ADRIATIC SEA INTEGRATED COASTAL AREAS AND RIVER BASIN MANAGEMENT SYSTEM PILOT PROJECT (ADRICOSM)

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Abstract
The ADRICOSM (ADRIatic sea integrated COastal areaS and river basin Management system pilot project) represents an innovative application of data assimilation to a forecasting system in the coastal areas. A key step toward integrated coastal area management is to connect the catchment basin runoff and the wastewater management with marine environment monitoring and forecasting since the coastal areas are strongly forced by the drainage basin inputs and disperse these inputs in a complex hydrodynamic environment.

Keywords: data assimilation, Adriatic Sea, Coastal Management, Ocean Forecasts

Introduction

During ADRICOSM the implementation of an integrated coastal zone management system in the Adriatic Sea, consisting of a predictive circulation module and a river basin and wastewater management module, has taken place. The aims are:

1)the demonstration of the capability to monitor and predict in real time the shelf and coastal currents variability;

2)the implementation of the monitoring and modelling scheme for a river basin and its associated wastewater system in a test site;

3)the integration of the river basin modelling with the coastal current prediction system.

ADRICOSM is possible because several of its components have been developed in the past ten years, but they have never been put together or applied to the Adriatic Sea or in a coastal region.

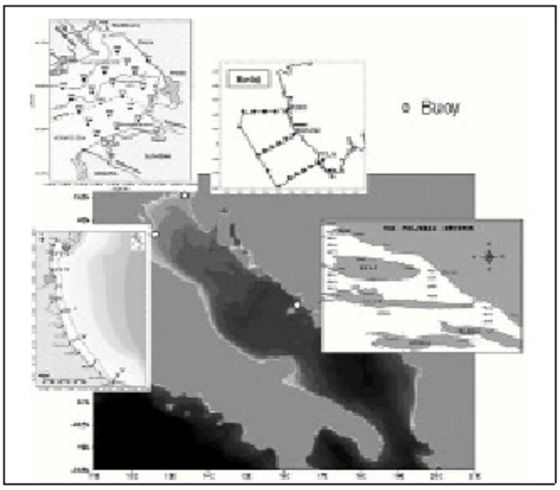
Results

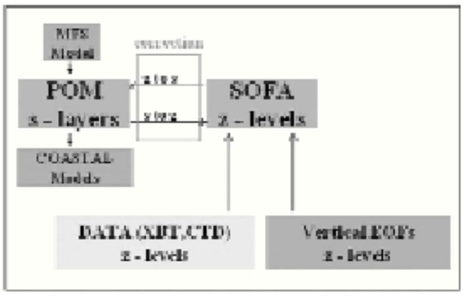
The Mediterranean marine Forecasting System (MFS) experience has demonstrated that the forecasts is applicable also in critical shelf area at weekly time scales. In particular the MFS activities have been developed in a way which takes in account the proper momentum and tracer ?uxes at the Adriatic Sea open boundaries. The interface between the MFS model and the Adriatic fields permits the selection of the lateral boundary (T, S, u, v) during the data assimilation and the forecasting.

Both large scale and coastal observations are utilized efficiently in a data assimilation scheme that uses sequential estimations to prepare initial fields for subsequent forecasts. Sea Surface Temperatures (SST) from satellite are available daily and are used for the surface heat ?uxes corrections in the Adriatic model.

Coastal network provides CTD data localized in 4 regions: the Emilia Romagna Coast, the Golf of Trieste, the Slovenia Coast and the Croatian Coast. In addition, XBT temperature profiles up to 900 m depths are collected by VOS (Voluntary Observation Ships) along the Ploce-Malta and the Split-Bari tracks.

Salinity and Temperature coming from CTD stations and temperature coming from XBT-VOS are assimilated in the Adriatic





Model (Fig. 1), which is POM (Princeton Ocean Model) [1] implemented by Zavatarelli et al. (2) for the Adriatic Sea. The model has a horizontal resolution of 5 km and 21 layers in the vertical, high frequency forcing and daily Po river run off. The assimilation system is SOFA (System for Ocean Forecasting and Analysis) [3], which is a multivariate reduced-order optimal interpolation method. This assimilation system has been successfully applied in the MFS and the innovative part in ADRICOSM is the sequential assimilation of the multivariate parameters (T, S profiles from CTD) and univariate parameters (T profiles from XBT). The sequential assimilation improves the system and the Adriatic model is efficiently corrected during the date assimilation using a coordinate transformation from sigma to z and vice versa(Fig.2). Moreover, nested shelf and coastal models receive the forecasting boundary conditions in “slave mode”. A simulation systems for the river basin and the coastal currents has been coupled for the study case of the Cetina river in the Croatian coastal area.

Conclusions

ADRICOSM started to forecast in real time in May 2003 and it is continuing. Forecasts are done once a week and for seven days in the future. Assimilation of coastal CTD and open ocean XBT data is carried out by an Optimal Interpolation scheme, adapted to the coastal areas. Data assimilation improve the representation of the ocean processes by optimally combining a dynamic model and in situ data and provides better initial conditions for weekly coastal ocean forecasting.

References

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