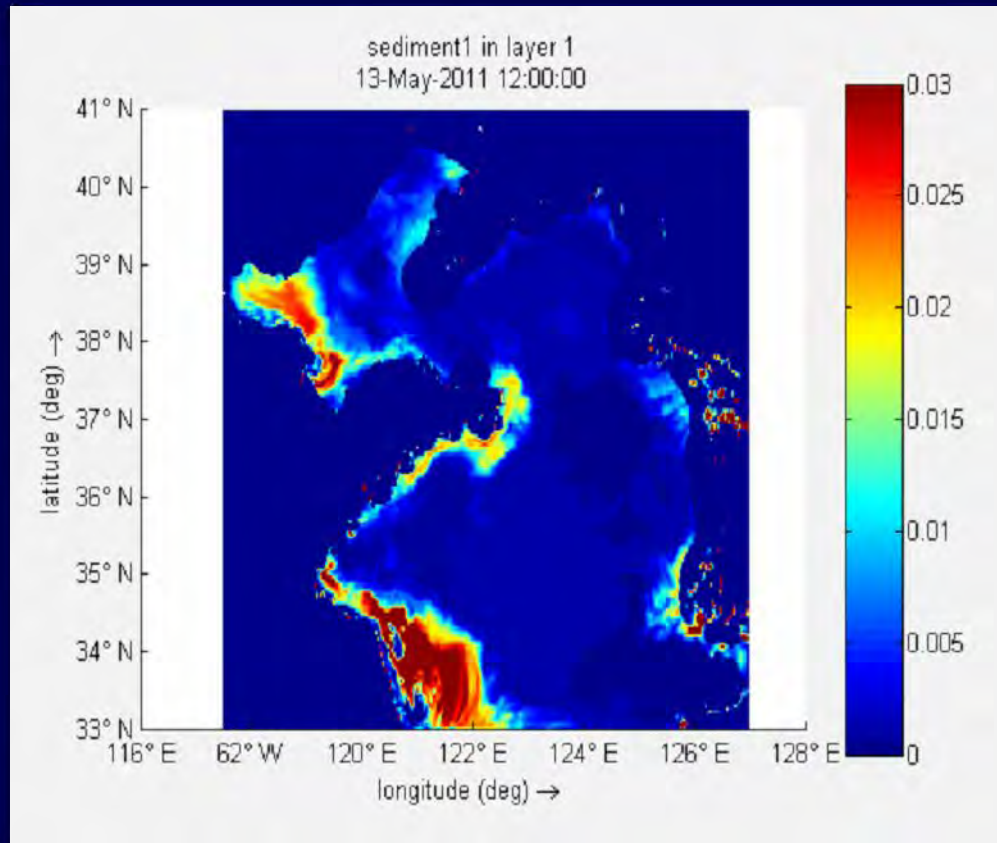
Comparison of GOCI satellite data (right) with Sediment Model Output (left)
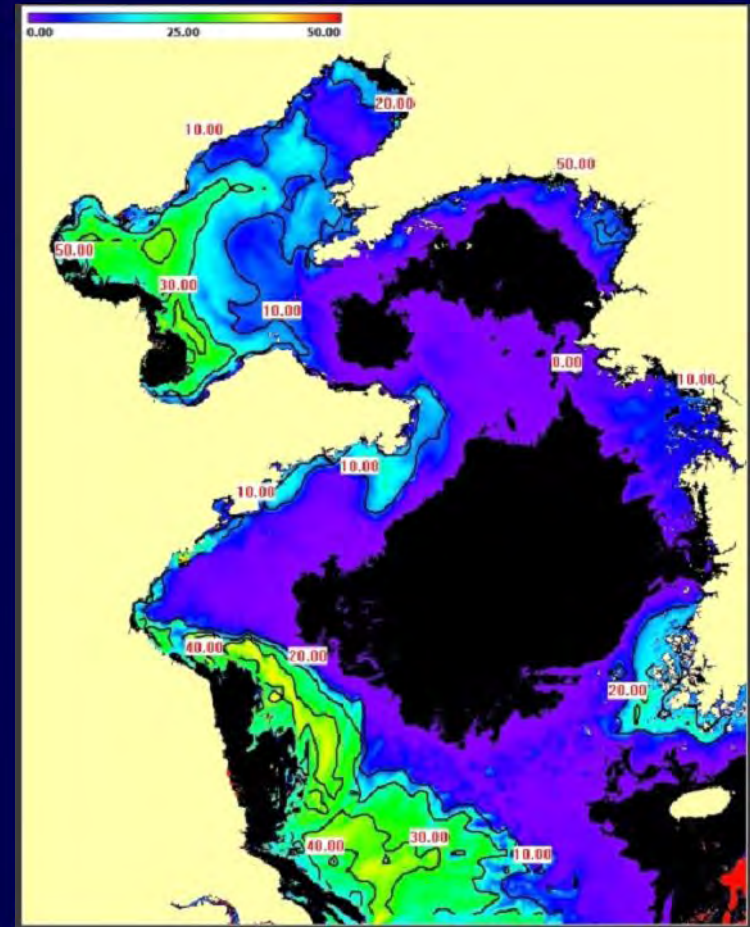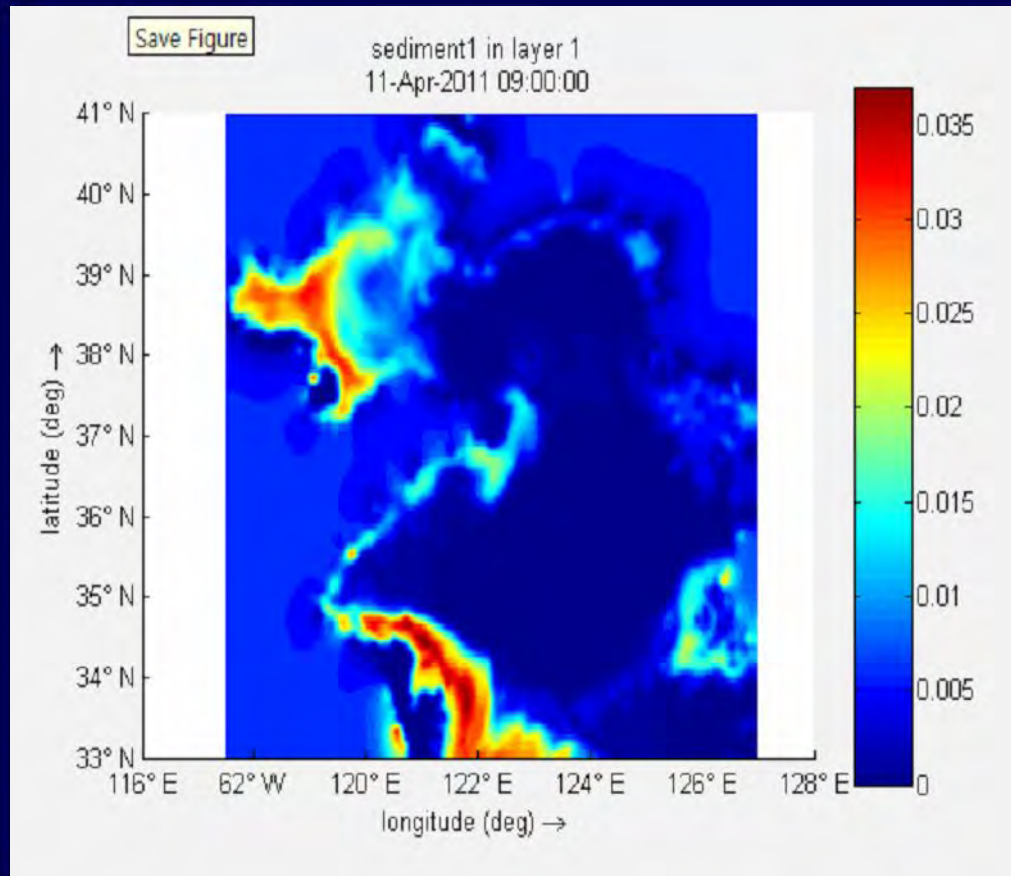
Comparison of GOCI satellite data (right) with Sediment Model Output (left) after Data Assimilation

On Going Studies

- Kyeonggi Bay, Korea

  . KORDI ? USACE-CHL Cooperation

  . Sand-mud mixed bed Sediment Modeling

- Yangtze River Estuary, China

  Hohai University, Nanjing, China

- Yellow River Estuary, China

  Ocean University of China, Qingdao

Summary

Demonstration of modern technologies in coastal observation

- Automatic remote controlled vertical profiler
- Geo-stationary Ocean Color Sensor
- 3D Numerical Model

Integration of in situ data, Satellite Remote Sensing Data and 3D Numerical Model can produce the detailed feature of coastal environment varying fast both in time and space