Ocean & wave modeling effort synthesis: DART-05

Topics to be discussed

Modeling background material
Modeling scientific objectives
Models involved and their properties: type, resolution, etc
Multi-models
Model calibrations and OSSEs
Collaborations
Modeling Action List

Notation

Text with interrogation marks: not certain/to be prioritized
Text in grey: unlikely
Name in blue: POC/responsible institution/person

Specific Real-Time Modeling objectives (for DART-05 only)

- **Physical ocean science objectives: small-scale instabilties**
  - (Sub)-mesoscale eddy formation and mixing off ``Testa del Gargano'' (effects of buoyancy flows, atmospheric forcing and topography)
  - Understanding/modeling of (sub)-mesoscale instabilities, up to: inertial oscillations/scales
  - Upper-layers processes:
    - e.g. Drifting dynamics, Surface boundary layer (SBL) and transfer of atmospheric fluxes (SBL model learning), air-sea interactions (ocean SST feedback)
  - Transports at the Palagruza sill
- **Technical objectives**
  - Validation/verification of model estimates (e.g. Model skill estimation, evaluation of parameterizations?, validation of calibration models for satellite/optics data)
  - Data assimilation
  - Nested sub-mesoscale, mesoscale and Adriatic real-time forecasting
  - Multi-model and super-ensemble formation and forecasting
  - Drifter predictions
  - Model training, learning and correction?
  - Uncertainty/Error predictions?
  - Adaptive sampling: which scales?, which purposes (uncertainty, features, coverage)?
  - Secondary variables predictions/analyses?: energy, vorticity, MsEVA, etc

Models involved and their properties

Ocean Models

NCOM (1km, maybe more domains?)
ROMS (ARPA + research by CNR)
HYCOM (NRL)
POM/OPA (MFSTEP/ADRICOMS)
HOPS: 1 prod. for HU, Anco., INGV
DieCAST?
GOTM, ERSEM?

Wave models

WAM/SWAN (ARPA)
SWAN (NRL, 3 nests)

Surface drift models?
(GNOME: griffa, nurc,Hu)

Biology?
Acoustics?
Optics?

Multi (ocean) models

NURC
HU
Bologna?
NRL?

Super-ensemble? (NURC)
(all models and their ensembles, of all types)

Needed info from each modeling group:

Model and modeler's contact:	HOPS, Address, phone
Web-page:	e.g. www.deas.harvard.edu/HOPS
Type, technique:	e.g. Prim. eq. physics, NPZ biology,tidal, wave, etc
Domains:	
Resolutions:	
Data assimilation:	
Forcing:	e.g. Any
Previous experience in Adriatic:	what? ref?
Real-time plans:	
Miscellanous	

Needed preparation material and resources (on Web)

POC/responsible person identified for each topic in blue

- Bibliography of Adriatic literature (focus on DART-05 goals): Book/Rixen/All of us
  - Cushman-Roisin et al. Phys. Ocea. Adriatic (Yellow book, 2001)
- Web-links to local expert reports/vgfs on dynamics off “Testa del Gargano”?
  - What are the dominant processes, scales, etc? (internal waves?, over-turning?, tides?)
  - Local historical data sets available?: CNR Alessandra Conversi + IOF (Morovic)
- Historical and climatological data bases (e.g. ADREA-02-03, WODB, MEDAR, MEDAS-Dadic, OGS-web, etc): Rixen/Book
  - In situ, Satellite and other remote sensing (codar, etc) , Atmospheric Forcing
  - Bathymetries, river inflows, tidal fields
- List of existing model set-ups: Rixen/Russo/PierreL
  - Web-page and some info on model code, region, resolution, data used, assimilation, etc
- List of other data collections that are planned to occur in the Adriatic, during DART05: Book
  - Provide web-links to: Data of opportunity, planned experiments, availability, etc
- DART-05 web-page where all of the above is maintained: NURC

Real-time study of model outputs?

- DART-05 multiple groups allow for more real-time scientific interpretation
  - Interest?
    - Use of SST from ocean model as input into atmos. model
    - Real-time descriptive oceanography (data-based, model-based, comparisons)
    - Secondary variables studies, balances of terms
    - Jeff Book, HU, NURC interested to do this in real-time
    - Maybe drifter dynamics (A. Griffa)
- Investigate possibility of setting-up DODS (maybe at NURC), LAS or other model data access server
  - Enables collaborative real-time science
  - Pre-select some of the models for real-time use onboard the Alliance, to facilitate data transfers. Use other models at later time

Experimental plans relevant to modeling: to be discussed

- List of real-time sensors and platforms available
  - Spatial and temporal sampling capabilities and constraints
  - Routine or adaptive
- Ocean sampling needs
  - Initialization survey: optimize ship use and deployment of fixed assets
  - Updating surveys: Adaptive and routine
  - Verification surveys: Field forecast evaluation and Model parameterization evaluation
- Repetitive data calibration stations for multi-sensors/platforms
  - Protocols, frequency
- Atmospheric data
- Other data bases: bathymetries, rivers inflows, tides
- Real-time modeling inputs/outputs wishes and needs
  - LAS or not?, GEOS?: Model data flows for model training and multi-model estimation
- Operations and real-time modeling logistics (who, where, how, which?)

Pre-cruise model plans and calibrations: to be discussed

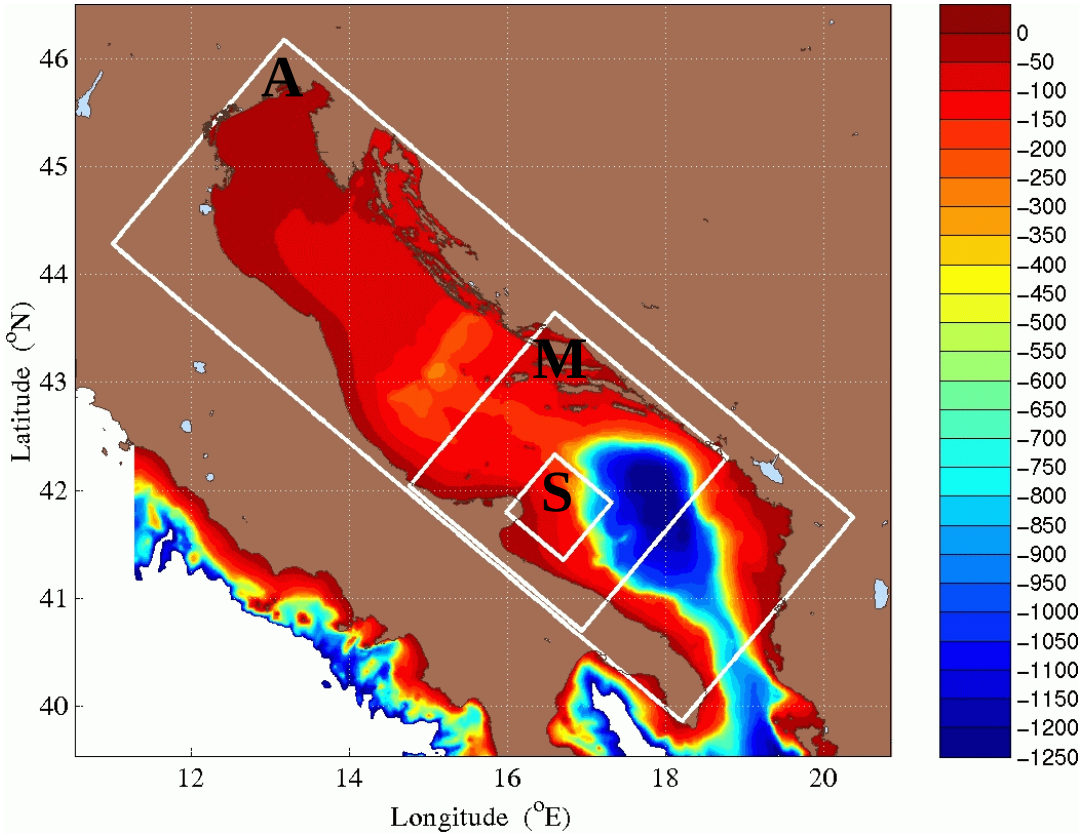
- Bibliography of modeling literature in the Adriatic: Oddo, Russo and NRL
- Interest in dry-run modeling collaborations, coordinations?
- Numerical and scientific tuning
  - Single model (NRL, ROMS, POM, HOPS, etc)
    - e.g. A. Russo, P. Oddo and HU for HOPS
  - Multi-models tuning
- Useful model calibrations via Observation System Simulation Exps.
  - OSSEs for initial surveys (if done, needs to be done in next few weeks): maybe NRL
    - e.g. which among 2-3 scenarios for initial R/V Alliance survey is best for each of the expected 2-3 dynamical scenario (based on historical wind conditions, remotely-sensed oceanic circulation/features).
  - OSSE for routine data needs
    - e.g. what are optimal routine tracks for the R/V Alliance?
  - OSSEs using drifter data (Griffa), for both of the above and drifter ideal release location
- Multi-model estimation testing
  - Plans for sharing fields, parameters, etc prior to experiment

Technical Modeling Issues

- Common/consistent spatio-temporal boxes (lon, lat, 1 week before and after?). High-resolution domains must be sufficiently large to account for uncertainty of dynamical hot-spot locations
- Common/consistent lead times (3, 6,…48 h, 1x or 2x a day?)
- Suitable formats: Netcdf, Grib?
- Single files per day?
- Modified Julian days or other abs. temp. ref within file
- Various forcings/combinations + high res met
- Tides (OSU), 4 components in the Med
- Coupled vs not coupled
- New bathymetry
- Modeling personnel onboard?
- Use of NATO high-performance computing cluster: on site only

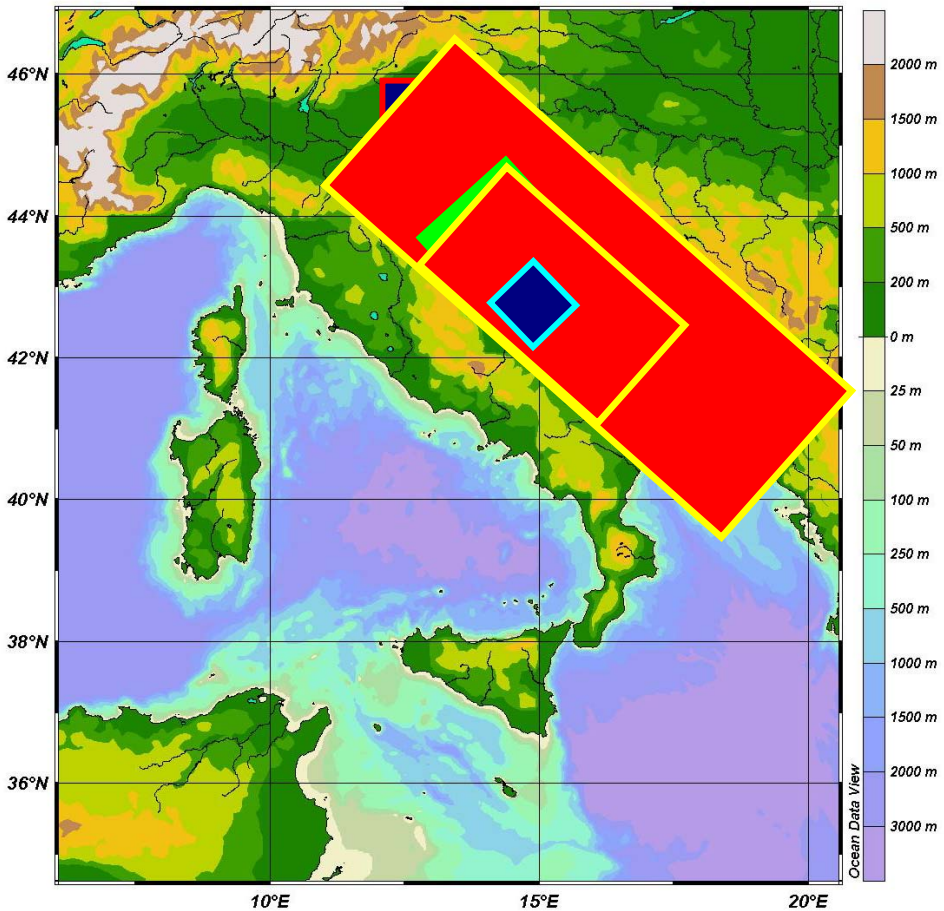
Potential HOPS Modeling Domains

(To be updated based on this meeting)



	Adriatic (A)	**Mesoscale (M)**	**Sub-Mesoscale (S)**
Resolution	4.05km	1.35km	0.45km
Size (nx,ny,nz)	190x69x21 (~765x275km)	173x174x21 (~232x234km)	173x174x21 (~77x78km)
Speed (300s dt)	19 minutes/(model day)	44 minutes/(model day)	44 minutes/(model day)
Resolution	9.639km	3.213km	1.071km
Size (nx,ny,nz)	81x32x21 (~771x299km)	77x78x21 (~244x247km)	77x78x21 (~81x82km)
Speed (300s dt)	3.8 minutes/(model day)	8.7 minutes/(model day)	8.7 minutes/(model day)

Nello Russo - Domains



ADRICOSM Domains