Eddy-Resolving Global Ocean Prediction: An Update on U.S. Navy Participation in GODAE

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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	NAVO
1/16° global NLOM nowcast/forecast system [2]	ENVISAT+GFO+JASON-1 SST FNMOC winds+thermal	NAVO

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

- 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	2005
1/32° NLOM [2]	3.5 km	Layered		NAVO	2005
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	2006
1/12° Pac. HYCOM	7 km	ρ/σ/z		NAVO	2006
1/25° Black Sea HYCOM	3.2 km	ρ/σ/z		NAVO	2006

[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 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 2004

Total # hits	18,467,717
Avg hits/day	50,458
# hits used in country breakdown	18,289,089
# countries with ≥ 1000 hits	67
# countries with ≥ 100 hits	120
Total number of countries	182

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	15,917,868
Japan	971,377
China	197,225
Taiwan	137,623
Germany	97,609
Great Britain	75,999
Spain	73,888
Canada	66,436
Vietnam	65,704
New Zealand	64,092
South Korea	48,663
Greece	48,087
France	46,755
Australia	45,925
Russia	38,601
Italy	30,435
Peru	28,181
India	27,794
Mexico	25,764
Netherlands	25,081
Switzerland	24,827
Sweden	22,260
Puerto Rico	17,683
Philippines	13,558
Portugal	11,350