



NCEP Ocean Modeling in support of TC forecasting.

Focus work of the Marine Modeling and Analysis Branch.

(NWS / NCEP / EMC)

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NCEP Ocean Modeling in support of TC forecasting.

- Operational implementation of the Global Real Time Ocean Forecast System (RTOFS-Global), a global $1/12^\circ$, 32 layer HYCOM model, with a daily 6 day forecast.
- Hurricane wave model upgrades (WAVEWATCH III[®]).
- Coupled HYCOM-HWRF(-WAVEWATCH III[®]) hurricane modeling ([previous presentation](#)).



NOAA SAB 2004/2005 directed building of ocean modeling backbone capability within NOAA.

- NCEP global and basin scale responsibility.
- NOS coastal responsibility, moving to operational computer.
- IOOS Regional Associations coastal responsibility in public-private partnership.
- Strong partnership with Navy essential.

EMC Jan 2008 workshop outcome:

- Adopt Global HYCOM from Navy.
 - Natural approach with partners in HYCOM consortium.
 - Implement capability rapidly with limited resources.
 - Support coupled hurricane modeling consistently for any geographic location.
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Four major efforts:

- Eddy resolving ocean modeling.
 - Eddy resolving ocean initialization.
- Operational 2005
Operational 10/25/2011
- RTOFS-Atlantic
RTOFS-Global

- Coupled modeling for hurricanes.
- Live testing (2008 →) nested RTOFS coupled to HWRF

- Coupled modeling for weather – CFS / NEMS.
- In early development
- RTOFS-NEMS

- All RTOFS products based on the community HYCOM model, MMAB is part of the HYCOM consortium.



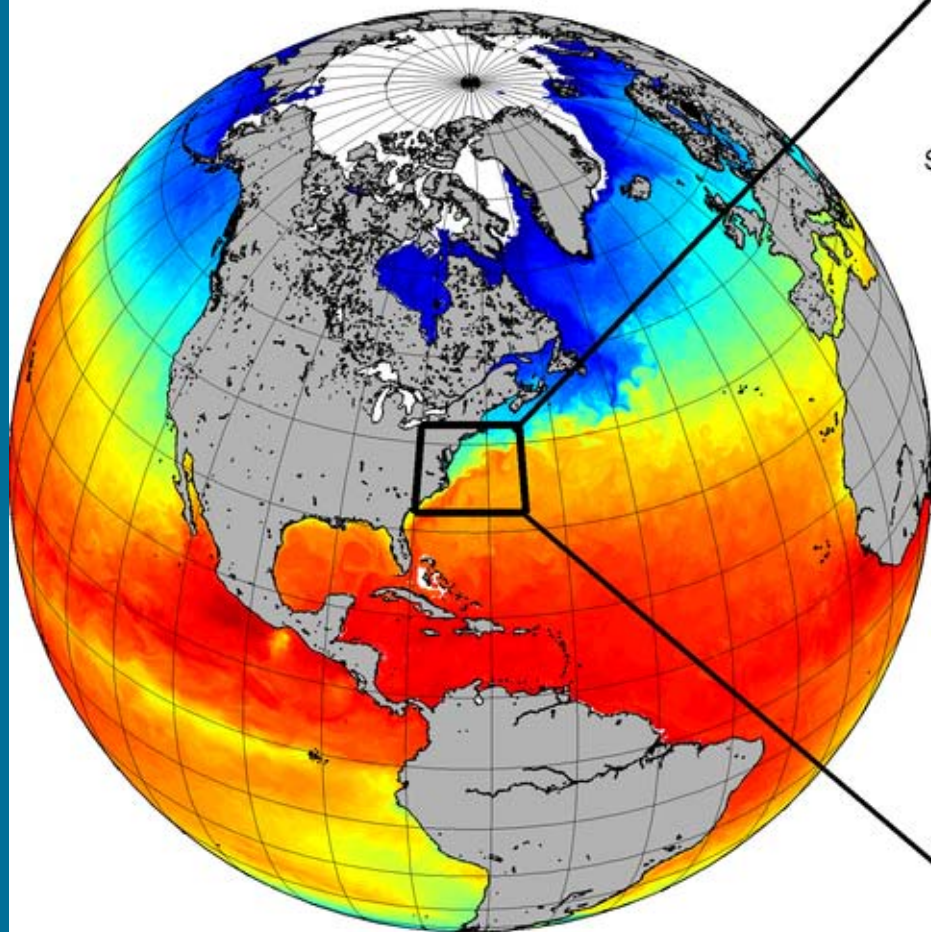
- Adopting existing 1/12° model from NRL (NOPP).
 - GFS forcing (including diurnal cycle).
- Timeline:
 - Operational 10/25/2011 with NRL/NAVOCEANO (NCODA) initialization (daily feed from NAVO).
 - FY2014: full initialization at NCEP.

paradigm shift for NWS

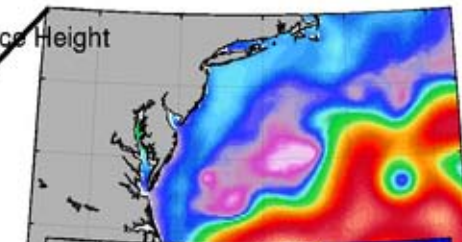
- NOMADS as main distribution points (OpenDAP, NetCDF).
- No tides yet (unlike RTOFS-Atlantic)
 - Intend to follow Navy with implementation.



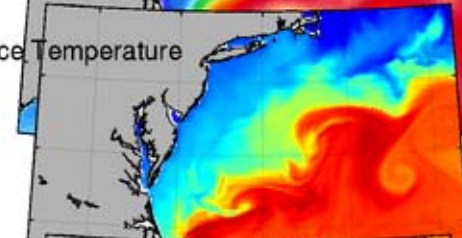
RTOFS Global
Sea Surface Temperature



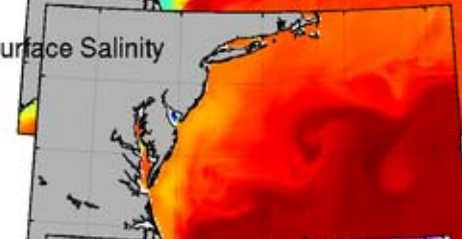
Surface Height



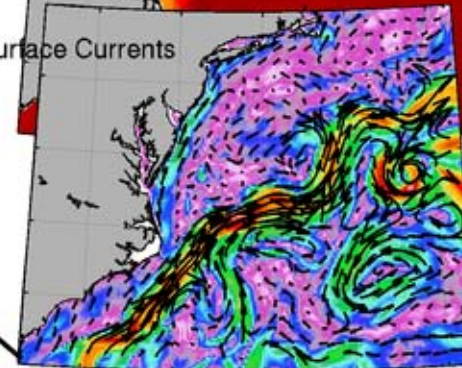
Surface Temperature

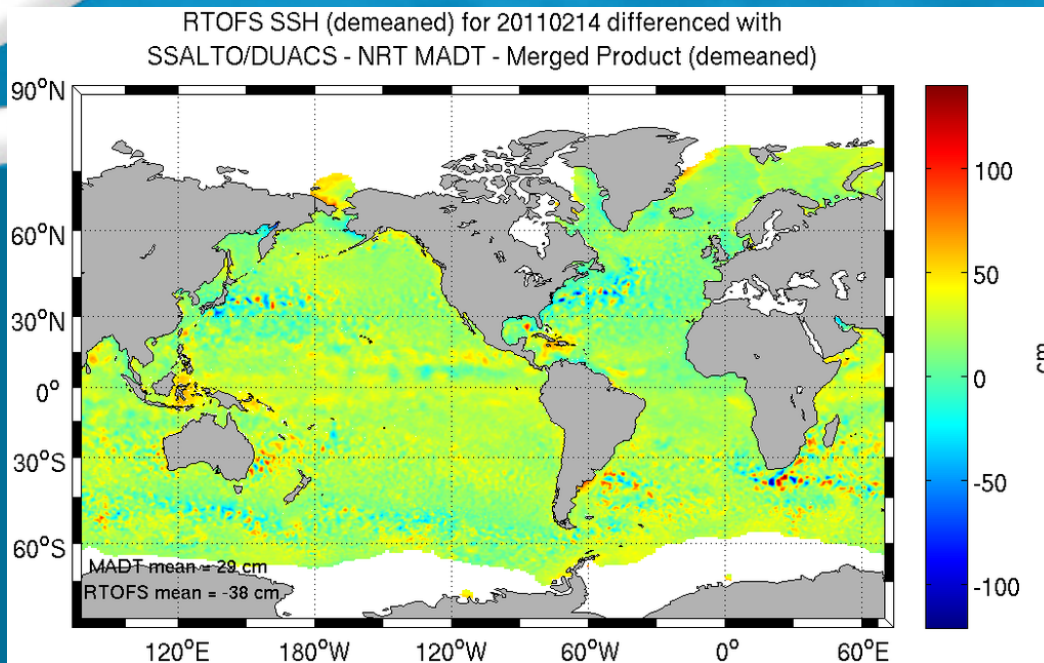
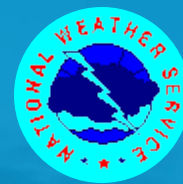


Surface Salinity

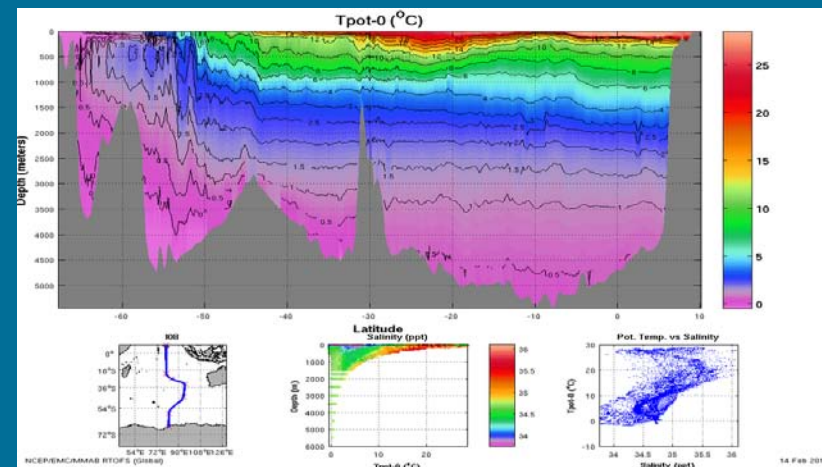
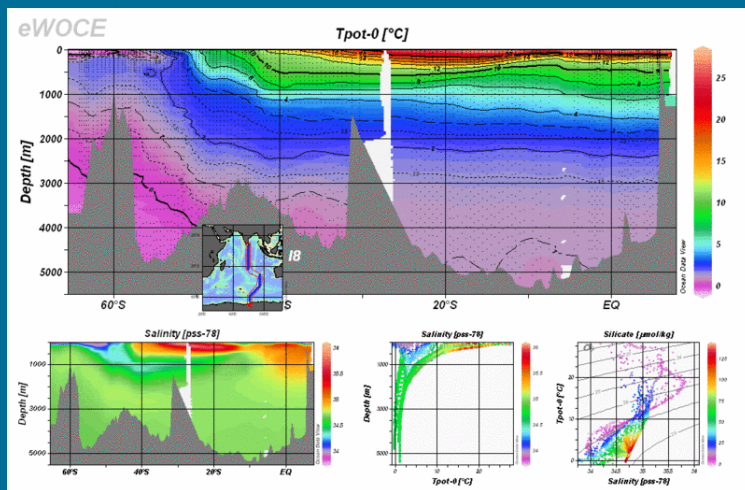


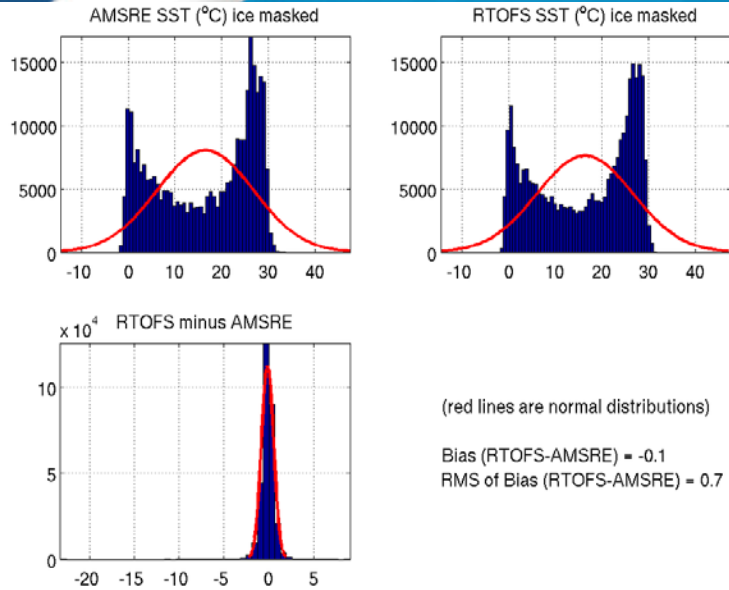
Surface Currents





Focus on GODAE metrics to monitor performance. Instantaneous SSH and climatological temperature profile examples. (+ extensive Navy validation)

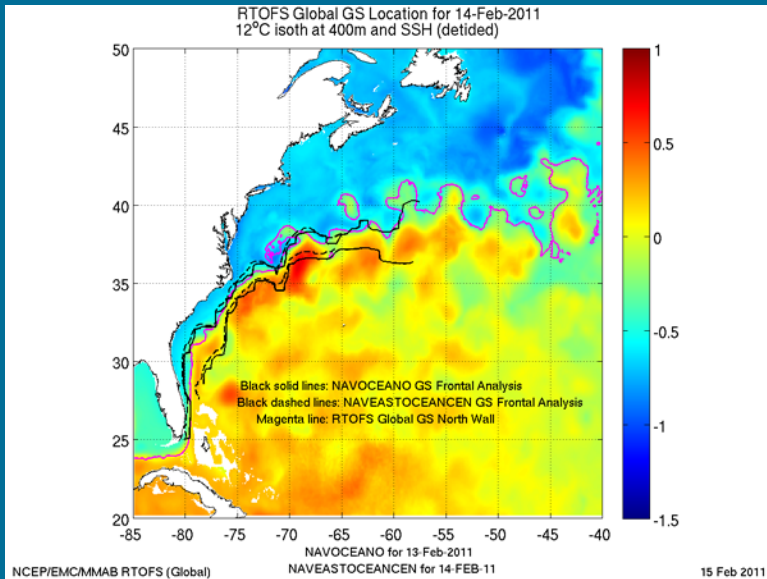




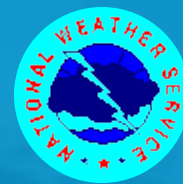
Critical for use in TC forecasting:

- SST accuracy established against multiple instruments (AMSR-E example).
- Location of features (Gulf Stream example).
- Mixed layer depth reasonable but systematically shallow (previous presentation).
 - NOGAPS → GFS forcing.
 - Wave mixing (Langmuir, Stokes).
 - Internal tides.
 - **Need data (profiles).**
- Ocean response to TC seems reasonable, ongoing subject of research (previous presentation).

NCEP/EMC/MMAB RTOFS Global 14 Mar 2011

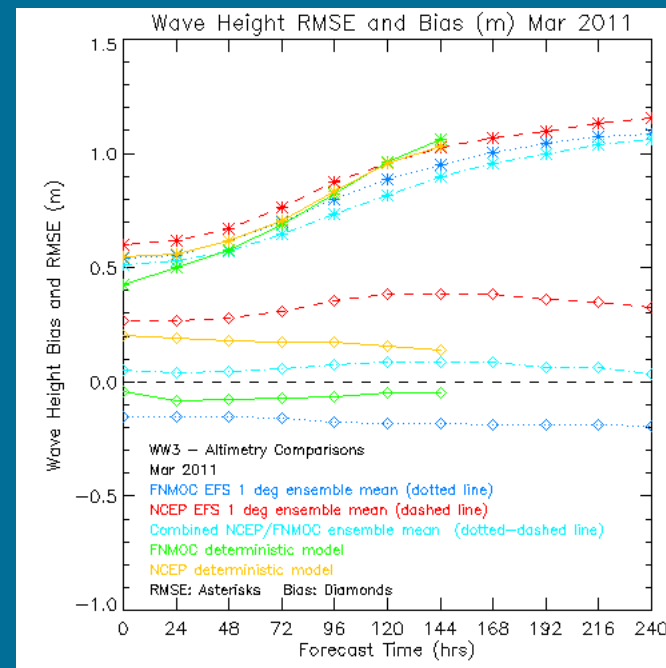
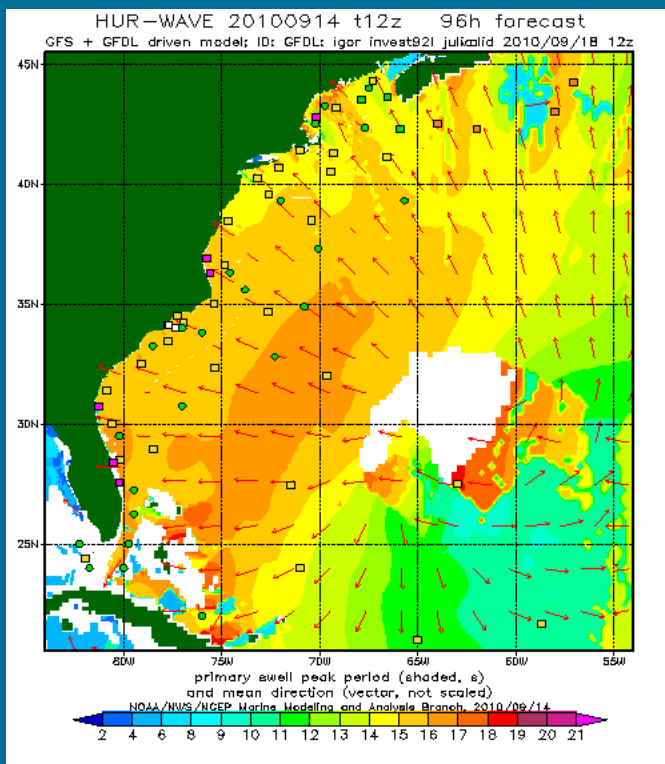


NCEP/EMC/MMAB RTOFS (Global) 15 Feb 2011



Recent operational upgrades

- Multi-grid hurricane wave model.
 - 7.5km coastal resolution, individual wave fields.
- Joint FNMOC – NCEP wave ensemble.
 - Hurricane applications?

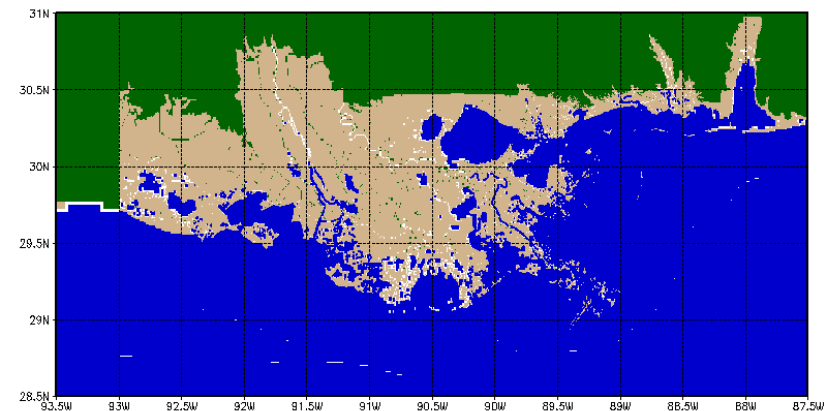




In the pipeline :

- Physics upgrades for global model 2012, others 2012/13.
- Curvilinear and unstructured grids, quasi-stationary options.
- Data assimilation re-introduced.
 - Need live WSRA data for hurricane model by 2014.
- Coupling, finish ESMF-NUOPC layers for WAVEWATCH III.
 - HWRF-WW-HYCOM coupled model.
 - COAMPS-TC.
 - 90+ output parameters.
 - Wave-surge modeling.
- NDFD winds to force hurricane wave model.
- Wave field tracking.
- NWPS (next slide).

Gustav example



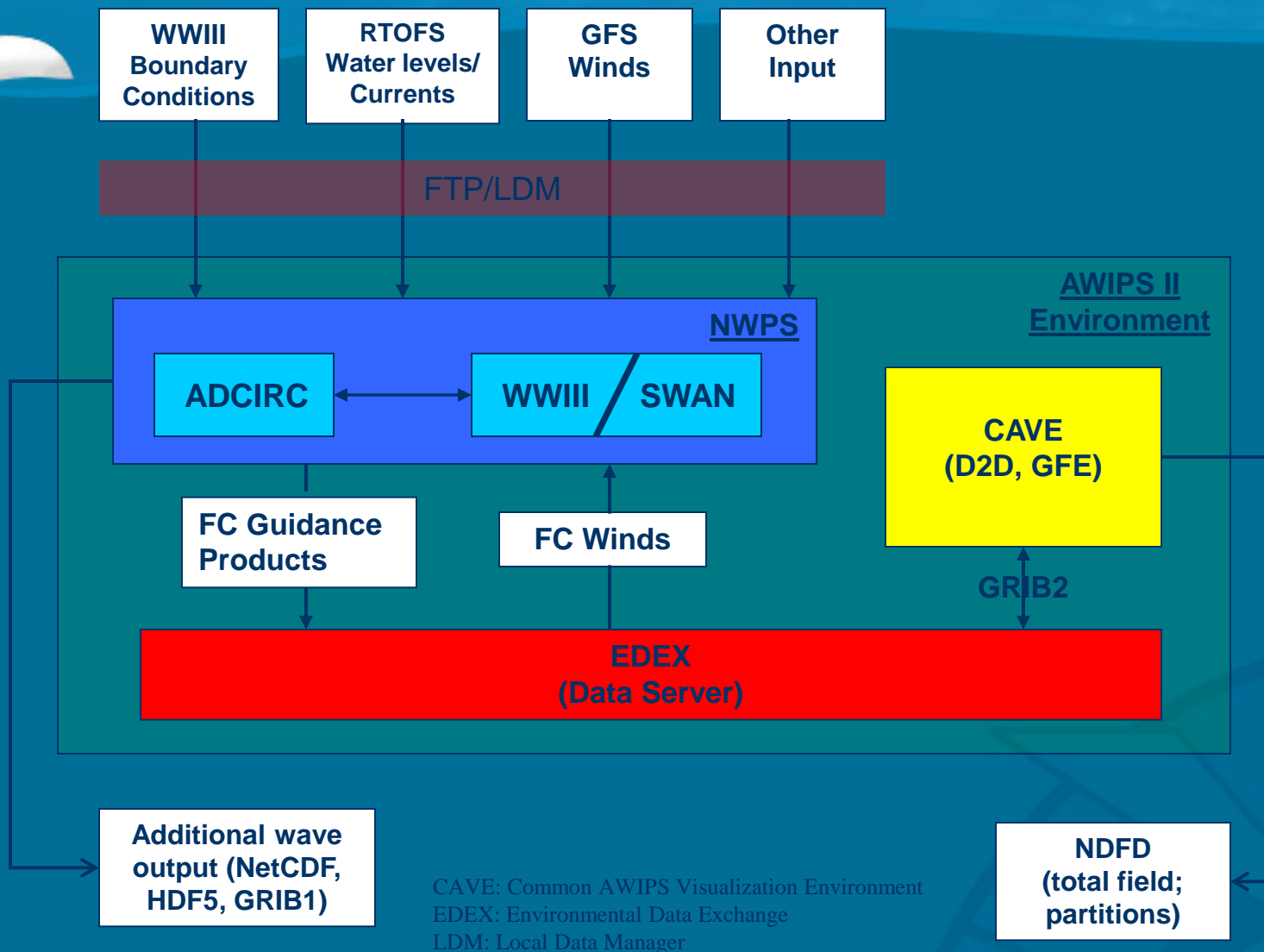
Adcirc levels in WAVEWATCH III
Inundation + 200m resolution

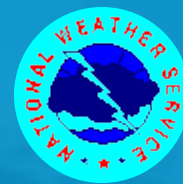


Nearshore Wave Prediction System (NWPS)

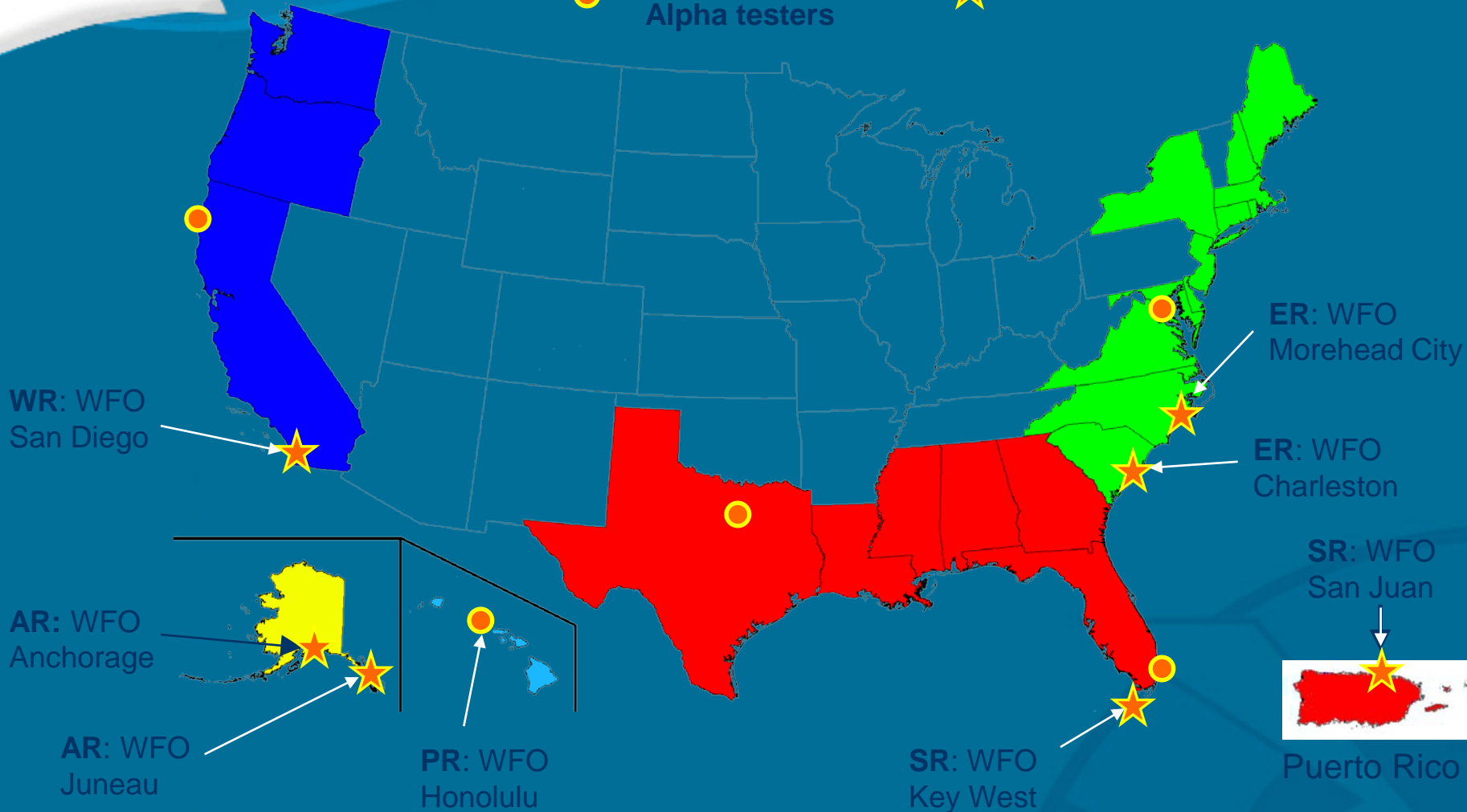
- OSIP 06-093: NCEP to support local wave modeling capability for WFOs (AWIPS-II or local workstation) as established by pilot projects using SWAN model.
- Funded FY2010 by NOS using HFIP funding.
 - Supplemental HQ funding for link to AWIPS.
- Expanded to coupled wave-surge (Adcirc, NOS) model.
- Basic concepts:
 - Make WAVEWATCH III centric, support SWAN.
 - For any collaborator, but has to work at WFO.
 - Live data feeds from NCEP.
 - Generate cyclic development path with WFOs and other external collaborators.

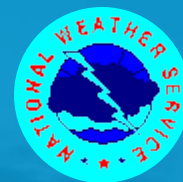
NWPS system architecture





● Developers/
Alpha testers ★ Beta testers





Phase	Task/FY	11 Q 2	11 Q 3	11 Q 4	12 Q 1	12 Q 2	12 Q 3	12 Q 4	13 Q 1	13 Q 2	13 Q 3	13 Q 4
I.1	Set up SVN repository at NCEP	█										
I.2	SWAN command file update	█	█									
I.3	RTOFS in SWAN	█	█									
I.4	Inclusion of 1D SPEC files	█	█									
I.5	Partitioning in SWAN	█	█									
I.6	AWIPS II compatibility	█	█									
II	Alpha-1 testing			█	█	█						
III	Addition of Nearshore WWIII	█	█	█	█	█						
IV	Alpha-II testing & documentation						█	█	█			
V	Beta testing								█	█	█	
VI	Nat. Roll-Out of NWPS v.1											█



AWIPS Schedule

Note: these are projected dates

Sep 2012: 12 GB PX server on 64bit OS tested at field sites

Dec 2012: 12 GB PX server on 64bit OS deployed to field sites

Jun 2013: Anticipated full deployment of AWIPS II

Jul 2013: NWPS to be deployed with AWIPS baseline



Thank you!