

HYCOM for Ocean Modeling at NCEP

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context

- Operational oceanography components and activities are distributed within and across institutions.
 - Observational Systems
 - Numerical models: physical, bio-geochemical, waves, etc.
 - Assimilation schemes
 - Distribution of data
 - Services
- Integration and coordination within each component and across components is necessary for progress.

(Some) attributes of a model for operations

- Robust and efficient for operations
- Skill to represent processes of interest
- Modular and amenable to improvement
- Active and productive community working for the model (class).
- Proven efficient and accurate integrated
 - Parameterizations of not resolved processes
 - Data assimilation schemes
 - Pertinent inter-disciplinary models

Models at NCEP

- Climate Outlook:
 - Atmosphere-Ocean coupled model: MOM and GFS
 - 3DVar (Rosati-Derber)
- Short Term Forecast
 - NW Atlantic: POM; OI.
 - Atlantic Sector: HYCOM; 3DVar

Ocean Forecast Systems: Immediate Objectives

- Routine estimation of the ocean state [T, S, u, w, ssh].
 - Daily 0-4 week forecast
 - Every 5 years, re-analysis
- Help to improve estimation in (nested) sub-domains
- Help to improve the estimation of the atmosphere state
 - In short term global forecast
 - In short term regional forecast
 - Hurricane
 - US regional
- Help to improve the estimation of chemical components (water quality) and organisms distributions in the water(ecosystems).

Ocean Forecast Systems: general configurations

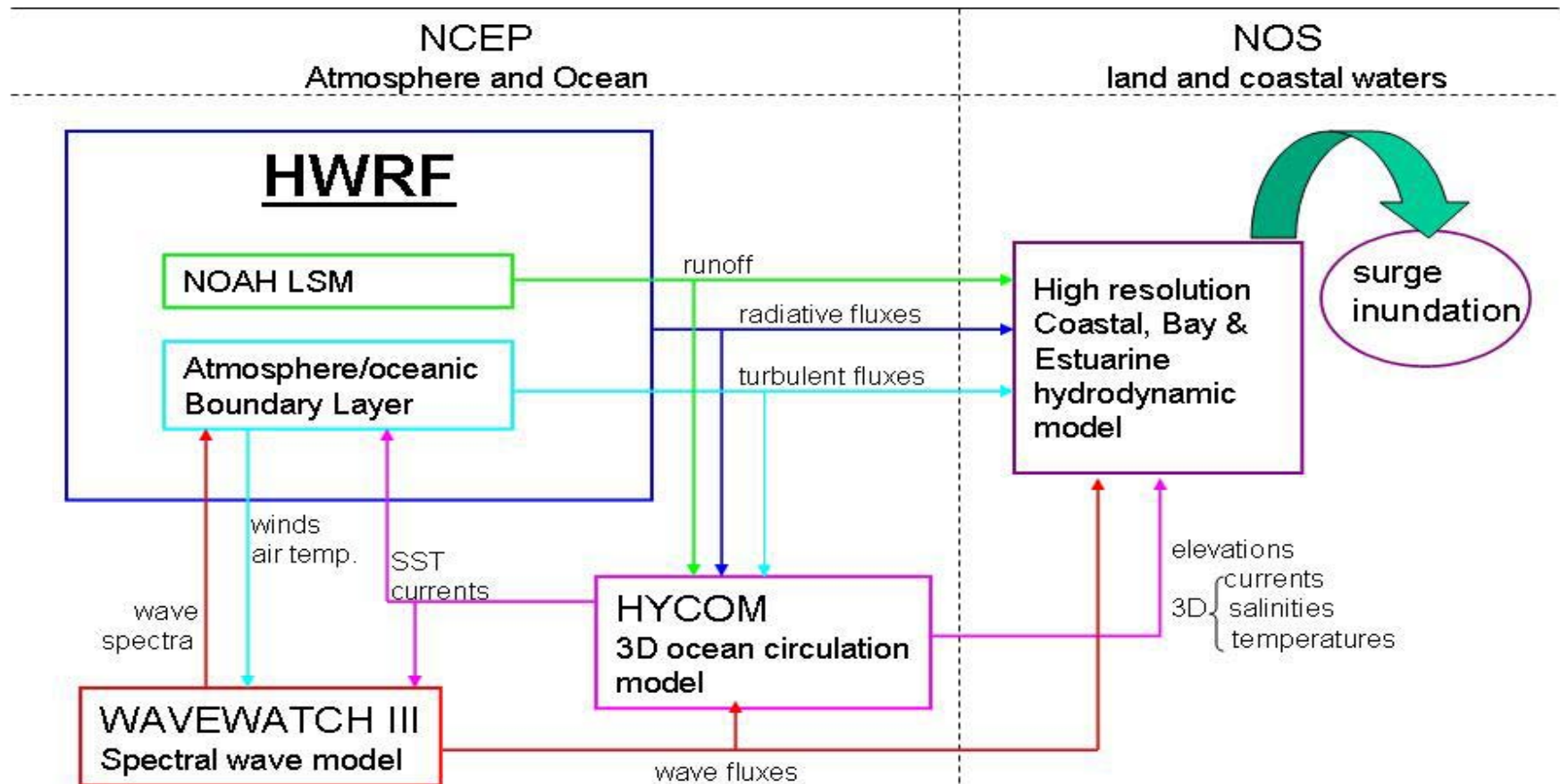
- Ocean standalone Global Basin(*) and sub-basin systems for the Atlantic and Pacific(**)(0-1 week)
- Coupled Global atmosphere-ocean (***) (0-4 weeks)
- Event driven coupled regional atmosphere-ocean (0-1 week) Tropical and extra-tropical storms
- Event driven coupled ocean physical-bio-geochemical (0-4 weeks).
- Event driven coupled ocean physical-physical (0-1 week).

*Eddy permitting to eddy resolving,

**Eddy resolving,

***Replacing standalone.

Hurricane-Wave-Ocean-Surge-Inundation Coupled Models



WRF-HYCOM Coupling Strategy

Atmosphere:

- WRF coarse domain one way nested to GFS.
- WRF fine Hurricane tracking domain two way nested to WRF coarse.
- WRF coarse domain configuration is changed every forecast cycle: 'jumping grid'.

Ocean:

- HYCOM regional one way nested to RTOFS.
- HYCOM regional domain configuration is changed every forecast cycle: 'jumping grid'.

Ocean-Atmosphere:

- Two way information exchange in over-lapping region.

And some final examples in integration

- Integrated software infra-structure.
 - Across institutions
- Common protocols for
 - Model and forecast validation
 - Monitoring and diagnostics
- Ensemble forecasts
 - multiple realizations
 - multiple models
 - multiple institutions
- Adaptive sampling [model, data assimilation, observing system]