

Quantifying, Predicting, and Exploiting Uncertainty Modeling (DA and Uncertainty) Group Report

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- Focus: what are we supposed to do?
 - Service providers:
 - Nested modeling to provide T/S/currents fields and their uncertainties around the intensive acoustic area up to grid resolution of 100 to 500m
 - Create productive interactions and exchanges between Taiwanese and US Researchers
 - Scientific modeling
 - Large-scale Predictability (Transports, Meandering, Impinging, Intrusions) of Kuroshio
 - Effects of Strength, Meandering, Impinging and Intrusions of Kuroshio on the shelf region
 - Dynamics of Taiwan strait region and its influence on the Cold dome area
 - Revisiting dominant time-scales from Large-scale to mesoscale
 - Cold dome mesoscale dynamics: creation, maintenance, variability and demise
 - Modulation and modification of mean properties of internal tides, waves and solitons by mesoscale features: phases, directions and amplitudes
- Modeling scales
 - 100 to 500m resolution
 - 500 to 3km resolution
 - 3km to 10km

- Sensitivity studies
 - Use of Adjoint modeling to investigate
 - Effect of large-scale dynamics east of the Kuroshio on the Kuroshio transport/position
 - Effects of mesoscale Kuroshio east of Taiwan and Taiwan Strait currents on the Cold Dome
 - Use
- Tidal effects
 - Include tidal effects in circulation models
 - Barotropic tides computed based on OSU or MIT-Matlab version of Representer inversion with high-resolution bathymetry, used to force ocean circulation models at open boundary
 - East China Sea is an important location for Dissipation
- Data Assimilation
 - Assimilation of SSH in larger-scale and maybe regional/shelf area
 - Assimilation of acoustic data

- **Dynamical Keys**
 - Strength and position of Kuroshio inflows (South and East of Taiwan)
 - Taiwan Strait currents and transports
 - Depth of Mixed layer (especially under strong atmospheric forcing)
 - Deep Intrusions and associated gradients
 - Internal tides, waves and solitons: phases, directions and amplitudes
- **Atmospheric forcing**
 - EMCWF
 - COAMPS? Nested in NOGAPS for larger-scale
 - WRF?
 - Maybe collaborations towards coupled ocean-atmospheric research (instead of getting atmos fluxes only, investigate coupling in a research mode)
- **Open Boundary conditions**
- **Boundary Layers Modeling**
 - Bottom boundary layers: need to be implemented/evaluated if important for this region

- Exchange references and complete literature surveys
- Suggested Observations:
 - Glider Conveyor Belt using dynamics
 - Data on both sides of Taiwan

Information Modelers need to exchange:

Modeling System components

Bathymetry

Domains (nesting, stand-alone, etc)

Grid and Resolution (vertical, horizontal, etc)

Initial Conditions

Open and Land Boundary Conditions

Forcing

- Tides, Rivers
- Atmospheric

Data Utilized and Assimilation Scheme

Model Dynamics

Parameterizations and Parameters

- Mixing, sub-grid-scale, boundary layers, etc

Model Numerics

Platforms and Compiler used

The Modeler

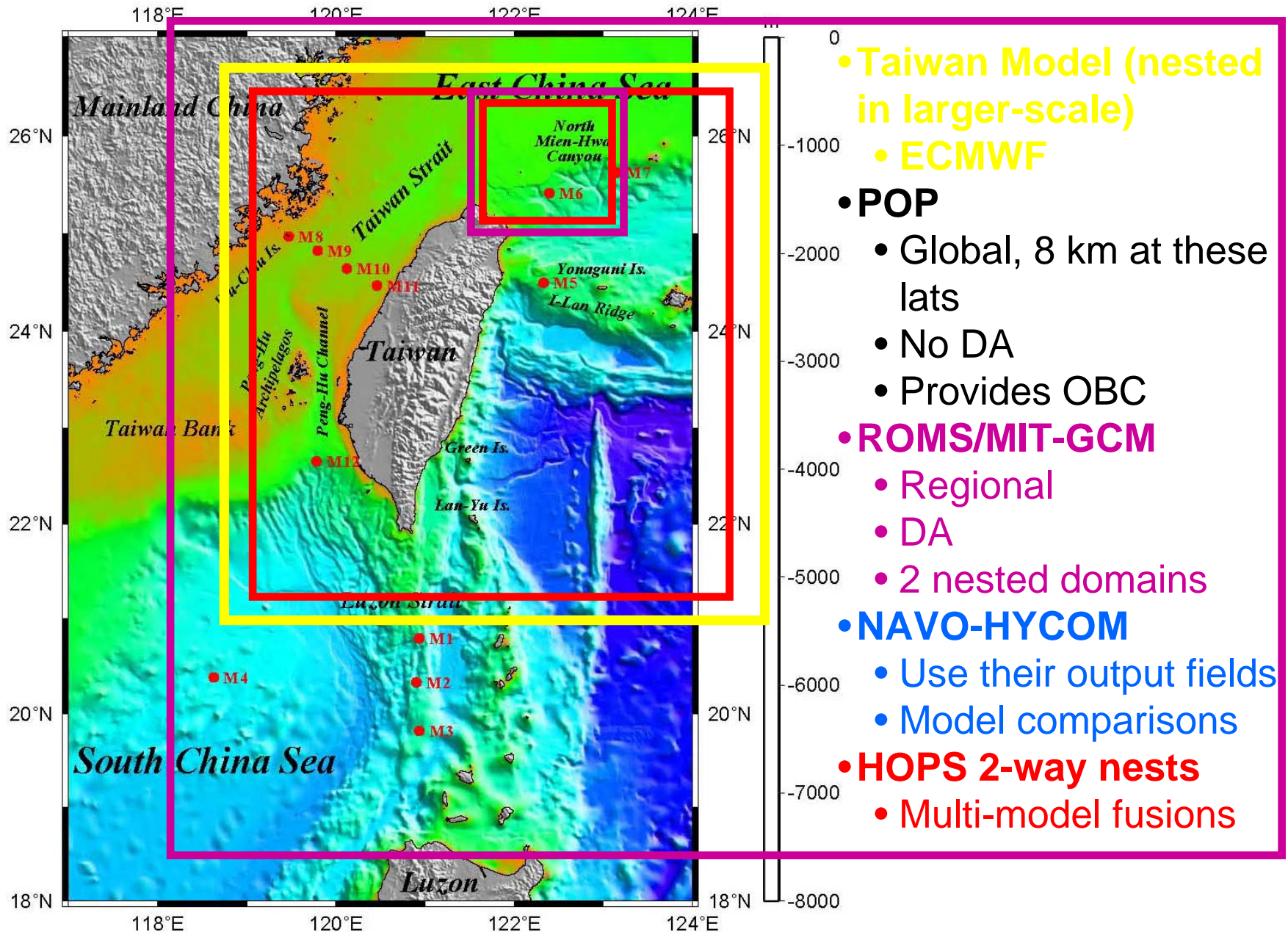


Fig. 1. Bathymetric chart showing areas around Taiwan and mooring locations.

High-resolution domains

- **HOPS 2-way nests**
 - Real-time
 - Acoustic Data
- **ROMS/MIT-GCM**

NOTES AND CORRESPONDENCE

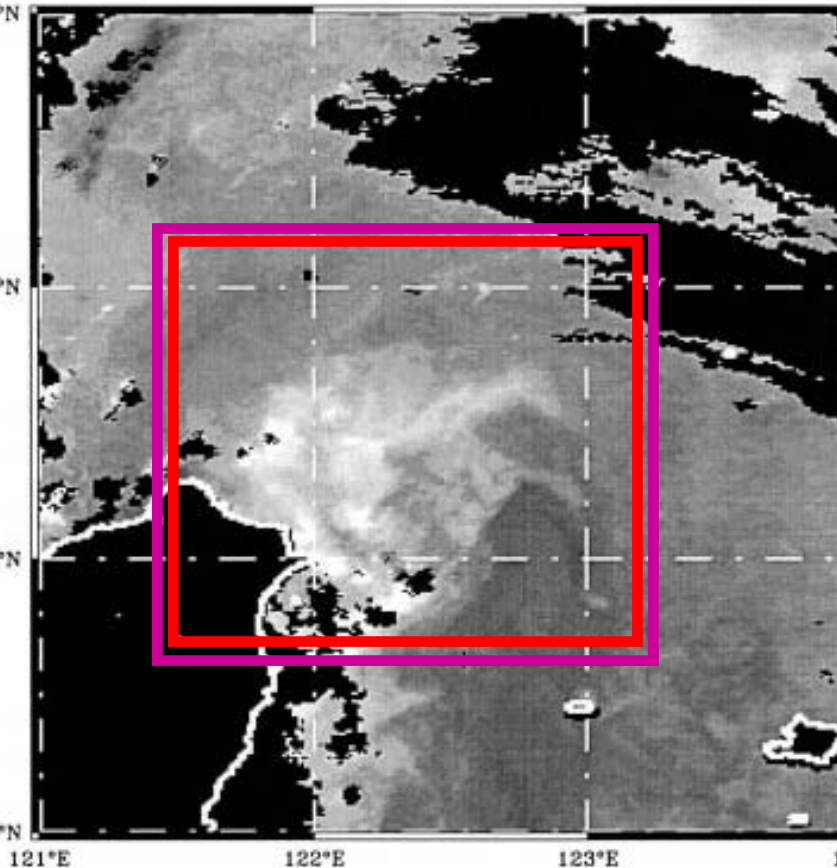


Fig. 1. Infrared image of the sea surface temperature in the study area obtained by MODIS on 12 August 2002. Light shading indicates low surface temperature.

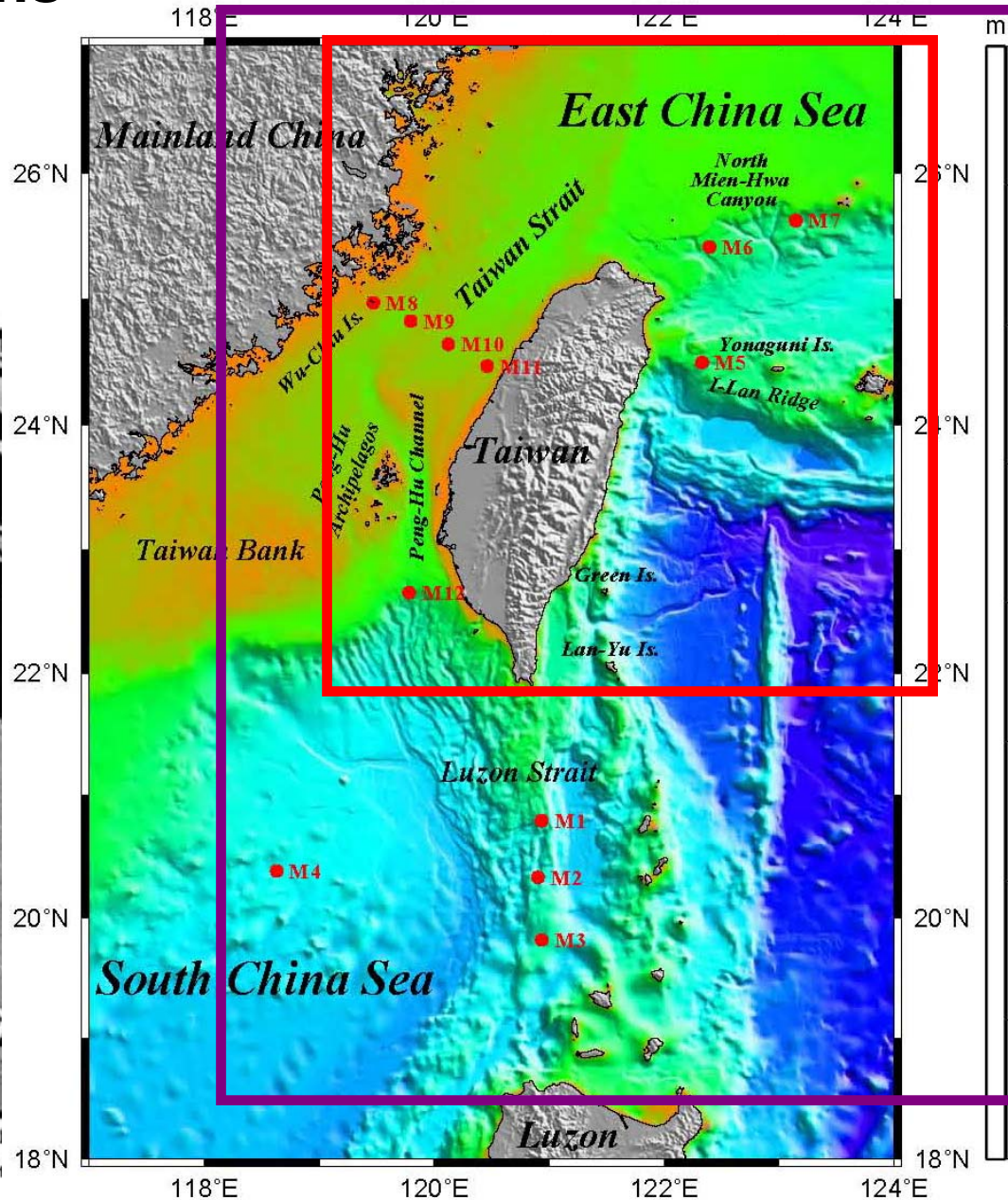


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Prioritize

- **Regional Scientific Priorities, Towards Regional Real-time System**
 - The Cold Dome should possibly become the dominant real-time objective
 - Is the Mien-Hwa Canyon the inflow route?
 - What is its variability (time/space scales) and what are its structures?
 - If it is permanent, what controls it and makes it permanent (creation, maintenance and decay)
 - Barotropic and baroclinic tides statistics, and their effects on mixing within and around the Cold Dome
 - Sensitivity of acoustics to all of the above
 - Estimate/forecast uncertainty of ocean physics-acoustics in this environment
 - Acoustic-Physics Data assimilation. If sufficient acoustic data not available in real-time, coupled DA will be carried out after the fact

• **Scientific Modeling Priorities (not in real-time)**

- **All previous goals are also of hindcast interest**
- **Other essential goals**
 - Large-scale Predictability (Transports, Meandering, Impinging, Intrusions) of Kuroshio
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 - Cold dome mesoscale dynamics: creation, maintenance, variability and demise
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- **The above can become real-time as hindcast progress occurs**
 - Real-time large-scale modeling products should come from HYCOM (NAVO)

• **Modeling effort has to be in part driven by novel research and publications**

- What is the utility of a real-time prediction system for QPE?

•**Atmospheric Forcing**

- NOGAPS (1 to ½ deg via FNMOC)
- COAMPS may be classified (27km?)
- EMCWF may have high resolution by 2009: not in real-time
- NCEP: not in real-time

•**Bathymetry**

- Corrected etopo2 bathymetry from Larry/Brian
- Taiwanese data???

•**Exploitation of dynamics and uncertainty**

- Adaptive sampling
- Needs more discussion

•**Objectives and work for Meeting 3?**