Modeling for Water Management

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Name of Model : **WRF-ROMS**

Purposes:

1. **This model is for** : operational weather forecasting
2. **Decision making** : real-time operation for Decision Support System for water management in normal and crisis situations

Model characteristics:

1. **Type of model** : dynamic simulation model, coupling between an atmospheric (WRF) and oceanic (ROMS) model using COAWST modeling system
2. **How can we view this model?**
   - Spatially : 2D (precipitation, wind, temperature, humidity) / 3D (wind, vapor)
   - Resolution : 3 nested domains at 27, 9 and 3 km horizontal resolutions for WRF and 25 km for ROMS
   - Time Period : The model is initialized at the 00 and 12 UTC of the Global Forecast System (GFS) for 3 and 7 days forecast

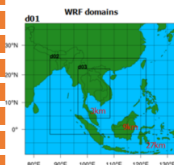# WRF-ROMS operational system at HII

PRE-PROCESSING

Meteorological Initialization/ boundary condition

3-hr GFS (0.5 deg)

Ocean Initialization

HYCOM Output (1/12 deg) provided at initial time (only for nudging)
+ SST
+ Salinity
+ Currents

WRF domains

Initial 00 UTC, 12 UTC

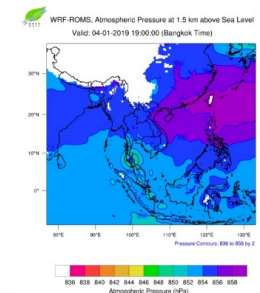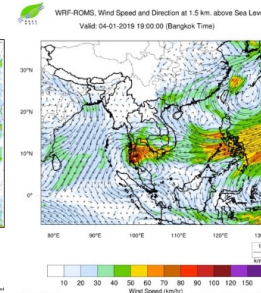|							
Domain 1	1	2	3	4	5	6	7
Domain 2	1	2	3	4	5	6	7
Domain 3	1	2	3				

PROCESSING

WRF

3-nested domains
WRF
27/9/3 km

ROMS
with single domain
25 km

ROMS
Regional Ocean Modeling System
Research Community

POST-PROCESSING

WRF-ROMS (ThaiGeo), 24-Hour Precipitation, Southeast Asia Model (9x9 km)
04 Jan 2019 07:00 to 05 Jan 2019 07:00 (Bangkok Time)

WRF-ROMS, Wind Speed and Direction at 1.5 km. above Sea Level
Valid: 04-01-2019 19:00 (Bangkok Time)

WRF-ROMS, Atmospheric Pressure at 1.5 km above Sea Level
Valid: 04-01-2019 19:00:00 (Bangkok Time)

ThaiWater Mobile Application

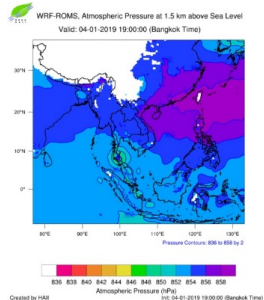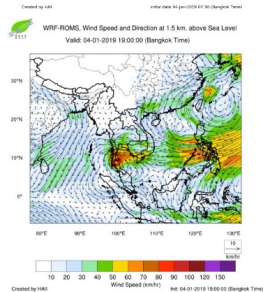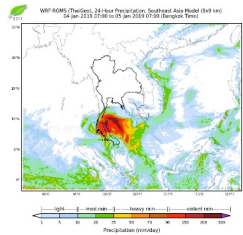**USER SERVICE**

Web service:
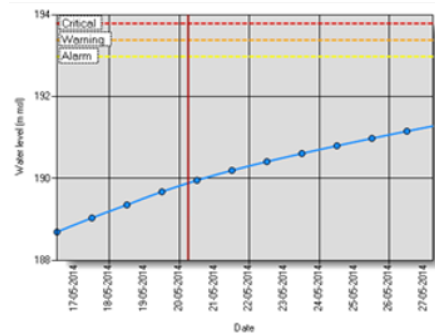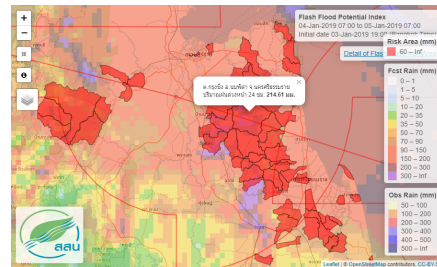ASCII, NetCDF, CF-compliant, CSV

WRF-ROMS "Outputs" become "Inputs"
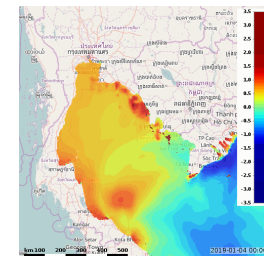
WRF-ROMS Outputs

Integrated with

Flood forecasting Model
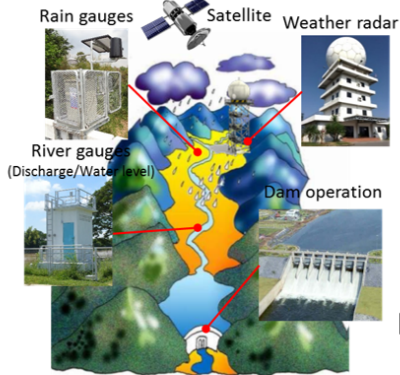
Flash Flood Model
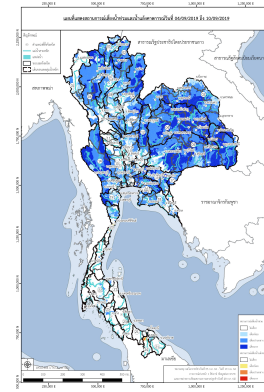
Water Balance Forecast

Storm Surge

etc.

Integration of the weather forecasting (WRF-ROMS) and river forecasting models

Observation

Rain gauges
Satellite
Weather radar

River gauges
(Discharge/Water level)

Dam operation

**Decision Support System (DSS)
for flood forecasting and water management**

Weather forecasting system

A Coupled Weather and Ocean Model (WRF-ROMS)

Asia (27km x 27km)

High performance computer

Southeast Asia (9km x 9km)

Thailand (3km x 3km)
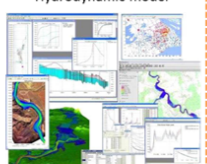
High resolution WRF-ROMS
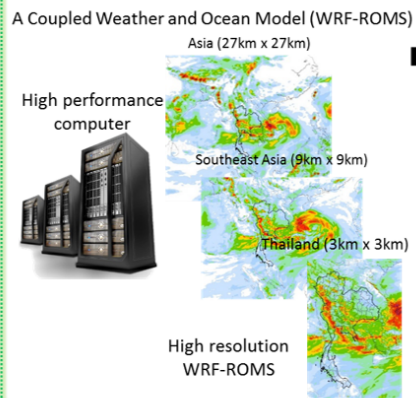
Flood forecasting system

Decision support system

Data
(Real time data, Rainfall forecast)

Hydrological & Hydrodynamic model

Monitoring
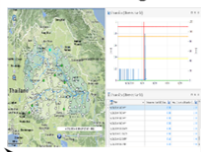
Forecasting
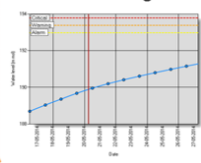
Upstream

Hydrological Model
NAM model
A conceptual rainfall-runoff model

Hydrodynamic Model
MIKE FLOOD (MIKE11+MIKE21)
Integrate 1D river model and 2D overland flow model

Reservoir Optimization Model
MIKE11+Optimization algorithm
Optimize operating rules to solve operation problem

Water Resources Model
MIKE HYDRO Basin Model
Manage and plan water resources in river basins

Salinity Intrusion Model
MIKE11 (HD+AD module)
Analyse salinity intrusion behavior

Downstream

Actions/Reponses

The water management committee

Early warning

Reports
Website
Email

EMAIL

Public users

Technologies for water management

Rainfall-Runoff

Hydrological Model
A conceptual rainfall-runoff model

Satellite

Remote Sensing Technology
Monitor and assess flood and drought disasters

Weather Forecast

Urban flood

Urban Flood Model
Flood protection and flood risk managment in urban area

Radar

Weather Radar
Rainfall estimation and nowcasting

Flash Flood

Flash Flood Model
Simulate the rapid flood with a relatively high peak discharge

Reservoir optimization

Reservoir Optimization Model
Optimize operating rules proposed to solve the operation problem

Telemetry

Telemetering Station
Monitor real-time water situation

Hydrodynamic Model
Integrate the 1D river model and 2D overland flow model

Hydrodynamics

Storm Surge Model
Calculate water level from the effect of tide, wave and surge

Storm Surge

Salinity Intrusion Model
Analyse salinity intrusion behavior and provide a guideline for water management

Salinity

Water Resources Model
Manage and plan water resources in river basins

Water Resources

Monitoring system

Telemetering station

Weather radar

Satellite

Modeling for water management

Basin scale model
(Flood forecasting system)

Local scale model
(Flash Flood Forecasting and Warning System)

Drought monitoring system

Urban scale model

Storm surge model

More Models and Technologies for Water Management

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Water Management

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