Research to Operation (R2O):
PWS ROMS & U.S. West Coast Modeling Testbed

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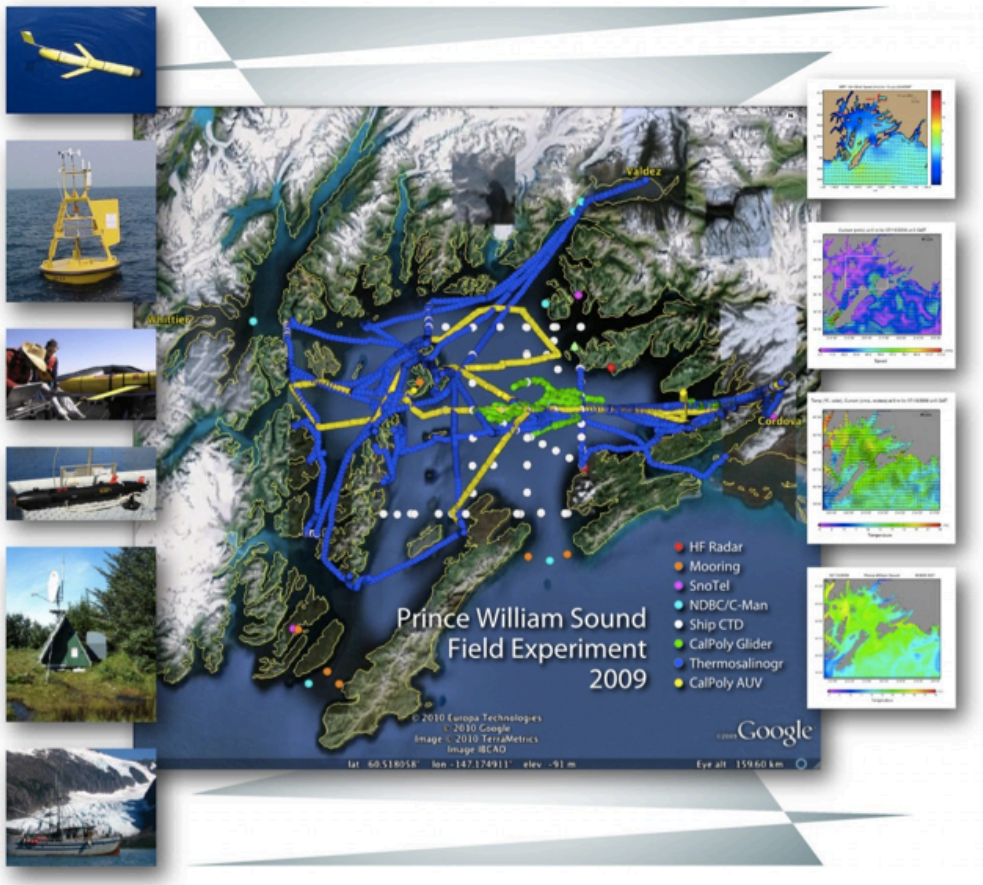
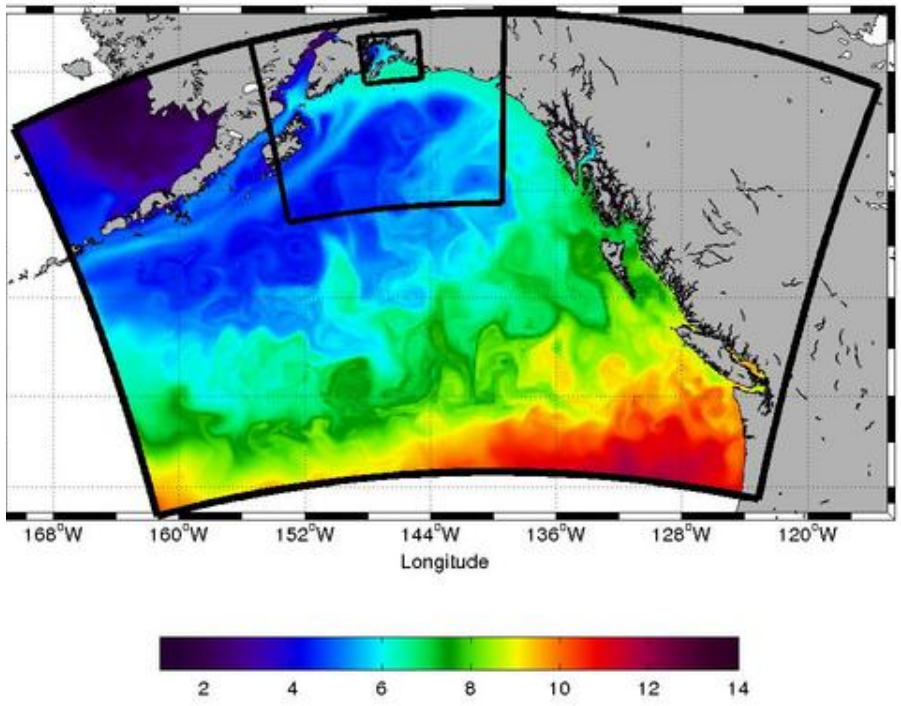
Research:
Regional Demonstration in Prince William Sound

Observing System → (2005-2009) → Regional Ocean Modeling System ROMS





Thanks to: Carl Schoch and Molly McCammon at AOOS

Research:

Regional Demonstration in Prince William Sound

References

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Wessel, P., and W. H. F. Smith (1998), New, improved version of Generic Mapping Tools released, *Eos Trans. AGU*, *79*(47), 579.

—Richard Styron, Michael Taylor, and Kelechi Okoronkwo, Department of Geology, University of Kansas, Lawrence; E-mail: styron@ku.edu

Fig. 2. HimaTibetMap-1.0 data in Google Earth™. Color scheme is the same as Figure 1 except white lines indicate folds and green lines indicate thrusts.

Ocean Observing System Demonstrated in Alaska

PAGES 181–182

To demonstrate the utility of an ocean observing and forecasting system with diverse practical applications—such as search and rescue, oil spill response (perhaps relevent to the current Gulf of Mexico oil spill), fisheries, and risk management—a unique field experiment was conducted in Prince William Sound, Alaska, in July and August 2009. The objective was to quantitatively evaluate the performance of numerical models developed for the sound with an array of fixed and mobile observation platforms (Figure 1).

Prince William Sound was chosen for the demonstration because of historical efforts to monitor ocean circulation following the 1989 oil spill from the *Exxon Valdez* tanker. The sound, a highly crenulated embayment of about 10,000 square kilometers at approximately 60°N latitude along the northern coast of the Gulf of Alaska, includes about 6900 kilometers of shoreline, numerous islands and fjords, and an extensive system of tidewater glaciers descending from the highest coastal mountain range in North America. Hinchinbrook Entrance and Montague Strait are the two main deep water connections with the Gulf of Alaska. The economic base of communities in the region is almost entirely resource-dependent. For example, Cordova's economy is based on commercial fishing and Valdez's economy is supported primarily by the trans-Alaska oil pipeline terminal.

When the *Exxon Valdez* ran aground on Bligh Reef in the northeast corner of the sound, the resulting oil spill followed a southwesterly trajectory, with much of the oil stranding on island beaches before exiting the sound through Montague Strait. Since the incident, numerous studies conducted on oil spill–related impacts and ecological recovery have led to the development of a prototype ocean observing and forecasting system focusing on oil spill trajectories.

Developing Operational Forecast Models

In 2003 the observing system included periodic hydrographic surveys, coastal weather stations, a high-frequency (HF) radar array imaging the central basin, a 4-kilometer-grid regional atmospheric

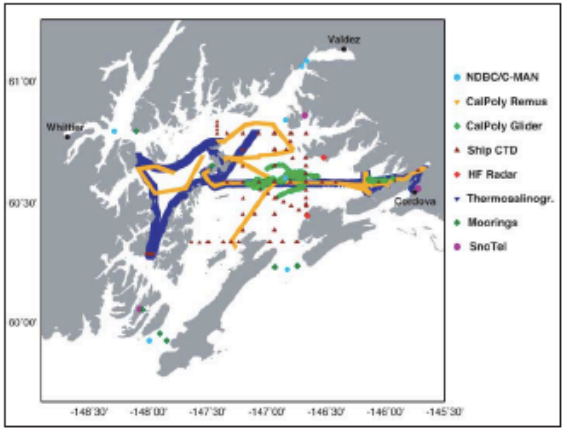


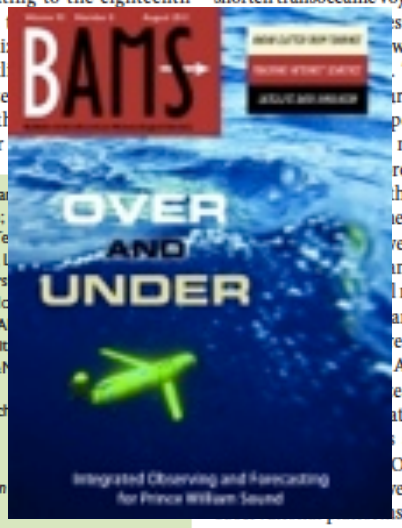
Fig. 1. Observational sensors, platforms, and surveys in Prince William Sound. NDBC/C-MAN is National Buoy Data Center Coastal-Marine Automated Network; CalPoly is California Polytechnic State University; CTD is Conductivity Temperature, Depth; HF is High-Frequency; SnoTel is Snowpack Telemetry

AN OCEAN OBSERVING AND PREDICTION EXPERIMENT IN PRINCE WILLIAM SOUND, ALASKA

BY G. CARL SCHOCH, YI CHAO, FRANCOIS COLAS, JOHN FARRARA, MOLLY MCCAMMON, PETER OLSSON, AND GAURAV SINGHAL

Twenty years after the *Exxon Valdez* oil spill in Alaska a unique field experiment demonstrated an integrated ocean observing system with advanced technologies to enable weather, wave, and ocean circulation forecasting.

Systematic weather observations in North America have a long history dating to the eighteenth century and colonial
country-wide weather organi
Office and Benjamin Frankl
General. In the nineteenth ce
of the U.S. Navy pioneered th
mentation of ocean weather



from ships so that mariners could use these data to shorten transoceanic voyages. The proliferation of the
strial weather observations to
wspapers distributed weather
. Technological innovations
ry, such as satellite imagery,
powerful computers to drive
models, and meteorological
rovided a better mechanistic
her phenomena. Today there
er stations reporting in near–
eather forecasts are routinely
nd private sources. However,
l networks, observations from
and forecasts of winds, waves,
e not as well developed. The
Atmospheric Administration
ean Observing System (IOOS;
t www.ioos.gov), through
such as the Alaska Ocean
OOS; see www.aoos.org), is
e infrastructure of networked
s and forecast models.

To demonstrate the utility of an ocean observing and forecasting system with diverse practical applications, such as oil spill response, search and rescue,

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Regional Demonstration in Prince William Sound

Special CSR Issue: 9 out of 20 contributed by AOOS authors

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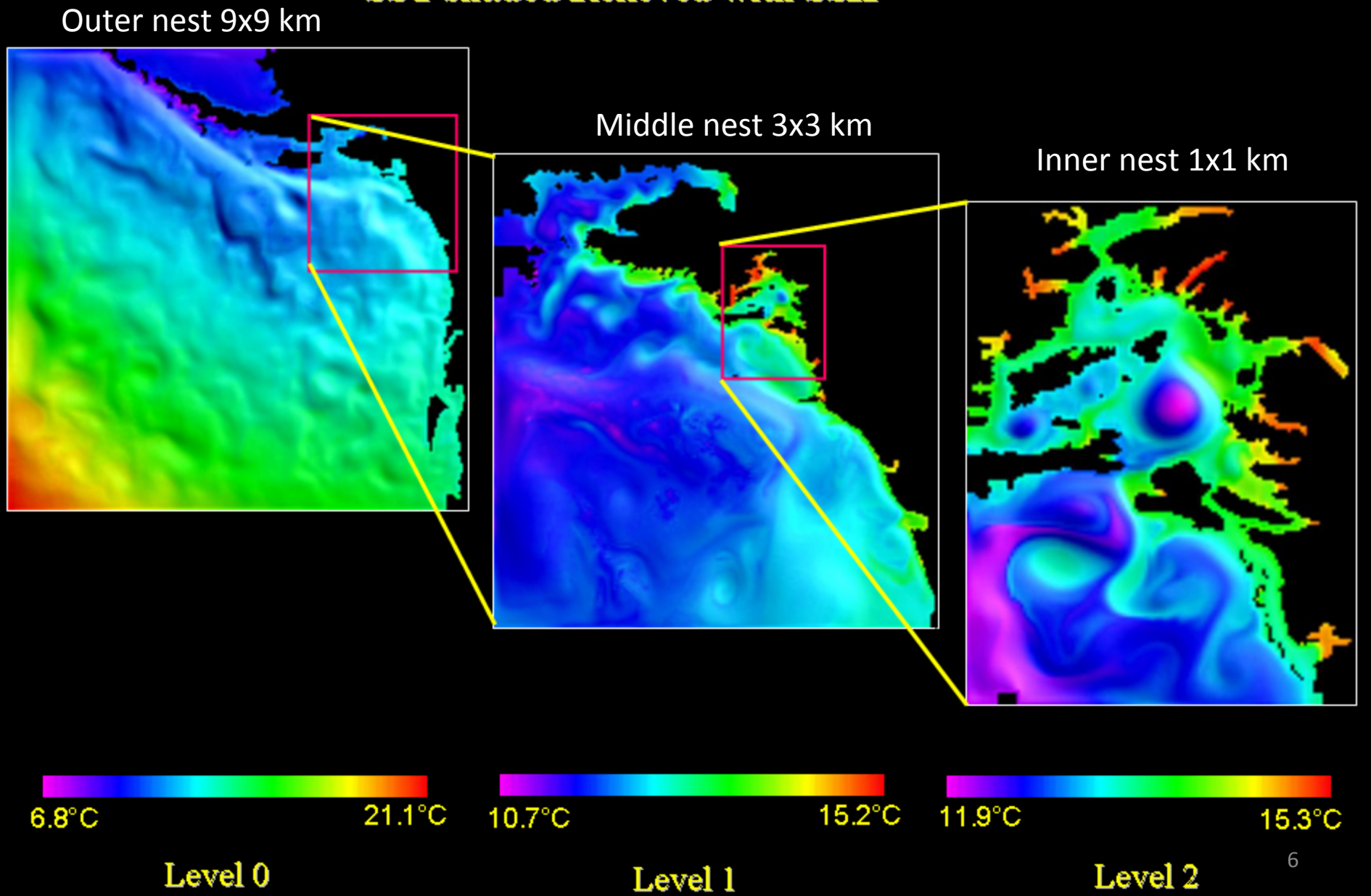
Three Level Nested Prince William Sound ROMS Model

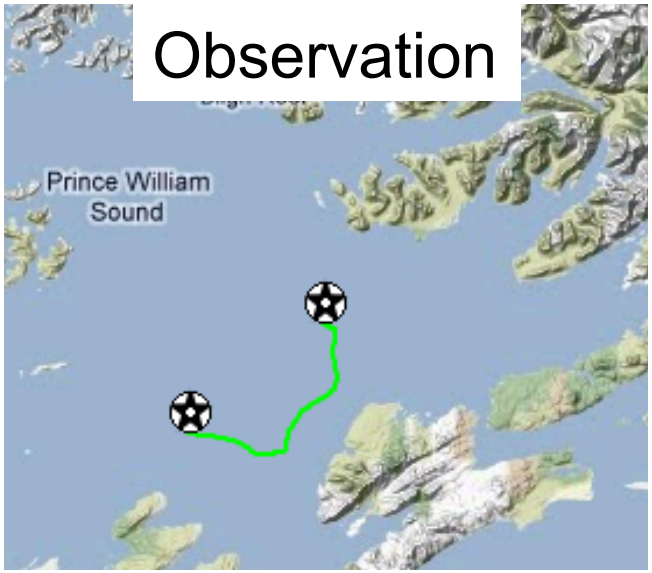
JPL

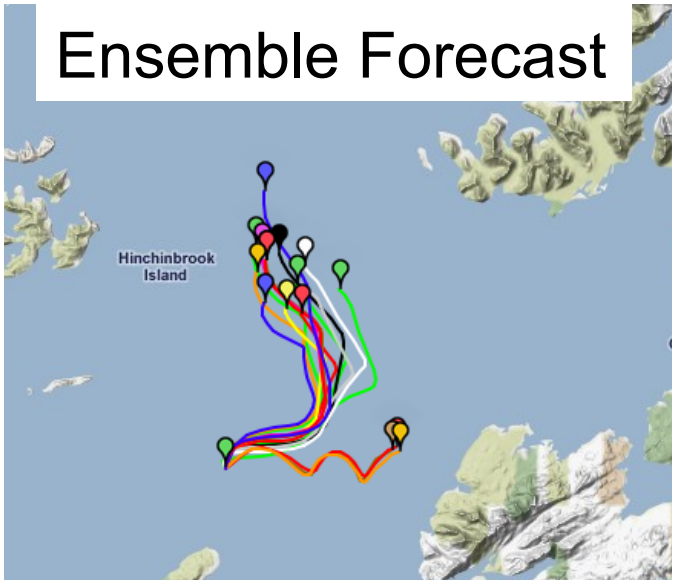
SST shaded Relieved with SSH

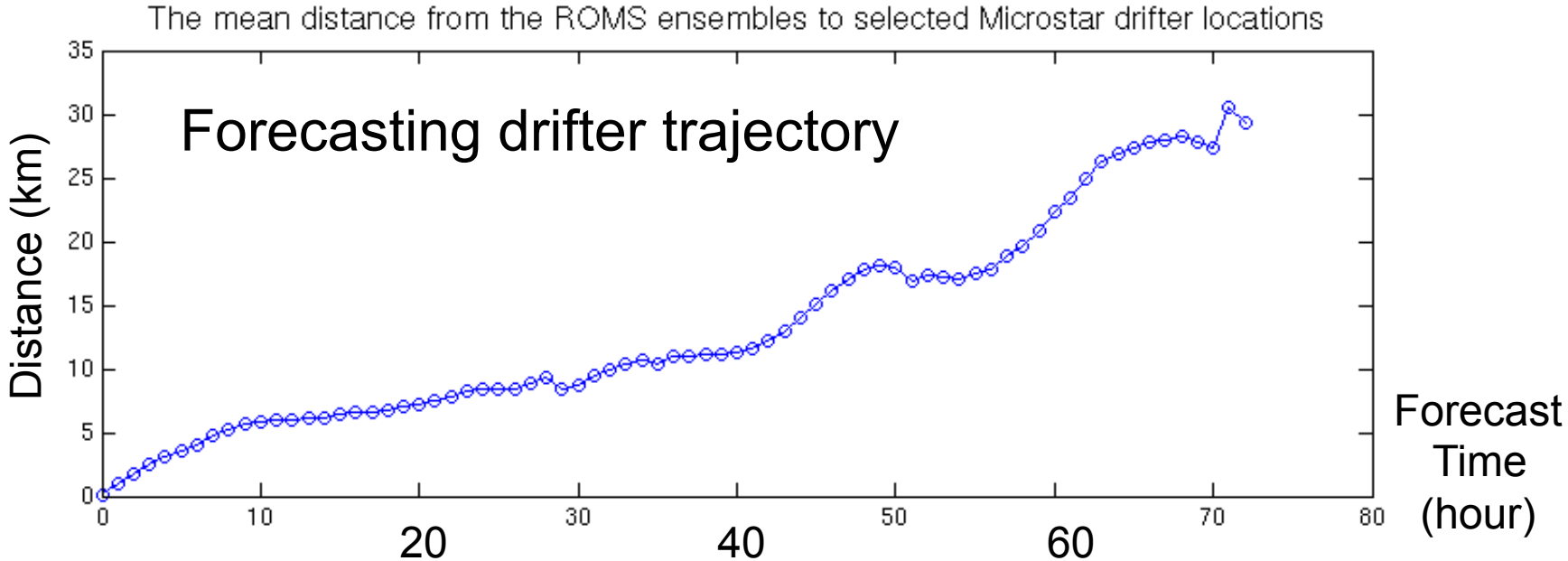


How accurate can we predict drifting body?

A question from U.S. Coast Guard (USCG)







Operational Oceanography:
ROMS 6 hourly nowcast at AOOS Model Explorer

AOOS Model Explorer

Back to Search Results | Layer Metadata | Map | Animation | Download

Salinity at Surface and Depth [1e-3]

- **Metadata URL:** http://ourocean.jpl.nasa.gov/PWS/Nowcast...
- **Date Range:** 03/30/2009 23:00 - 01/20/2014 22:00

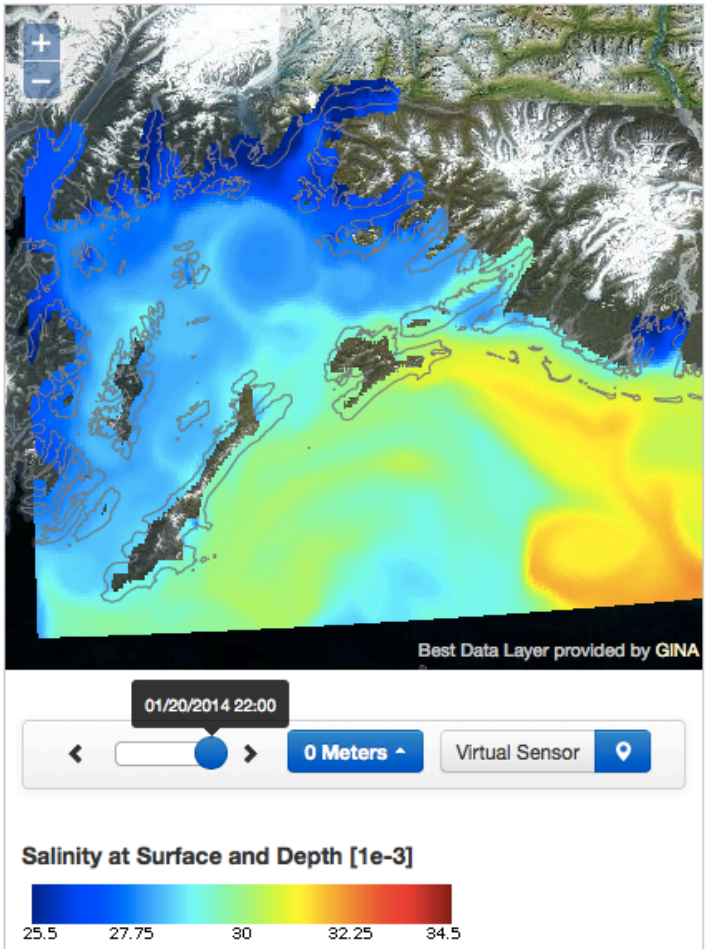
Data set

Regional Ocean Modeling System (ROMS) Nowcast 1 km x 1 km (Prince William Sound)

- **Metadata URL:** http://ourocean.jpl.nasa.gov/PWS/Nowcast...

The Prince William Sound (PWS) ocean forecasting system is based on the Regional Ocean Modeling System (ROMS). The ROMS configuration used consists of a 3-level nested configuration covering the Prince William Sound at 1-km resolution, the northeastern Gulf of Alaska (GOA) at 3-km, and the northeastern Pacific Ocean at 9-km. These three ROMS domains are nested as a single system and run simultaneously exchanging boundary conditions at every time step of the coarser grid. The interactions between the components are two-fold: the lateral boundary conditions for the fine grid are supplied by the coarse-grid solution, while the latter is updated from the fine grid solution in the area covered by both grids. An important addition to the standard ROMS configuration has been made as part of this project: freshwater forcing. In order to incorporating freshwater forcing into the PWS ROMS, the digital elevation model (DEM) of Wang et. al (2004) is used, which includes glacier, snow storage, and melting processes. The model is forced by air temperature and precipitation data from 0.5 degree NCEP global forecasts.

PWS ROMS: 1-km inner nest



Operational Oceanography:
ROMS 48-hour forecast at AOOS Model Explorer

AOOS Model Explorer

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Salinity at Surface and Depth [1-e3]

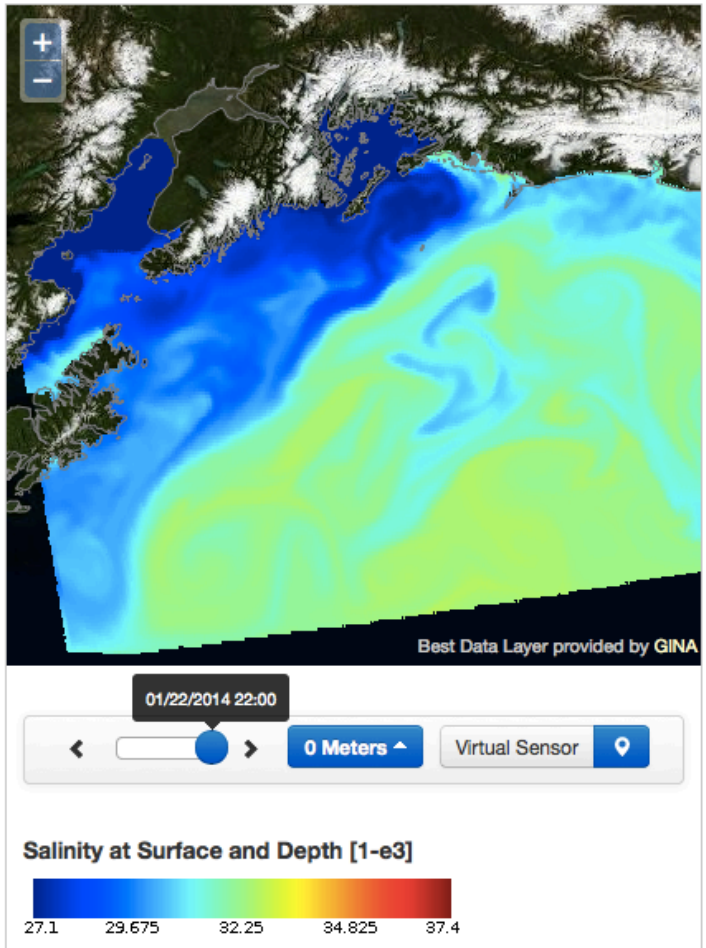
- **Date Range:** 01/31/2011 22:00 - 01/22/2014 22:00

Data set

Prince William Sound (PWS) Regional Ocean Modeling System (ROMS) Forecast 3 km x 3 km (Gulf of Alaska)

The Prince William Sound (PWS) ocean forecasting system is based on the Regional Ocean Modeling System (ROMS). The ROMS configuration used consists of a 3-level nested configuration covering the Prince William Sound at 1-km resolution, the northeastern Gulf of Alaska (GOA) at 3-km, and the northeastern Pacific Ocean at 9-km. These three ROMS domains are nested as a single system and run simultaneously exchanging boundary conditions at every time step of the coarser grid. The interactions between the components are two-fold: the lateral boundary conditions for the fine grid are supplied by the coarse-grid solution, while the latter is updated from the fine grid solution in the area covered by both grids. An important addition to the standard ROMS configuration has been made as part of this project: freshwater forcing. In order to incorporating freshwater forcing into the PWS ROMS, the digital elevation model (DEM) of Wang et. al (2004) is used, which includes glacier, snow storage, and melting processes. The model is forced by air temperature and precipitation data from 0.5 degree NCEP global forecasts.

PWS ROMS: 2-km middle nest



SUMMARY: PWS ROMS

- AOOS/IOOS leadership/vision/resources
- Synergy/leverage with other activities
  - PWS Science Center (other local organizations)
  - NASA co-funding (~$1M) for ROMS & PWS FE
  - U.S. Coast Guard in-kind contributions
- Scientists who care about AOOS

The US West Coast Component of the Coastal Ocean Modeling Testbed (COMT)

Principal Investigators:
Alexander L. Kurapov, Oregon State University (OSU)
Christopher A. Edwards, University of California at Santa Cruz (UCSC)
Yi Chao, Remote Sensing Solutions, Inc.

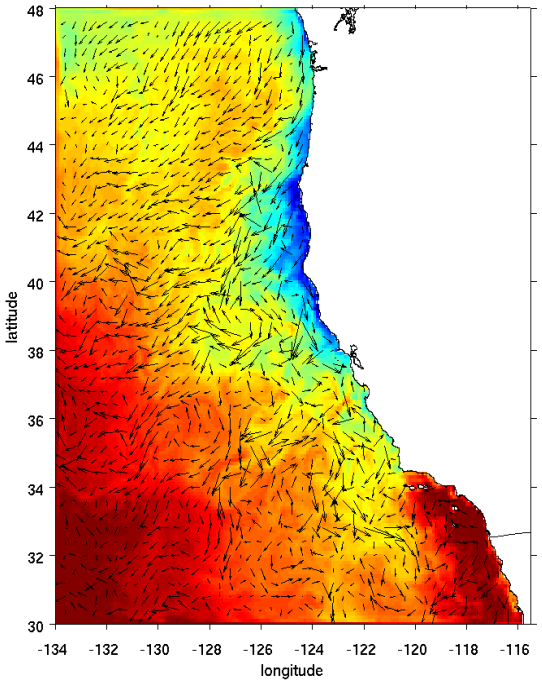
Co-Investigators:
Neil Banas, U. Washington
Andrew Moore, UCSC
Bruce Cornuelle, UCSD
Fei Chai, U. Maine

Federal Partners:
Frank Aikman, Edward Myers (NOAA NOS CSDL)
Frank L. Bub (Naval Oceanogr. Office)
Igor Shulman (Naval Research Laboratory)
Avichal Mehra (NOAA NWS NCEP)

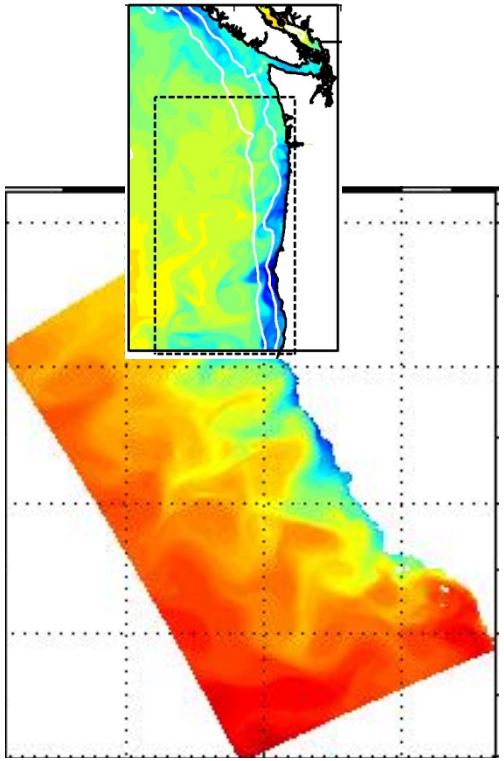
Budget:	**Yr1**	**Yr2**	**Total**
Original	500,531	498,414	998,945
Modified	275,000	711,198	986,198

Three West Coast Models

2-km res. ROMS/4DVAR (NANOOS)



10-km res. ROMS/4DVAR (CeNCOOS)



3-km res. ROMS/3DVAR (SCCOOS/CeNCOOS)

Specific Tasks:

- Model intercomparisons (HYCOM, RTOFS, climatology)
- Data assimilation schemes (3D/4DVAR; Ensemble methods)
- Coupled bio-phys models: N. Banas – NPZDO (6-component); C. Edwards – NEMURO (11-component); F. Chai – CoSiNe (31-component)

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