

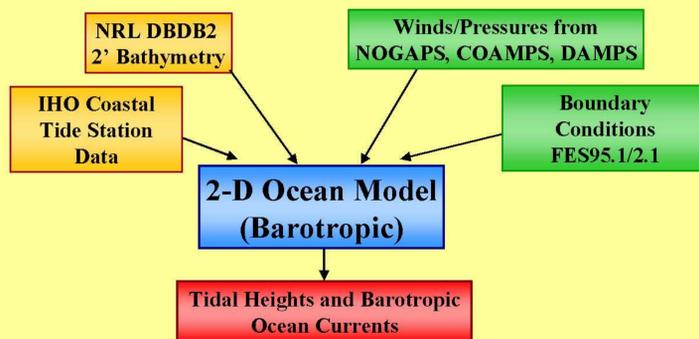
Introduction

Over the past several years, the Naval Research Laboratory has developed a globally relocatable tide/surge forecast system called PCTides. The system consists of a 2-D barotropic ocean model used to predict tidal height anomaly, storm surge and barotropic ocean currents. PCTides has successfully completed its operational evaluation by comparing forecasts along US coastal regions to real-time observations from the National Oceanic and Atmospheric Administration (NOAA) tide gauges. Based on comments from the operational evaluation, the system was upgraded during the past year and is being transitioned into the Oceanographic and Atmospheric Master Library (OAML). PCTides is also being applied to the Navy Integrated Tactical Environmental Subsystem II (NITES II) for fleet use.

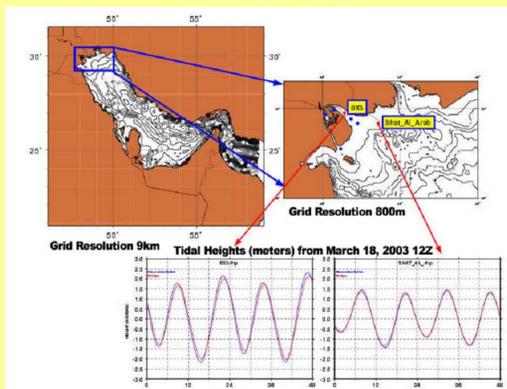
The System

The system, set up to run in a self-contained mode, includes global databases for bathymetry, boundary conditions and tide station data for assimilation purposes. The global bathymetry database is NRL's DBDB2, developed at NRL for coastal model applications. The boundary conditions are derived from the global tide model FES95.1/2.1. Coastal station data assimilated during model forecasts is derived from the IHO data base. Wind and pressure forcing, the only external data, is obtained from the Navy atmospheric models: NOGAPS, COAMPS or DAMPS.

The PCTides System



Persian Gulf



In support of Operation Iraqi Freedom, NRL ran PCTides in the Persian Gulf. This application used a nested model within a larger domain to produce tidal heights. Evaluation of the system with two IHO tide stations showed good agreement.



Applications of the Navy's Globally Relocatable Tide Model PCTides

Gretchen M. Dawson, Ruth H. Preller and Pamela G. Posey

dawson@nrlssc.navy.mil, preller@nrlssc.navy.mil, posey@nrlssc.navy.mil



•DBDBV – limited in coastal regions due to resolution and poor matching of bathymetry with coastlines.

•NRL-DBDB2 – 2-minute, global bathymetry database.

–Developed by NRL.

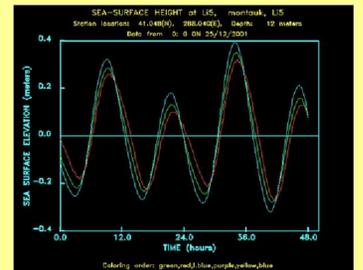
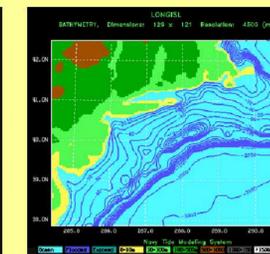
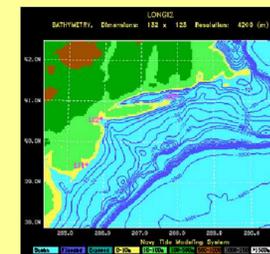
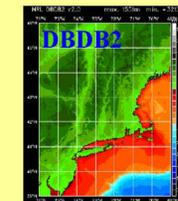
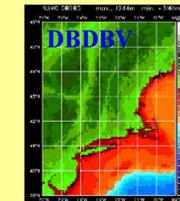
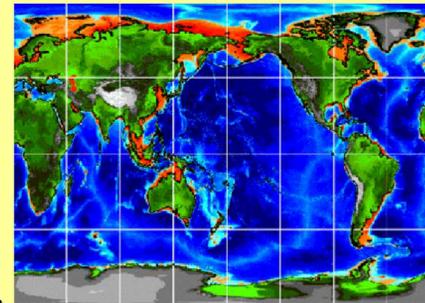
–Composed of DBDBV, ETOPO5, DAMEE (2.5 min), GOM 0.1 deg, Choi (YES-1 min), Sandwell (GTOPO2 - 2 Min), IBCAO (Arctic-2.5 min).

–Different data sources are smoothly blended.

–Careful matching with World Vector Shoreline.

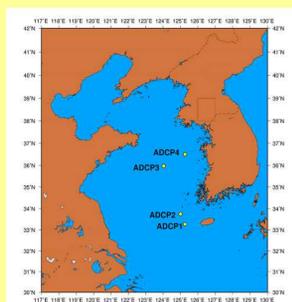
DBDB2 is continuously being updated with new data.

http://www7320.nrlssc.navy.mil/DBDB2_WWW/



Green – new bathymetry
Red – data
Teal – old bathymetry

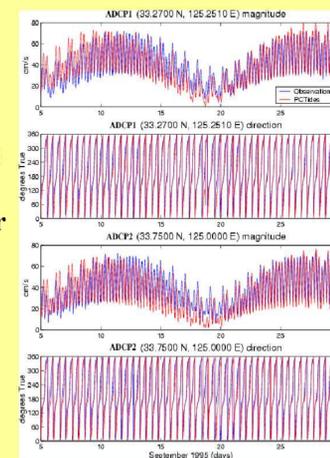
Yellow Sea



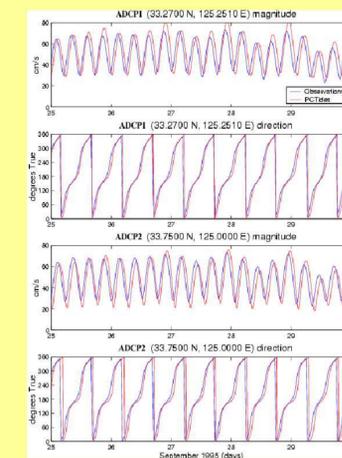
Resolution: 10 km

PCTides currents and tidal heights were evaluated against observations from 4 bottom-mounted ADCPs for the period Sept 1 - 30, 1995.

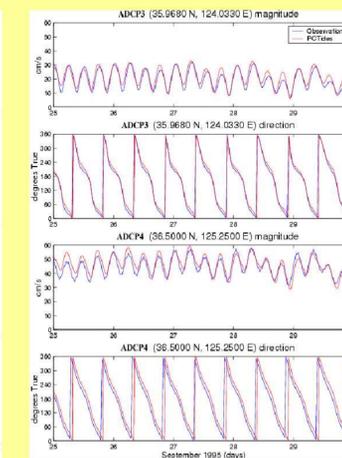
ADCP data was not assimilated into the model.



ADCP 1 and 2 - Comparison of PCTides versus ADCP current magnitude and direction.



ADCP 1 and 2 - PCTides versus ADCPs for September 25-30, 1995.



ADCP 3 and 4 - PCTides versus ADCPs for September 25-30, 1995.

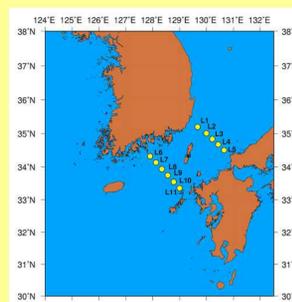
	Mean Tidal Current Magnitude (cm/sec)		
	OBS	PCTides	Difference*
ADCP1	38.53	39.52	-0.99
ADCP2	37.83	35.98	+1.85
ADCP3	16.34	16.96	-0.62
ADCP4	35.26	36.29	-1.03

* Calculated as Obs - Model

	Absolute Mean Error for Speed at Peak Amplitudes (cm/sec)	
	Difference*	
ADCP1	5.85	
ADCP2	4.84	
ADCP3	2.83	
ADCP4	7.31	

* Calculated as Obs - Model

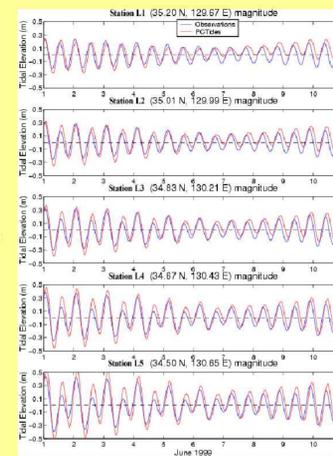
Korea Strait



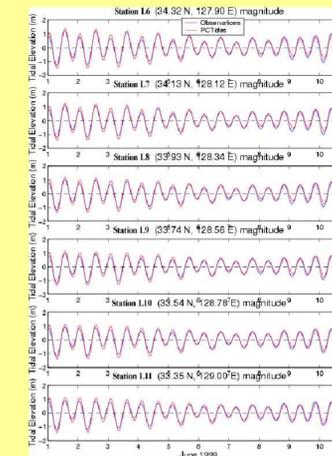
Resolution: 4.5 km

PCTides currents and tidal heights were evaluated against observations from 11 bottom-mounted ADCPs for the period May 1 - June 11, 1999.

ADCP data was not assimilated into the model.



Stations L1-L5 - PCTides versus ADCPS tidal height deviation for June 1-11, 1999.



Stations L6-L11 - PCTides versus ADCPS tidal height deviation for June 1-11, 1999.

Conclusions

A globally relocatable tide/surge forecast system has been developed by the US Navy for rapidly relocatable prediction of tidal amplitudes and phases as well as barotropic ocean currents. The system is presently designed to run quickly on a PC or in a UNIX environment. The system has successfully completed an operational evaluation that was performed at two Navy operational centers. As a direct result of feedback from the operational testing, PCTides has implemented several improvements. NRL's high quality DBDB2 (Digital Bathymetric Data Base – 2 minute) is now utilized as the default bathymetry. The model has the capability of “blending” high resolution, finite area bathymetry data with the two minute global data. PCTides is currently being implemented into the Oceanographic and Atmospheric Master Library (OAML).