Progress on the Environmental Simulation and Informatorium in Thailand

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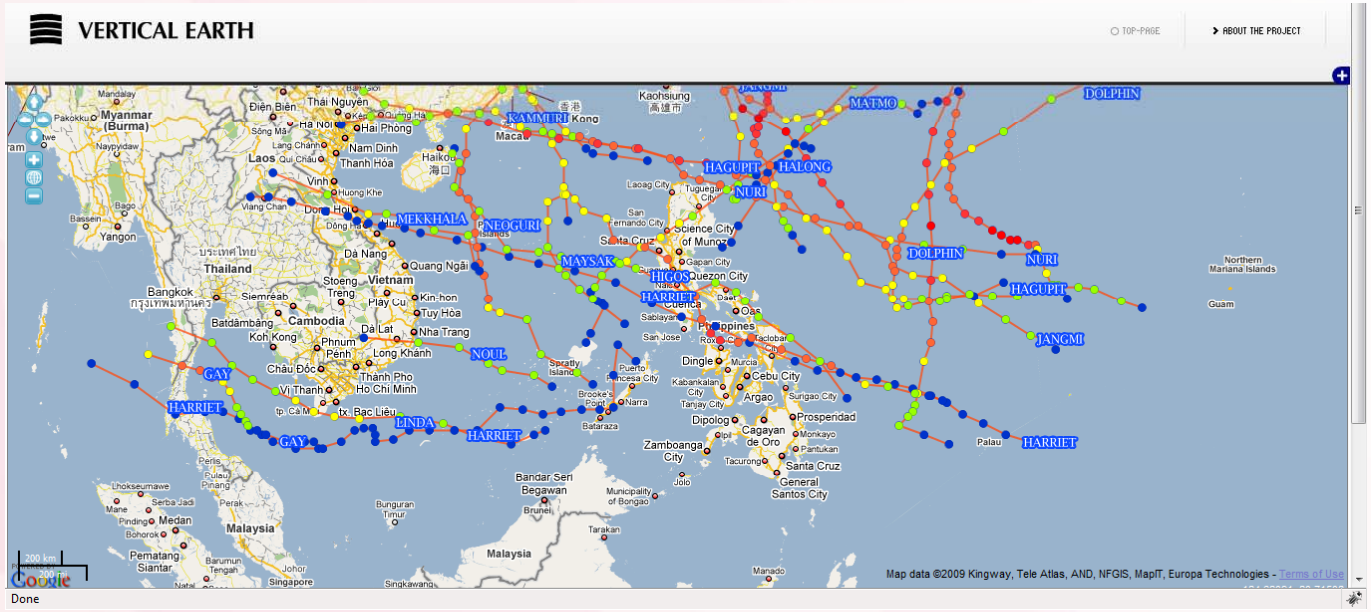
PART I

Simulation of Coastal Change in the Gulf of Thailand: Storm Surge

Storm surge


VERTICAL EARTH
TOP-PAGE
ABOUT THE PROJECT
KAMMURI
MATMO
DOLPHIN
HAGUPIT
HALONG
NURI
MEKKHALA
NEOGURI
MAYSAK
HIGOS
HARRIET
JANGMI
NOUL
GAY
LINDA
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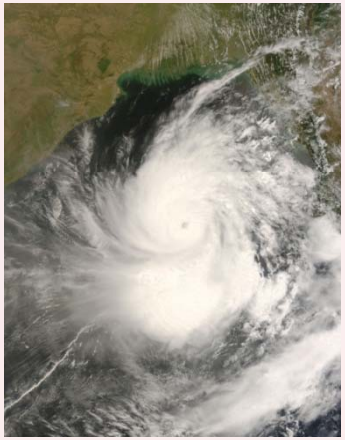
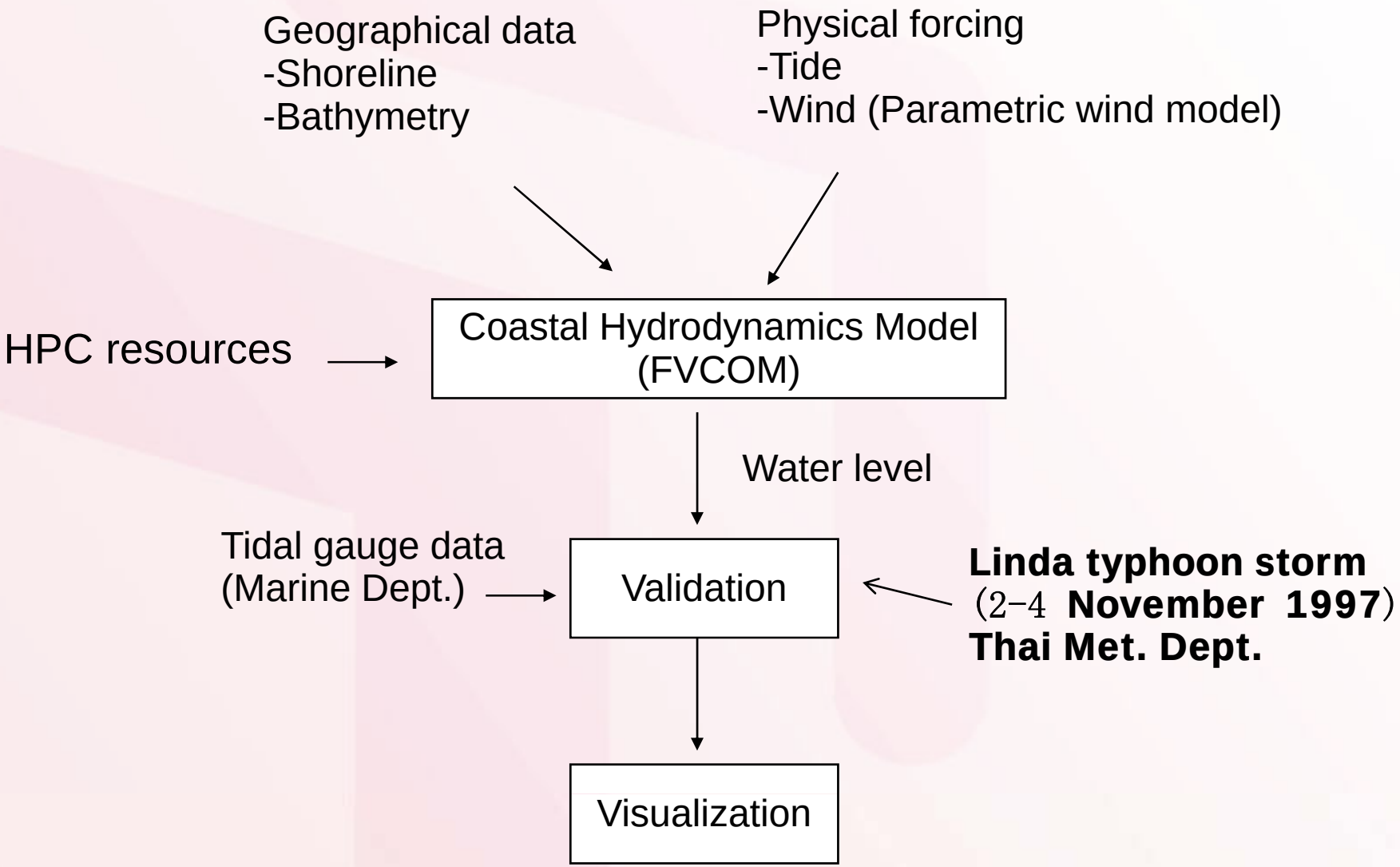


Methodology



Parametric wind model

$$V(R) = \sqrt{\frac{B(P_a - P_c)}{\rho}\left(\frac{RMW}{R}\right)^B \exp\left[-\left(\frac{RMW}{R}\right)^B\right] + \frac{R^2 f^2}{4}} - \frac{Rf}{2}$$

where P_a is the ambient pressure, P_c is the storm central pressure, B is the coefficient of storm

RMW is the radius of maximum wind speed, R is radial distance from the center of the storm, f is the Coriolis parameter and ρ is air density.

(Holland's model, 1998)

Coastal ocean hydrodynamic model

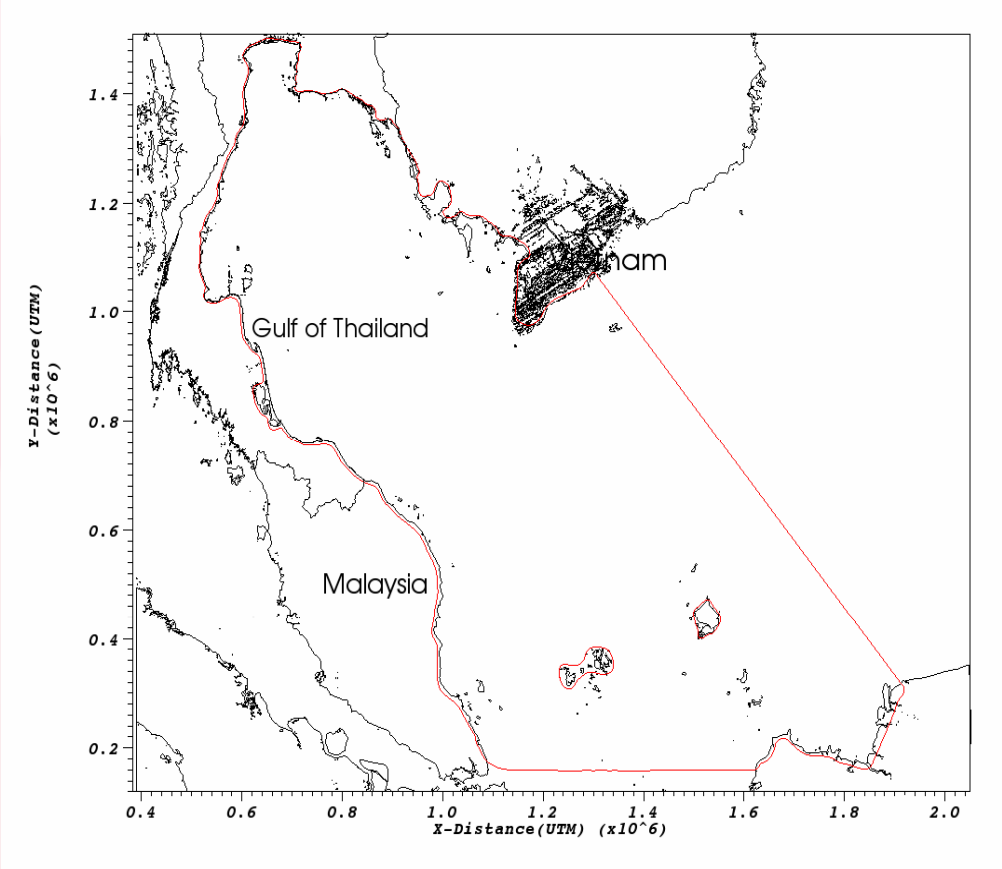
The governing equations used in the present study are the Boussinesq, hydrostatic approximations of the primitive equations of mass and (water) momentum conservation which can be written in Cartesian coordinates as below:

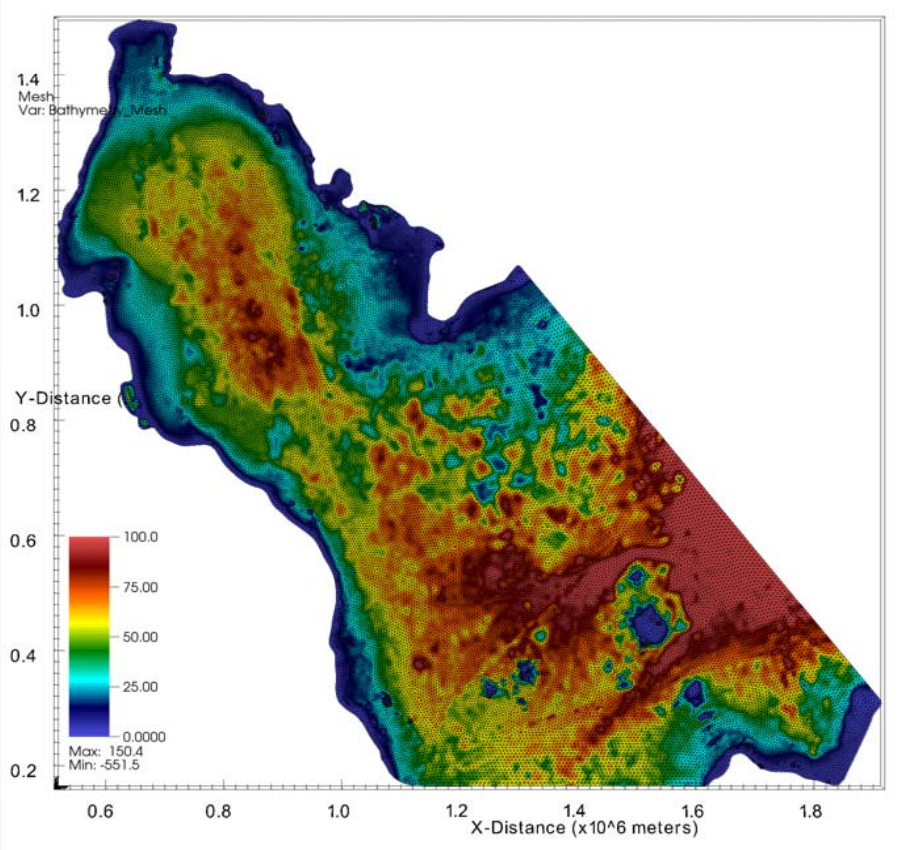
$$\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}-fv=-\frac{1}{\rho_0}\frac{\partial p_a}{\partial x}-g\frac{\partial \eta}{\partial x}+\frac{\partial}{\partial \mathrm{x}}\left(N_h\frac{\partial u}{\partial \mathrm{x}}\right)+\frac{\partial}{\partial \mathrm{y}}\left(N_h\frac{\partial u}{\partial \mathrm{y}}\right)+\frac{\tau_{sx}-\tau_{bx}}{\rho_0(h+\eta)}$$

$$\frac{\partial v}{\partial t}+u\frac{\partial v}{\partial x}+v\frac{\partial v}{\partial y}+fu=-\frac{1}{\rho_0}\frac{\partial p_a}{\partial y}-g\frac{\partial \eta}{\partial y}+\frac{\partial}{\partial \mathrm{x}}\left(N_h\frac{\partial v}{\partial \mathrm{x}}\right)+\frac{\partial}{\partial \mathrm{y}}\left(N_h\frac{\partial v}{\partial \mathrm{y}}\right)+\frac{\tau_{sy}-\tau_{by}}{\rho_0(h+\eta)}$$

$$\frac{\partial \eta}{\partial t}+\frac{\partial(uh)}{\partial x}+\frac{\partial(vh)}{\partial y}+\frac{\partial(u\eta)}{\partial x}+\frac{\partial(v\eta)}{\partial y}=0$$

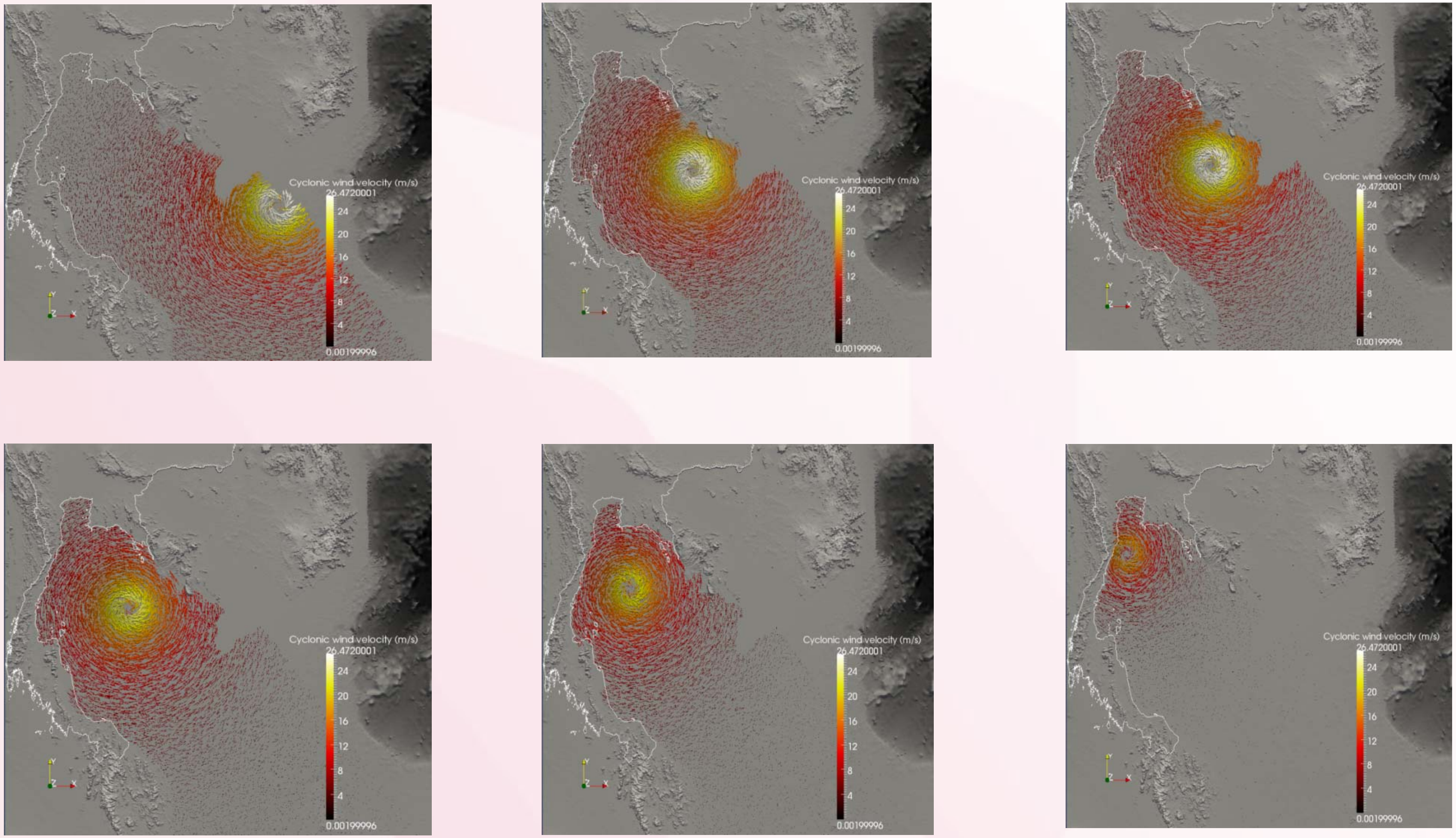
Computational domain





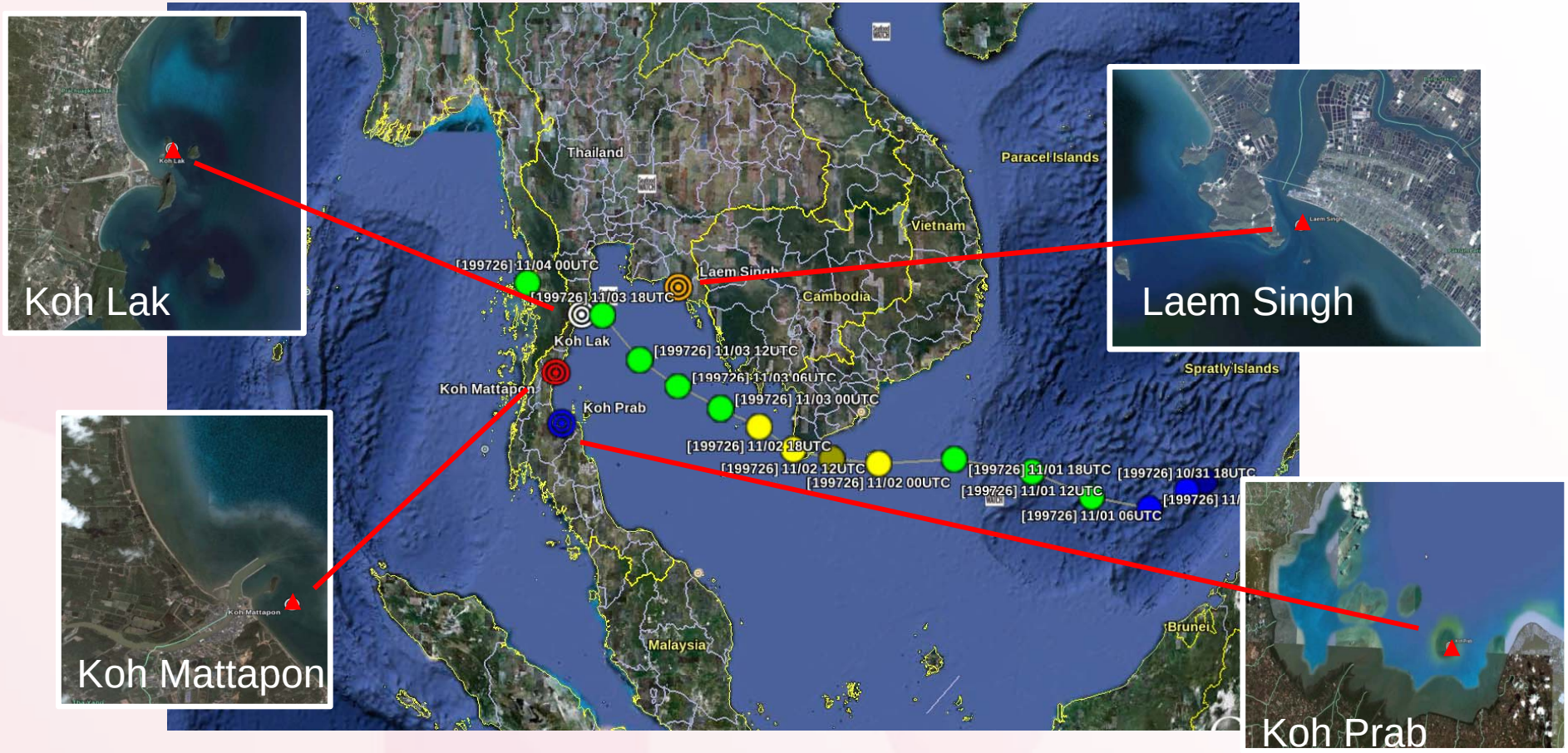
Computational domain (left) and a view of mesh overlaid bathymetry (right).

Cyclonic wind field



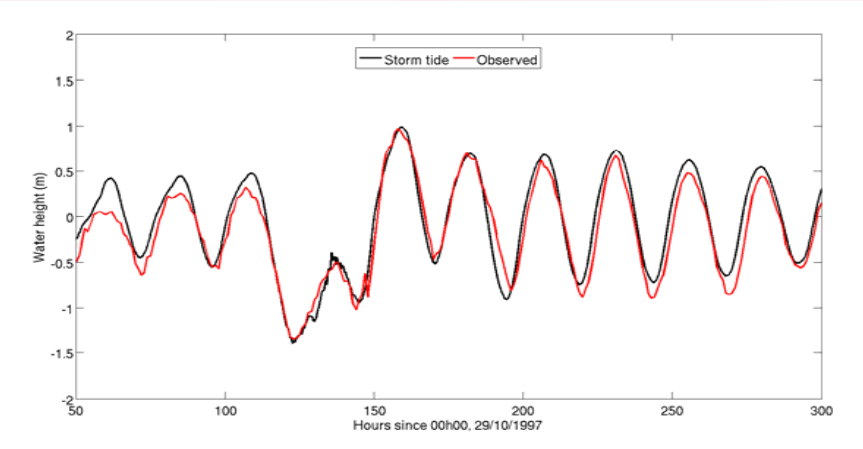
- Typhoon Linda wind field from 10:00:00 02/11/97 UTC to 00:00:00 04/11/97 UTC
- Calculated from parametric wind model

Model validation: Typhoon Linda

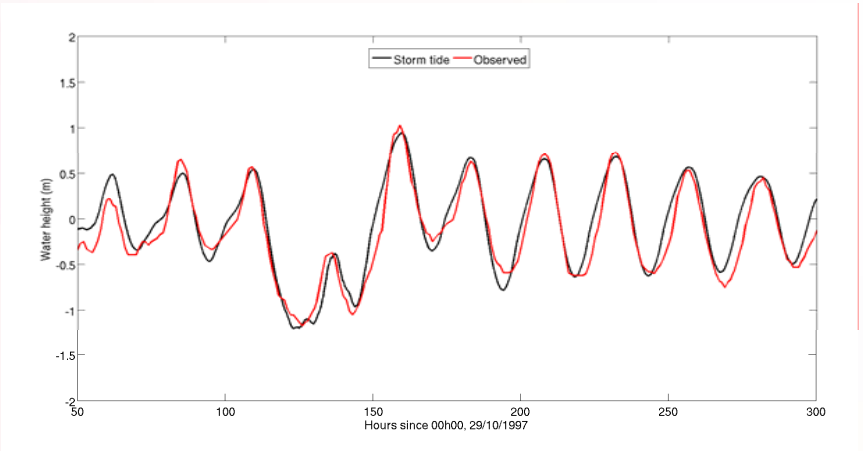


Historical typhoon tracks over the Gulf of Thailand and tidal stations with available sea level data cover the period of the the typhoon Linda in 1997

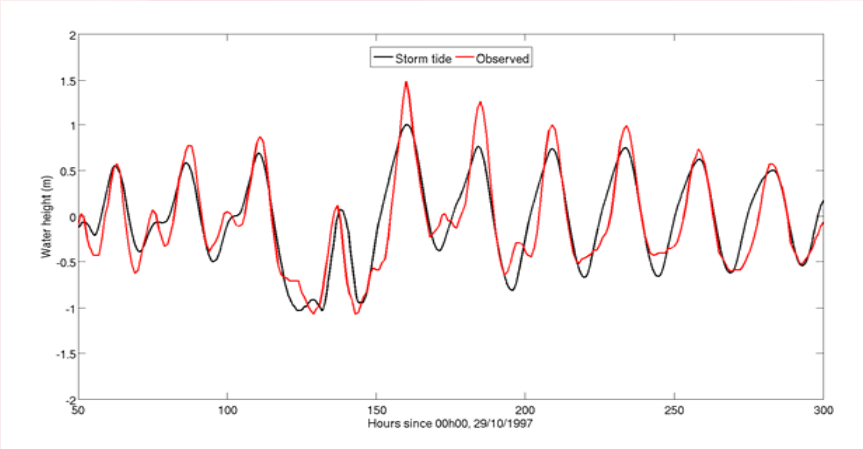
Validation Results



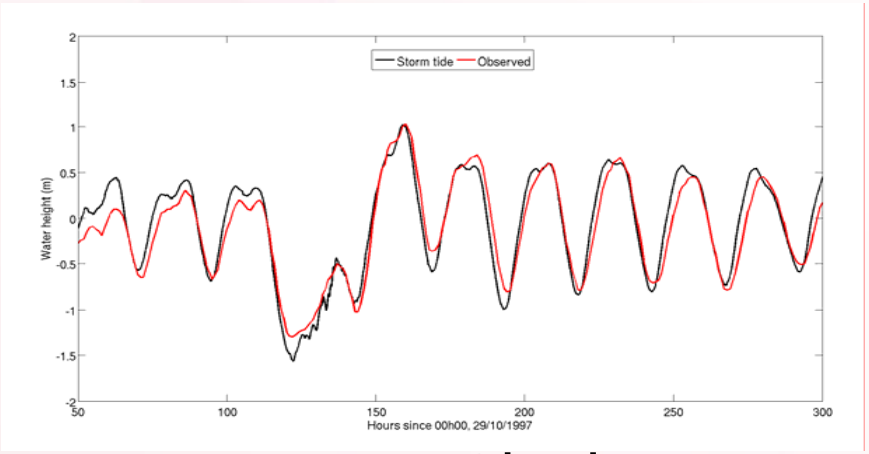
Koh Lak



Koh Matapon

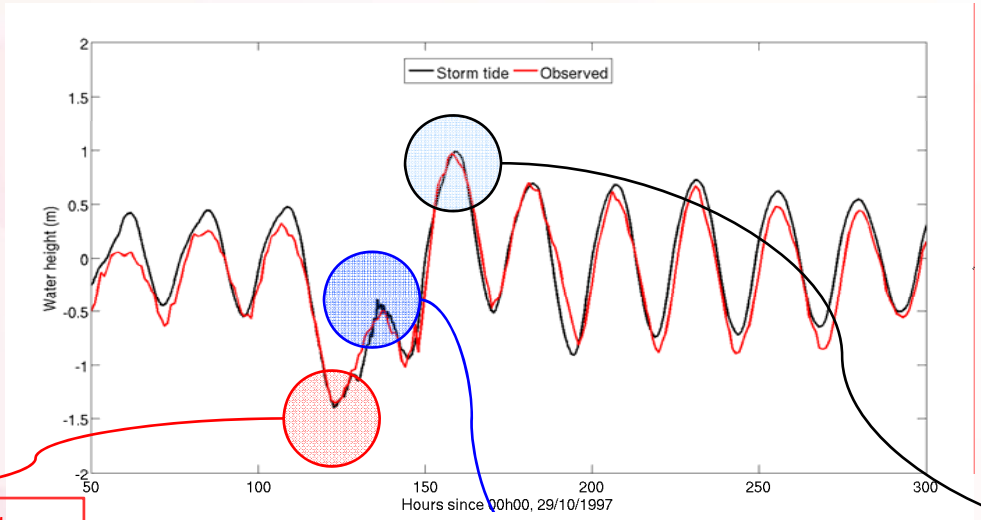


Koh Prab



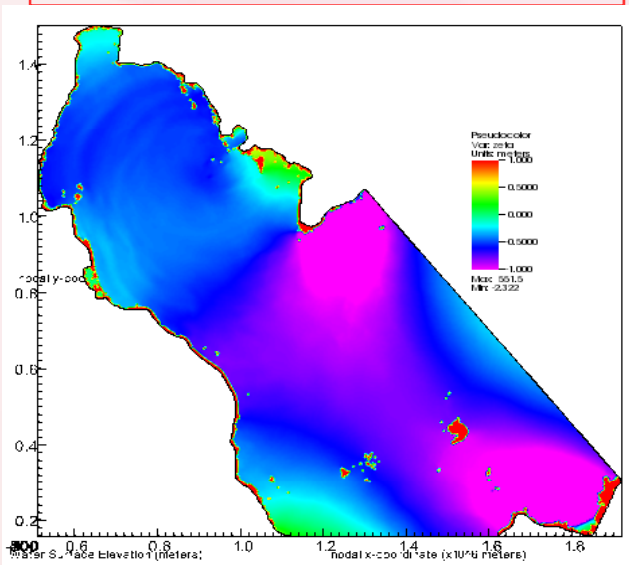
Laem Singh

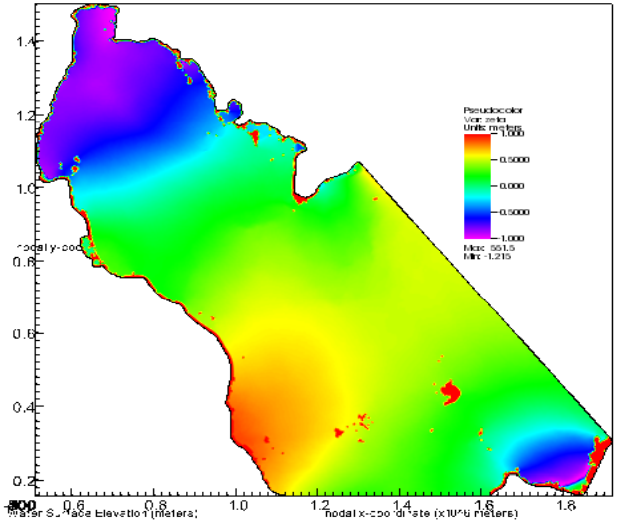
Nonlinear interactive process



Koh Lak

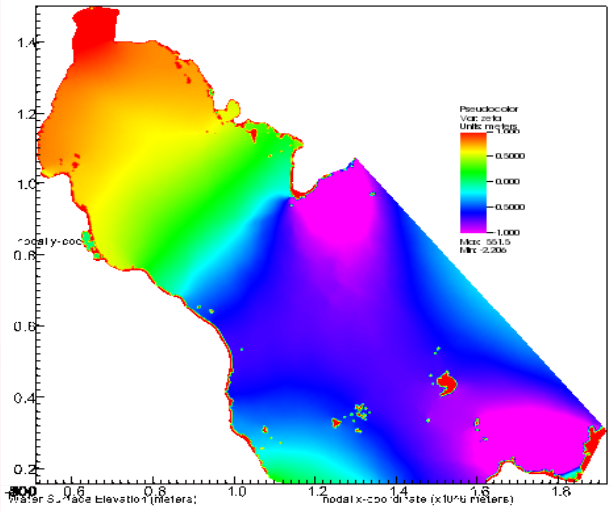
- Interaction process between the storm surge wave VS the tidal wave
- Storm surge wave become stronger
- **Amplifying of the negative tide**





- Vanishing of the storm surge wave
- Strong circular flow cell
- The circular flow drain the water away from the GOT coast
- **Tides become depressed**

- Rising of the highest tide period
- Remaining circular flow cell
- **Amplifying of the positive tide**



Conclusion

- The characteristics of tropical cyclone are calculated from a parametric wind model
- The validation results for storm tide are quite good agreement to the observation
- The wave interaction process between the storm surge wave and the tidal wave can amplified the negative surge in the Gulf of Thailand (GOT)
- The interactive process of the current induced by typhoon Linda and the tidal wave in the GOT can depresses the water elevation in the high tide period as the circular flow cell still stronger
- The influence of the high tide supported by the remaining current induced by the typhoon can amplify the positive surge of water elevation along the coast of the GOT

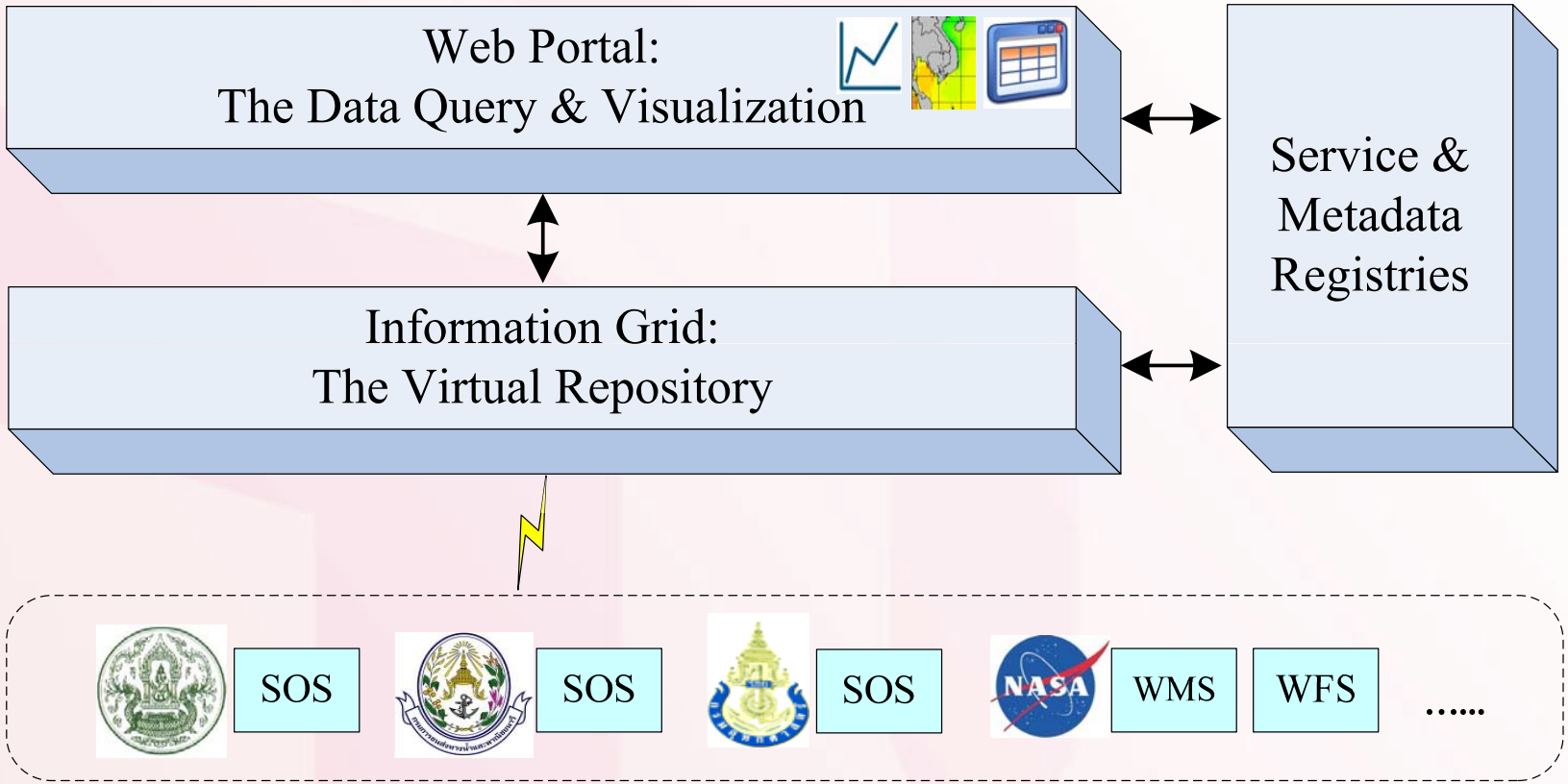
Part II

Environment Informatorium: The Sustainable Web Portal for Observation Data

Objectives

- Data Consumer Perspective:
  - To support the retrieval of the desirable, standard, observation data across geographically distributed repositories with ease
  - To facilitate the application of observation data in a user-oriented manner
- Data Provider Perspective:
  - To promote the publication of the standard observation data on-line without changes in the legacy systems
  - To support the workflow for servicing observation data to public

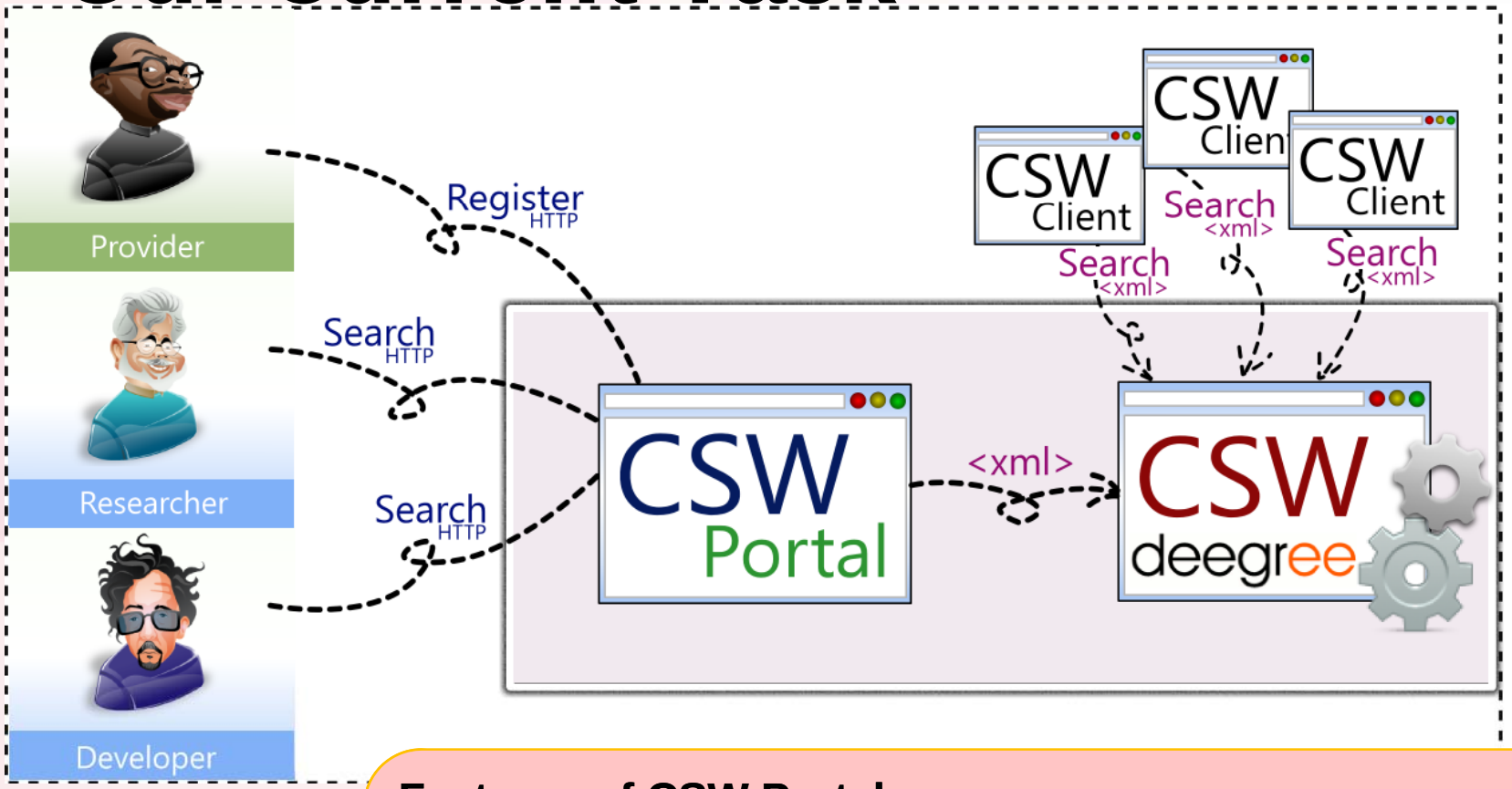
Environment Informatorium Architecture



Why Service Registry?

- A number of services are geographically distributed
  - Hard to find the potential ones
  - A place for advertising and discovering services is needed!!!
- Essentially, service registry enable our Environment Informatorium to promote the data utilization and interoperability across distributed services

Our Current Task



Features of CSW Portal:

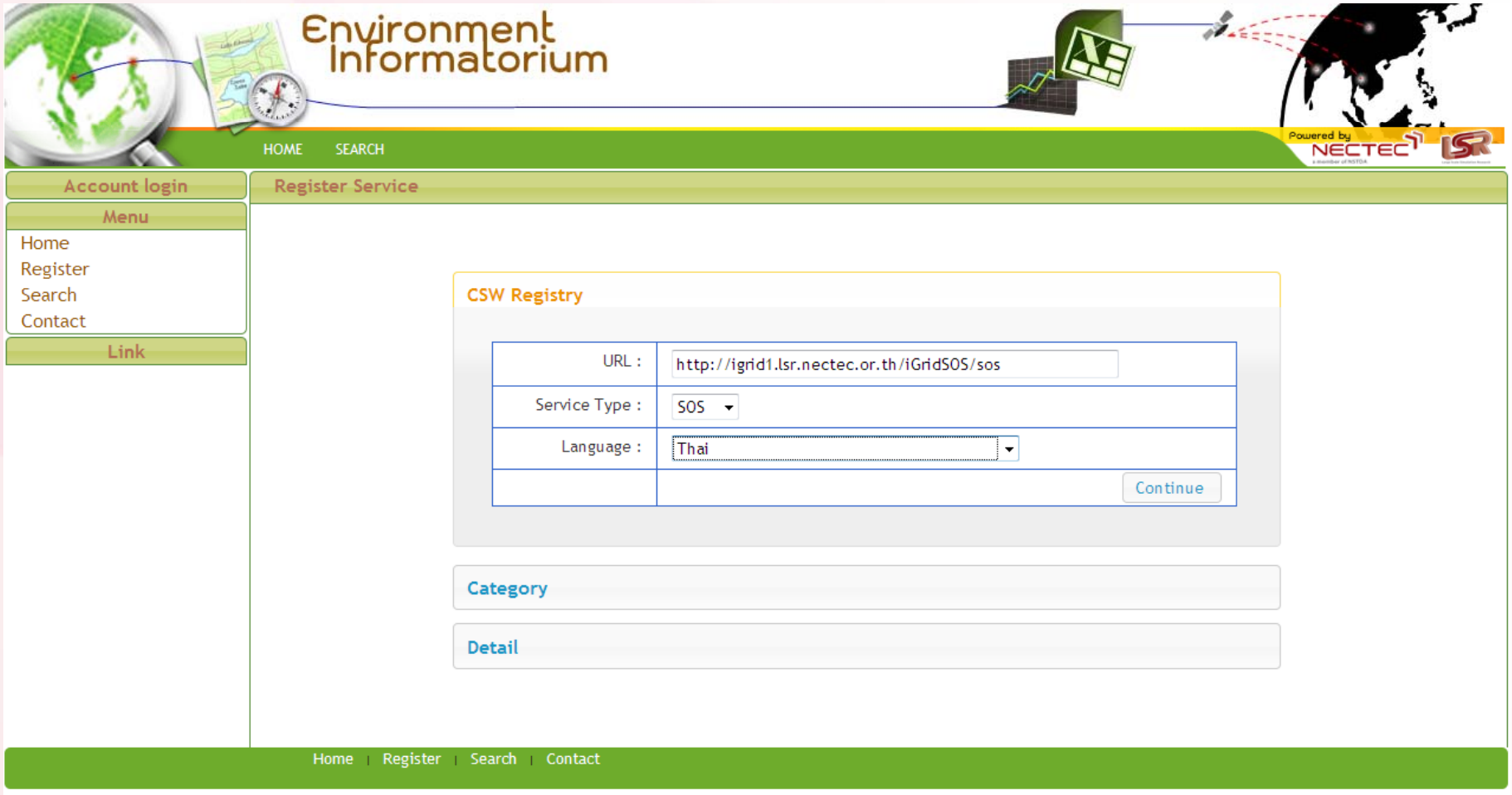
1)Access CSW functionalities without understanding of the standard

2)Automatically generate CSW Transaction message for service registration

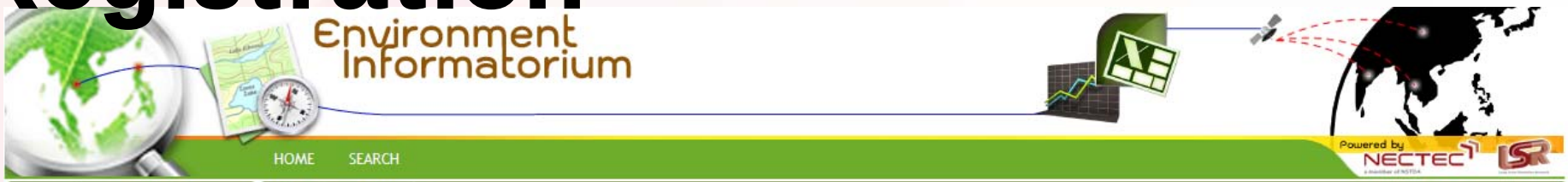
3)Search web services via keywords and CQL with ranked hits

4)Explore web services through service categories

Registration



Registration



Account login

Menu

- Home
- Register
- Search
- Contact

Link

Register Service

CSW Registry

Category

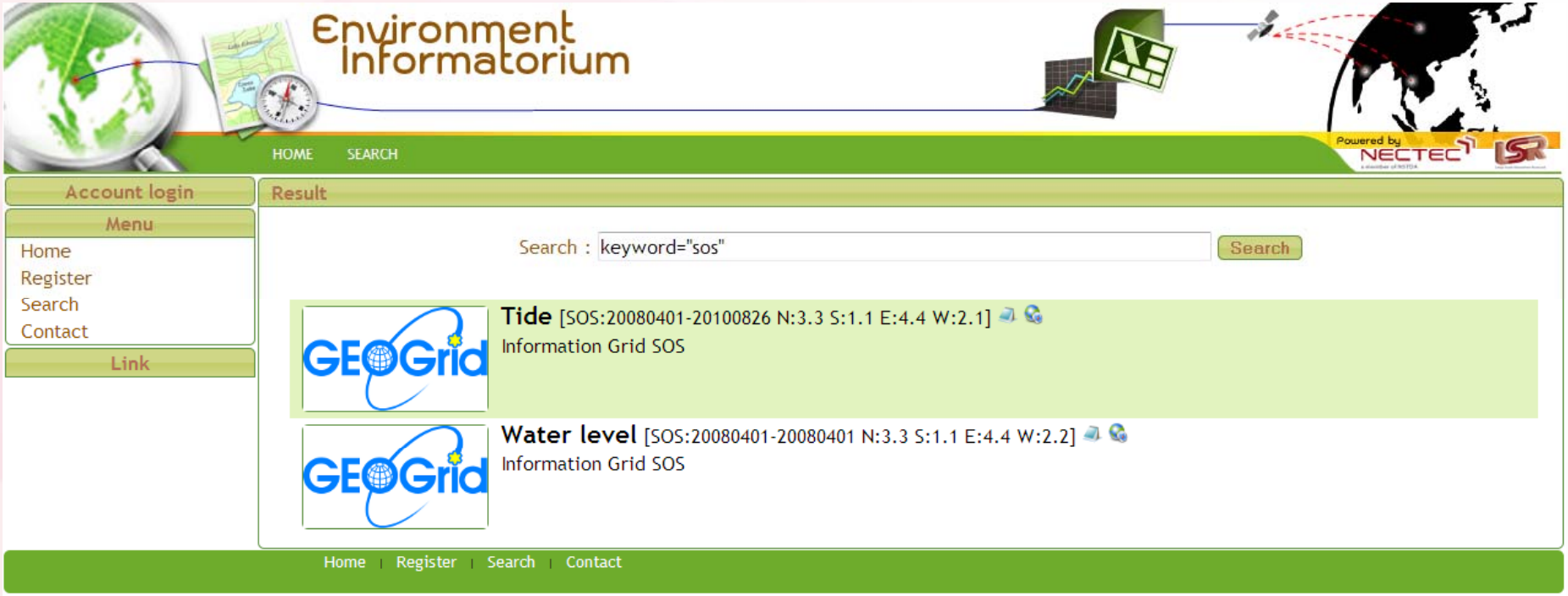
Category :	ocean:tide
Operations:	GetFeatureOfInterest
Metadata URI :	urn:ogc:def:phenomenon:igrid:1.0.0:tide
Begin Date :	2004-01-01T00:00:00.000+07:00
End Date :	2009-09-30T23:00:00.000+07:00
Category :	ocean:t
Ope	tide
Metadata URI :	urn:ogc:def:phenomenon:OGC:1.0.30:waterlevel
Begin Date :	2008-04-01T17:44:00.000+07:00
End Date :	2010-08-26T00:44:15.000+07:00

Continue

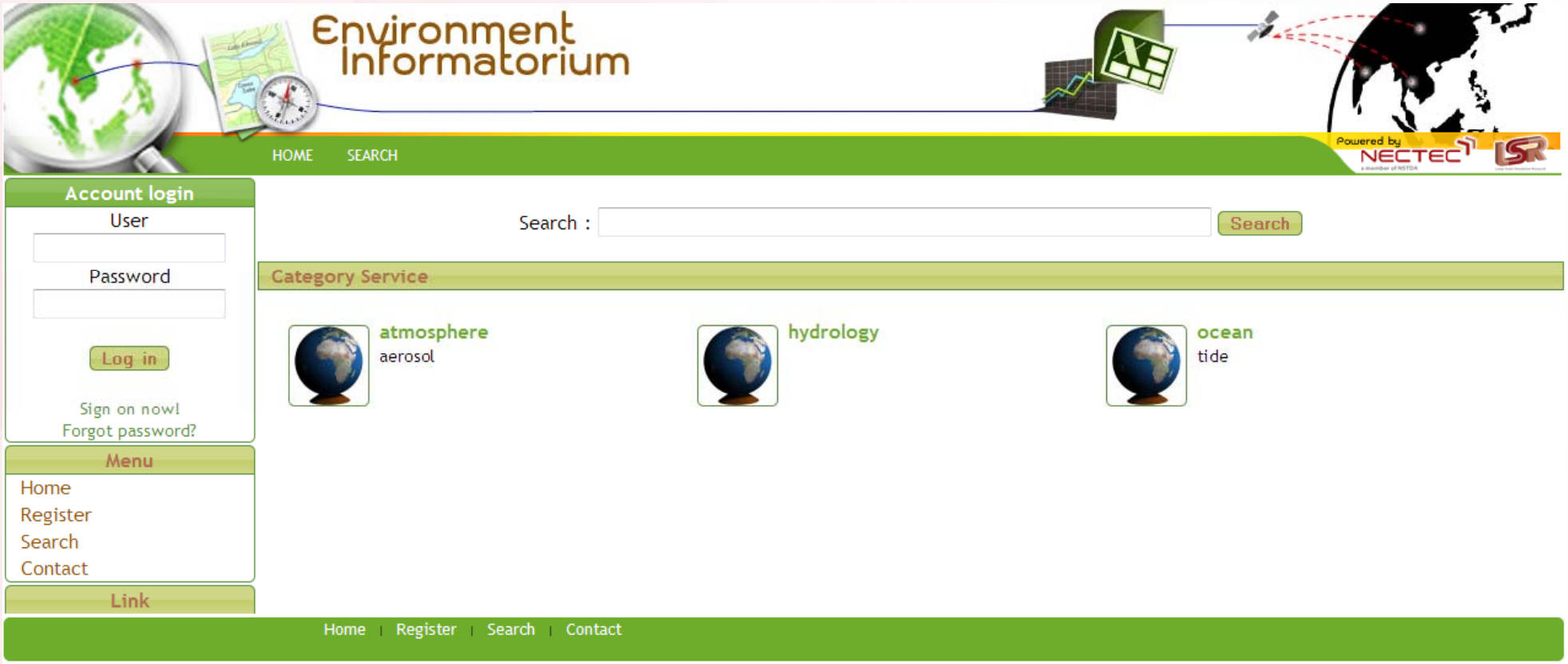
Detail

Home | Register | Search | Contact

Search by CQL



Browse by Category



Browse by Category

Future Work

- Fulfil Env. Informatorium to be able to
  - access information from services in different standards
  - view information via graph & map
- Collaborate with other organizations to
  - publish information through Env. Informatorium
  - access information from Env. Information

Large Scale Simulation Research

NECTEC
a member of NSTDA

THANK YOU