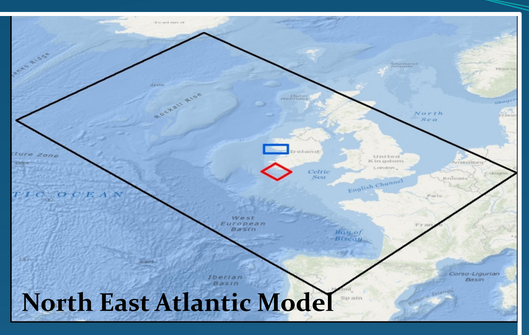
ROMS Applications at the Irish Marine Institute

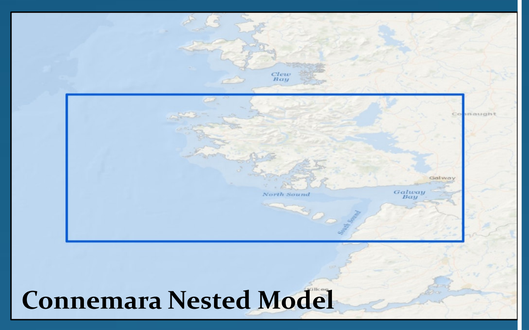
Alan Berry, Tomasz Dabrowski, Kieran Lyons, Glenn Nolan
Marine Institute, Rinville, Oranmore, Co. Galway, Ireland.
E: alan.berry@marine.ie T: +353 (0)91 387360

1. MODEL DETAILS

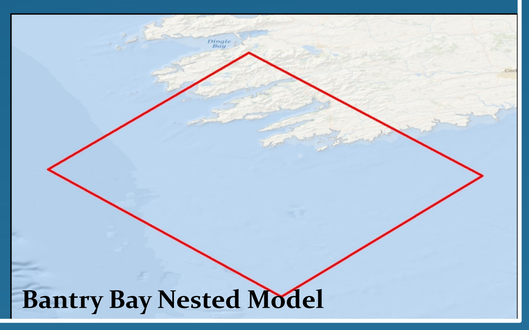
Model Name:	North East Atlantic
Model Code:	ROMS 3.6
Model Grid:	Curvilinear (1.2km – 2.5km) (1.3 km near coasts)
Bathymetry:	GEBCO & INFOMAR
Forcing:	3-Hourly GFS MERCATOR (PSY24R4) TOPEX constituents River climatologies
Validation:	Weekly hindcast (Tide, SST, Argo, buoys)
Forecast Period:	+3 days (daily)
Hindcast Period:	-7 days (weekly)
Output:	T, S, u, v, w, zeta @ 3 hrs spatially 1153 stations @ 10mins
Nested Domains:	Connemara (~200m) Bantry Bay (~250m)



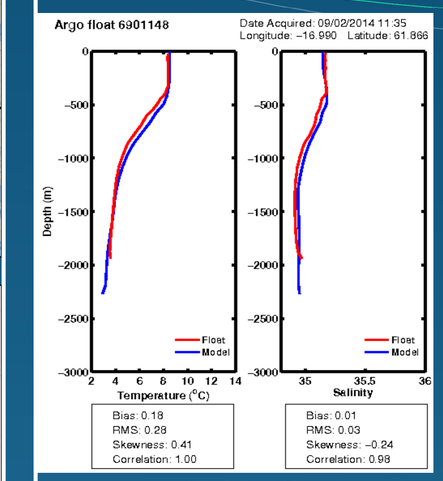
North East Atlantic Model



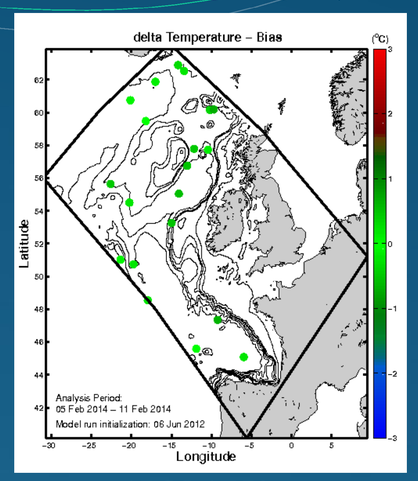
Connemara Nested Model


Bantry Bay Nested Model

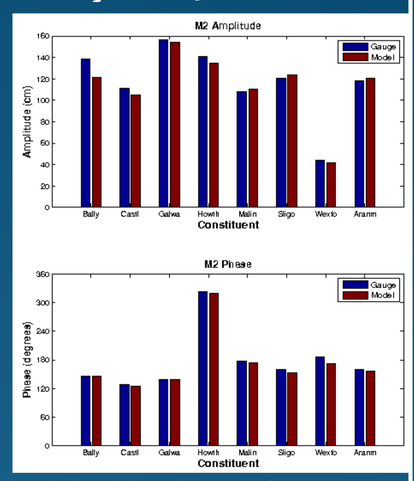
2. ONGOING MODEL VALIDATION (February 2014)



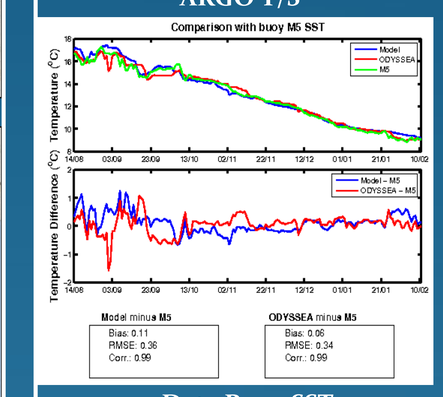
ARGO T/S



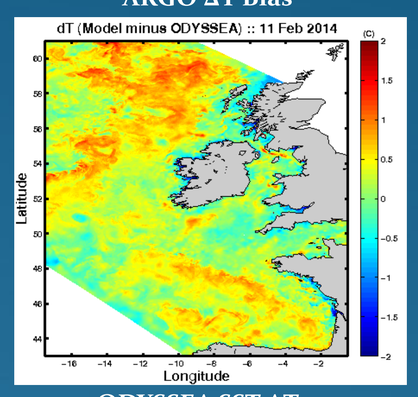
ARGO ΔT Bias



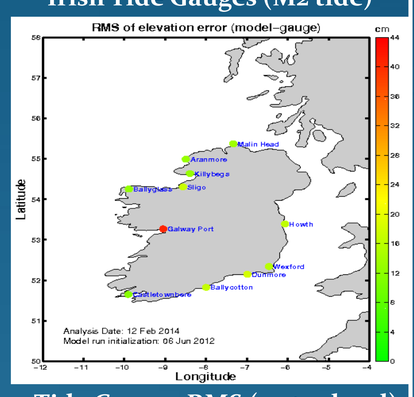
Irish Tide Gauges (M2 tide)



Data Buoy SST



ODYSSEA SST ΔT



Tide Gauges RMS (water level)

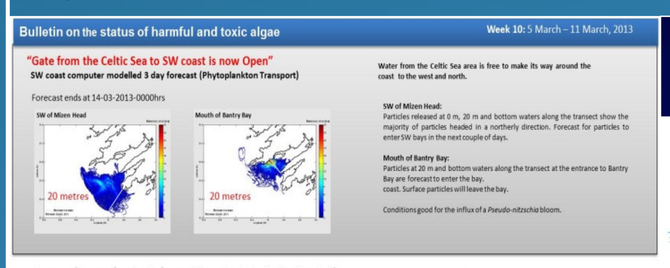
3. ASIMUTH [www.asimuth.eu]

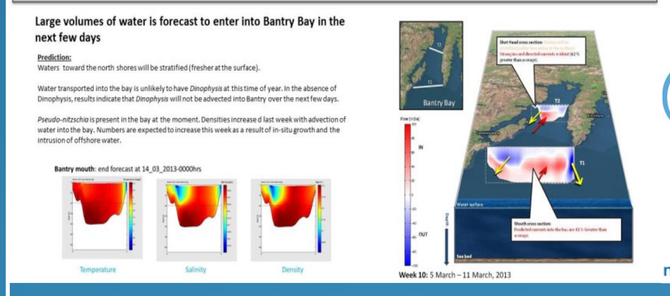
Applied Simulations and Integrated Modelling for Understanding Toxic and Harmful Algal Blooms

OBJECTIVE
Develop forecasting abilities to warn of impending harmful algal bloom (HAB) events.

Scientists and industry partners from 5 countries along Europe's Atlantic Margin have formed a network to produce the first realistic HAB advisory and forecasting service as a GMES downstream service to European aquaculture industry.

ASIMUTH is the first step to develop a short-term HAB alert system for Atlantic Europe. This will be achieved using information on the most current marine conditions; weather, water circulation, toxicity, etc combined with local-scale numerical modelling forecasts and predictions.





SEVENTH FRAMEWORK PROGRAMME

GMES

myOcean

Project supported by the EC FP7 Programme, Space Theme, Grant Agreement No.: 261860

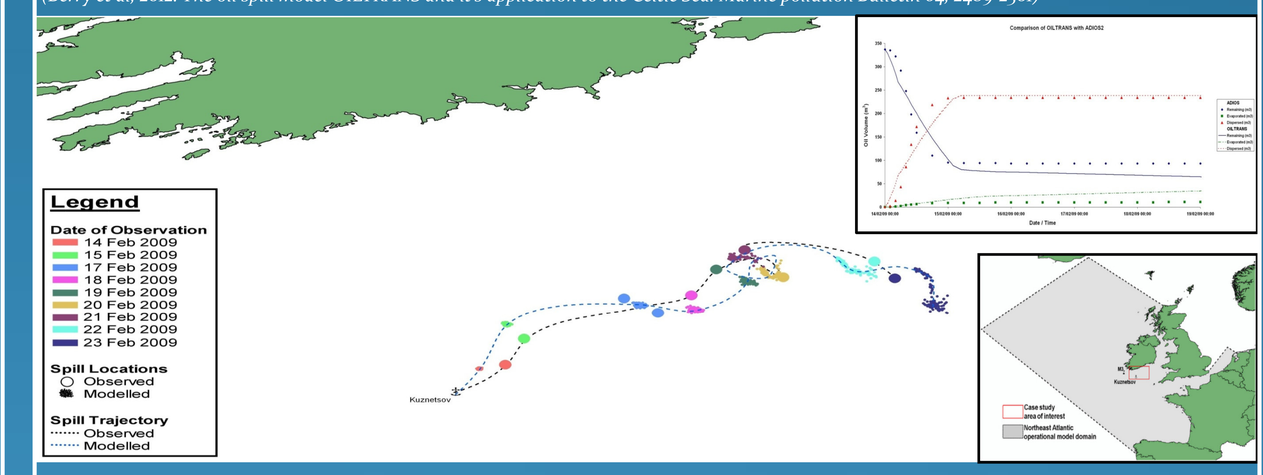
4. OILTRANS

Offline particle-transport model developed by the authors and coupled to Marine Institute's operational ROMS & SWAN model forecasts.

Formulations for the dominant oil fate processes of spreading, advection, diffusion, evaporation, emulsification and dispersion have been encoded, providing the model with the ability to accurately predict the horizontal movement of a surface oil slick, the vertical entrainment of oil into the water column and the mass balance of spilled oil.

The application of the OILTRANS model to an accidental release during a ship-to-ship fuel transfer in the Celtic Sea in February 2009 was presented to validate the system. Comparisons with aerial observations of the oil slick at the time of the incident, and subsequent ADIOS model simulations, indicate that the OILTRANS model is capable of accurately predicting the transport and fate of oil slicks.

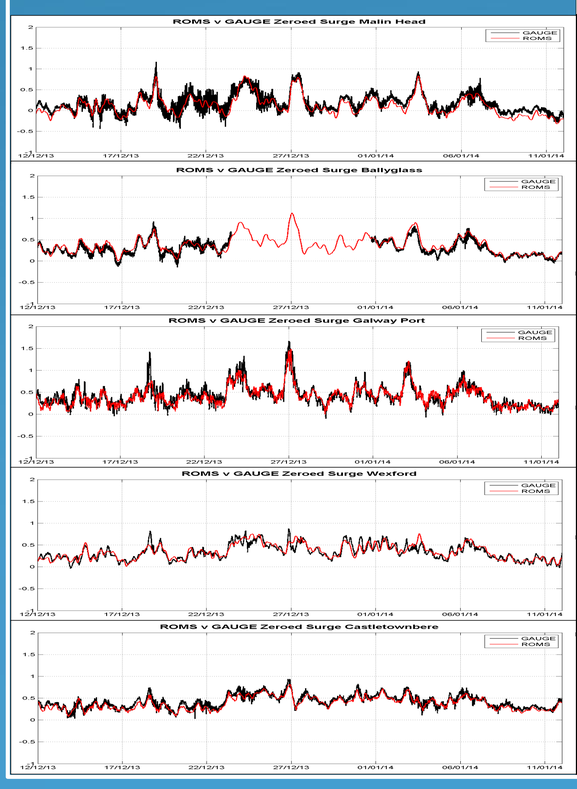
(Berry et al, 2012. The oil spill model OILTRANS and it's application to the Celtic Sea. Marine pollution Bulletin 64, 2489-2501)



Project funded by EU Atlantic Area Trans-National Programme; Priority 2, Contract No. 2008-1/061

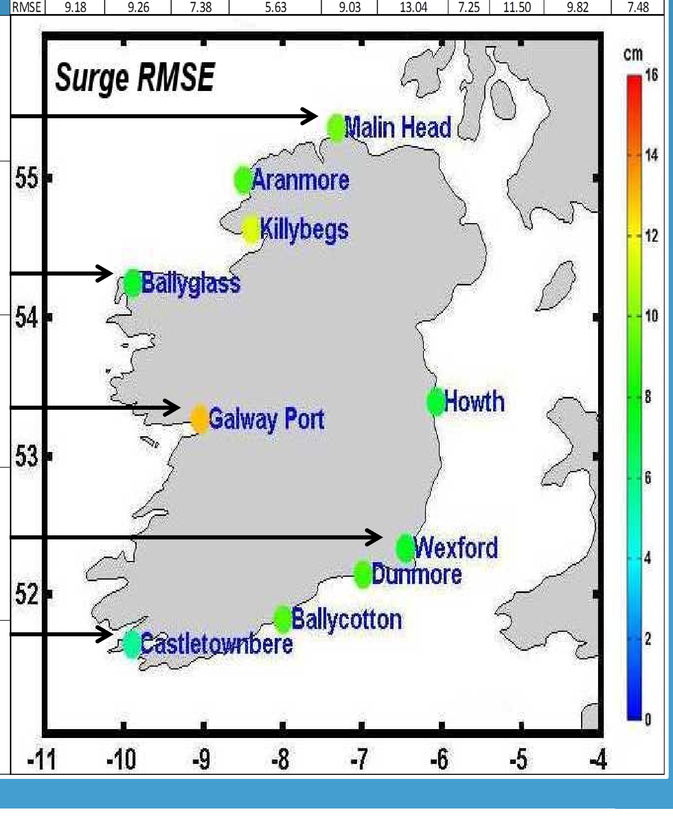
5. STORM SURGES (12 Dec 2013 – 12 Jan 2014)

Port Gauge v ROMS model Time series comparison (12/12/13 – 12/01/14)



Bias & RMSE Errors (12/12/13 – 12/01/14)

	Aranmore	Ballycotton	Ballyglass	Castletownbere	Dunmore	Galway Port	Howth	Killybegs	Malin Head	Wexford
BIAS	-2.61	3.15	1.21	-0.39	-1.43	-2.46	-1.69	-3.77	1.03	-1.31
RMSE	9.18	9.26	7.38	5.63	9.03	13.04	7.25	11.50	9.82	7.48



6. ROMS DATA ASSIMILATION

Preliminary experiments with IS4DVAR are currently ongoing at the Marine Institute. We have re-created the North East Atlantic model domain at approx. 5km resolution using the ROMS 3.7 release.

Normalisation coefficients were computed from a ~3 year model simulation period from 20090122 - 20111231.

Data assimilated to date only includes:
- EN3 CTD salinity and temperature observations from UK Met Office Hadley Centre
- AVISO blended satellite SST.

A number of different model configurations were examined:
Orig: Baseline model hot-started with standard Mercator solution for a 7 day hindcast
4DVAR: Baseline model hot-started with IS4DVAR computed initial conditions for a 7 day hindcast
Daily: Baseline model hot-started at daily frequency with IS4DVAR restart file for seven 1-day hindcasts

Results show improvement in model skill (above Orig) for both 4DVAR and Daily models when compared against all observations over the experiment period. (Fig.2)

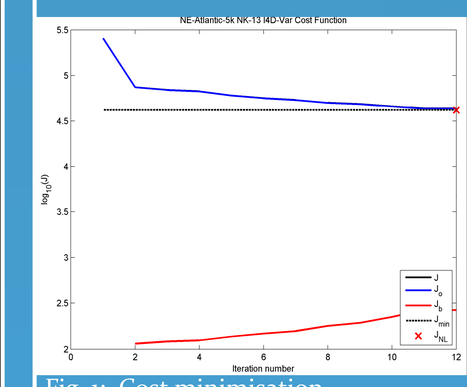


Fig. 1: Cost minimisation.

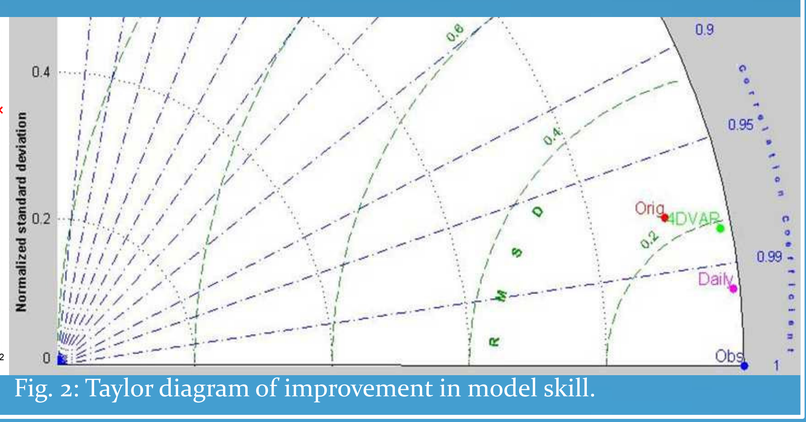


Fig. 2: Taylor diagram of improvement in model skill.

Marine Institute
Foras na Mara

Ocean Science and Information Services
Marine Institute
Rinville
Oranmore
Co. Galway
Ireland

http://www.marine.ie