Update on U.S. Navy Ocean Analysis and Prediction: Existing and Future Plans

presented by

Harley E. Hurlburt
Naval Research Laboratory
Stennis Space Center, MS USA

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Present U.S. Navy Operational Capabilities Related to GODAE Viewable on the web

http://www.ocean.nrlssc.navy.mil/global_nlom
http://www.fnmoc.navy.mil/PUBLIC
http://www.navo.navy.mil

Operational Global Ocean Product	Inputs	Run by
~1/2° 2D MVOI SST Analysis [1]	IR + in situ	FNMOC
1/8° MODAS SST Analysis [2]	IR	NAVO
1/4° MODAS SSH Analysis [2]	ENVISAT+GFO+JASON-1 [3]	NAVO
1/16° global NLOM nowcast/forecast system [2]	ENVISAT+GFO+JASON-1 [3] SST FNMOC winds+thermal	NAVO

[1] T239 or ~1/2° for atmospheric model boundary condition (on GODAE server)
[2] Provide subsurface temperature
[3] T/P is planned

- Real-time altimetry via NAVO Altimeter Data Fusion Center (ADFC)
- NLOM: NRL Layered Ocean Model
- GODAE: Global Ocean Data Assimilation Experiment
- FNMOC operates a GODAE data server with data and products from a variety of sources, including real-time altimetry from the NAVO ADFC

U.S. Navy Future Operational Transitions Related to GODAE

Participants: FNMOC, NAVO, NRL, ONR, Univ, Contractors

Global Product	Mid-Lat Resolution	Vert. Coord.	Inputs	Run By	Target Date
1/8° NCOM [1]	15 km	σ/z	SSH, SST, hydro, FNMOC NOGAPS atmospheric forcing	NAVO	2004
1/32° NLOM [2]	3.5 km	Layered		NAVO	2004
1/12° HYCOM	7 km	ρ/σ/z		NAVO	2007
1/4° HYCOM [3]	20 km	ρ/σ/z		FNMOC	2009
1/25° HYCOM	3.5 km	ρ/σ/z		NAVO	2011
Semi-operational Product [4]					
1/12° Atl. HYCOM [5]	7 km	ρ/σ/z		NAVO	2005
1/12° Pac. HYCOM	7 km	ρ/σ/z		NAVO	2005
1/25° Black Sea HYCOM	3.2 km	ρ/σ/z		NAVO	2005

[1] High vertical resolution for mixed layer prediction. Assimilates SSH from NLOM. Running in real-time, see http://www.ocean.nrlssc.navy.mil/global_ncom

[2] Running in near real-time, see http://www.ocean.nrlssc.navy.mil/global_nlom

[3] For coupled ocean-atmosphere prediction.

[4] To give NAVO/Navy experience with HYCOM without official operational status; to be replaced by global HYCOM including the 1/25° Black Sea HYCOM

[5] Under the National Ocean Partnership Program (NOPP), 1/12° Atlantic HYCOM demo is already running in near real-time. Includes the Mediterranean Sea. Results at http://hycom.rsmas.miami.edu/ocean_prediction.html

Nesting Strategy for Ocean Prediction

Global	→	Regional	→	Littoral	→	Nearshore

Near-term: present-FY04 in R&D, FY04-FY07 operational, including transition

1/8° NCOM	→	NCOM or SWAFS	→	NCOM or SWAFS	→	**ADCIRC
15-16 km mid-lat resolution	→	4 - 8 km, larger regions	→	< 1 to 2 km res	→	< 2 km resolution finite element

Mid-term: FY04 - FY07 in R&D, FY07 – FY10 operational, including transition

1/12° HYCOM	→	HYCOM	→	*NCOM or HYCOM	→	ADCIRC
7 km mid-lat resolution	→	2 - 4 km, smaller regions	→	.5-1.5 km res	→	< 1.5 km res

Long-term: FY07-FY11 in R&D, FY11 and beyond operational, including transition

$^{+}$1/25° HYCOM	→	Regional generally not needed	→	*NCOM or HYCOM	→	ADCIRC
3 - 4 km mid-lat resolution	→	Not used	→	≤ 1km res	→	≤ 1 km res

*Hogan and Kindle CO-NESTS project should provide research results needed to make the appropriate choice. An alternative model such as ROMS may also be considered.

Nested model may be a component of COAMPS.

$^{+}$1/25° HYCOM gives useful littoral resolution globally.

**ADCIRC needs a robust baroclinic capability before it can properly fill this role.

User Interest in Real-time Global Ocean Products

NRL Oceanography Division Web Site Hit Statistics during 2003

Total # hits	18,327,137
Avg hits/day	50,211
# hits used in country breakdown	16,322,753
# countries with ≥ 1000 hits	59
# countries with ≥ 100 hits	100
Total number of countries	169

Includes the following real-time global Ocean products and other results

Altimeter data

MODAS SSH & SST analyses

Ocean prediction systems

- **1/16° global NLOM**
- **1/8° global NCOM**
- **1/12° Atlantic HYCOM**

Top 25 Countries and # Hits

United States	**11,680,841**
Australia	**1,919,691**
Japan	**929,849**
South Africa	**525,233**
China	**311,852**
Taiwan	**303,221**
Great Britain	**56,025**
Canada	**55,825**
Germany	**50,895**
France	**44,899**
Russian Federation	**44,408**
Spain	**36,724**
South Korea	**35,216**
Switzerland	**34,809**
India	**28,579**
Italy	**20,987**
Netherlands	**20,504**
Vietnam	**16,747**
Peru	**15,667**
Sweden	**11,969**
Chile	**10,965**
Puerto Rico	**9,704**
New Zealand	**9,540**
Mexico	**8,100**
Ukraine	**7,877**