

GIS analysis for the marine environmental data off Karnataka coast

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Abstract

Geographic Information System (GIS) is used to develop the Oceanographic Information System (OIS) for marine environmental data off Karnataka coast. Its goal is to provide a set of tools for oceanographic and bathymetry data assessment and products like graphs, query system for the users. The most significant interfaces are the GIS based Map-query and Contour visualization. The interfaces are user-friendly and oriented towards bridging the gap between user's knowledge and the technical knowledge required to operate the software system. The OIS also provides users with other analysis tools like query based reports and graphs.

OIS can be used as a powerful tool to synthesize not only all the data off Karnataka coast but for comprehensive interpretation and forecasting of marine environmental ecosystems for any region. This system has been applied to the Karnataka Coastal Environment, India and it is very useful for the clients and policy makers.

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1. Introduction

Geographical Information System is a tool for decision-making, using information stored in a geographic form. Bloemer et al. (1986), Carrara (1989), Langran (1989) defined major requirements and functions of GIS. They mentioned spatial data handling tool for solving complex geographical problems. Angermeier and Bailey (1991) used GIS as a conservation tool for rivers. Nasr et al. (1997) used GIS to relate sediment distributions to heavy metal concentrations and pesticides in Abu-Qir Bay, Egypt. This paper describes about Oceanographic Information System (OIS) for Karnataka coast based on GIS (Wright et al., 1997).

1.1. Study area and materials

An area between Cundapoor and Kasargod along the coast of Karnataka state is chosen as a study area and it lies between 12° 20'N 75° 04'E and 13° 40'N 75° 04'E. The base map of the said area is digitized from 1:150,000 hydrographic chart supplied by Naval Hydrographic Office, India.

Vector maps of the selected parameters are generated for the data collected at National Institute of Oceanography, Goa by using Arc GIS. Maps of horizontal distributions of salinity, temperature, DO, Chlorophyll are generated using Arc GIS software is a part of OIS (Amit, 2003). The equipment and facilities are established at National Institute of Oceanography, Goa.

1.2. System functionality

The OIS is divided into two main modules. 1. GIS module and 2. Non-GIS module. The GIS module is carried out as Map digitization, Creation of the SDE database, and Visualization interface to deploy the maps and data over the network. The non-GIS module consists of 3 sub modules. The report module provides the users with additional reporting services to complement the services provided by the GIS module. The reporting interface shall generate reports for multiple parameters both period-wise and depth-wise. The graph module supports dual axis analysis (2 parameters), in addition it also provides the user with a choice of graphs like line, bar, and area charts along with 2-D or 3-D view. The Administrator module allows the administrator to manage the database once it is created. This module provides the administrator with a one-time solution to the tedious task of

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compiling data by the admin user to add and modify the oceanographic database in a structured manner. This module also provides the administrators with individual login accounts, thereby maintaining database security. The administrators are also granted rights to create a new user and change passwords.

1.2.1. System architecture

The OIS follows two separate architectures for the implementation of the GIS and non-GIS subsystems. The architecture is designed for deployment on the Internet Information Server (IIS), running on Windows NT or Windows 2000. All requests from the client are based on a HTTP Request-Response mechanism. All client requests are routed through the web server (IIS) to the layers behind it. The non-GIS subsystem follows the traditional 2-tier client-server architecture. The client tier consists of the web browser, whereas the web server (IIS) and the DBMS make up the server side. The connection between the web server and database is established using the standard ODBC application-programming interface. The GIS module follows a more complex multi-tier architecture.

2. Results

The Oceanographic Information System, for Karnataka region serves as a central reference, for any oceanographic information relating to the Karnataka region. OIS organizes the data collected for the region, into a systematic repository of information, which can then be efficiently used, to gain knowledge and improve the understanding of the coastal environment about the study region.

Fig. 1 shows the area of study with station locations. To develop OIS some of the data pertaining to Karnataka coast have been considered. Data on temperature, salinity, POC, PB, PH, TPHC, TBSED, SL for different seasons at different depths are used for creating database. The seasonal variations of temperature, salinity, Oxygen and Chlorophyll for surface, 6 and 10 m depths off the coast of Karnataka using OIS are shown in Figs. 2–5.

When the queries are on the basis of depth and period the digital output is generated (Fig. 6).

3. Conclusion

The GIS based Ocean Information System (OIS) is very useful in retrieval of any type of information and provision of summary data. This system provides an online information pertaining to the study region in the form of maps, contours,

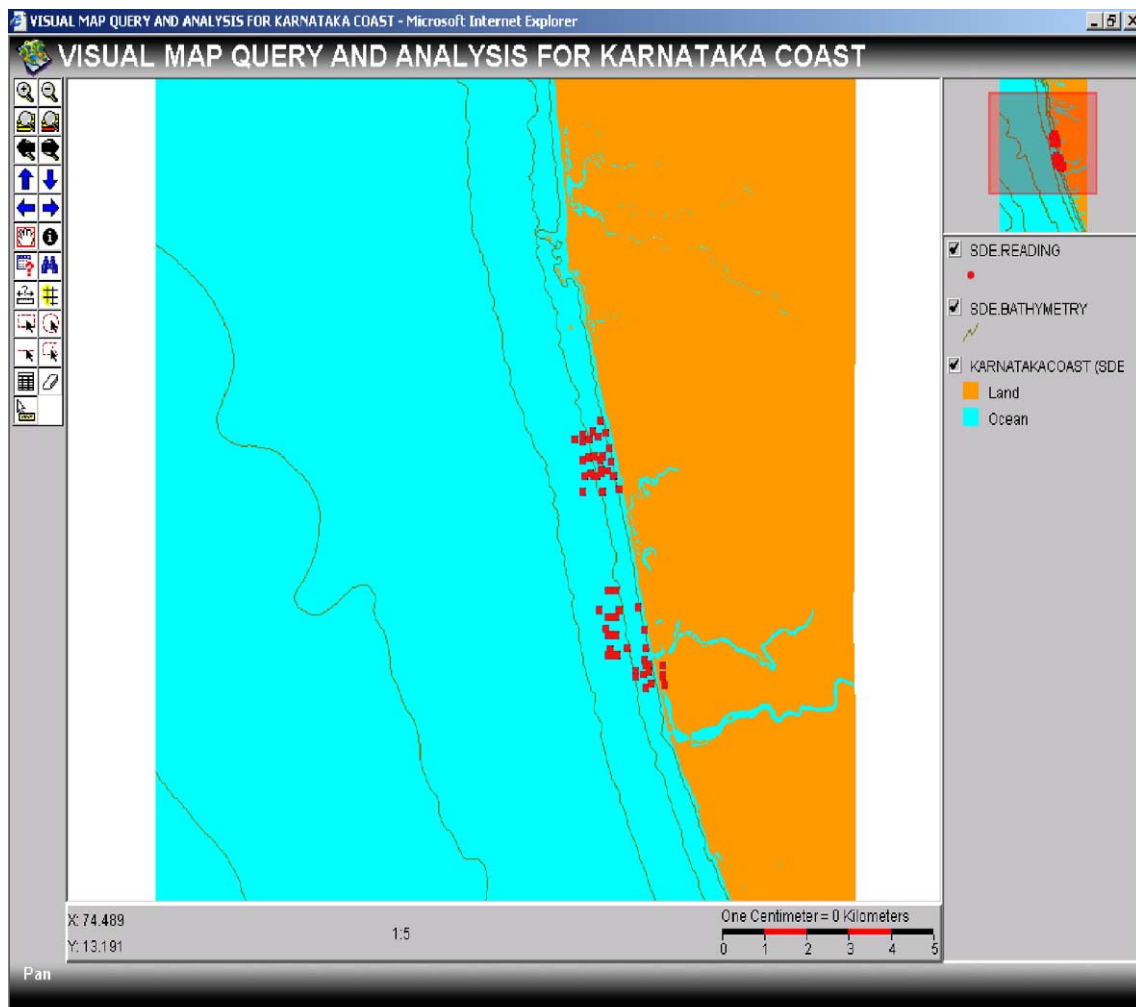


Fig. 1. Station location map.

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