Metadata Research and Design of Ocean Color Remote Sensing Data Based on Web Service

Kang yan[*a,b], Pan Delu[a], He Xianqiang[a], Wang difeng[a], Chen jianyu[a]
[a] State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, Zhejiang, 310012, China;
[b] Department of Earth Sciences, Zhengjiang University, Hangzhou, Zhengjiang, 310027, China;

ABSTRACT

The ocean color remote sensing metadata describes the content, quality, condition, and other characteristics of ocean color remote sensing data. Paper presents a metadata standard draft based on XML, and gives the details of main ocean color remote sensing metadata XML elements. The ocean color remote sensing data platform-sharing is in developments as a part of the digital ocean system, on this basis, the ocean color remote sensing metadata directory service system based on web service is put forward, which aims to store and manage the ocean color remote sensing metadata effectively. The metadata of the ocean color remote sensing data become the most important event for the ocean color remote sensing information more retrieved and used.

Keywords: Web-based GIS, Google earth, Metadata, Ocean color remote sensing, XML

1. INTRODUCTION

The remote sensing ocean color data became more available and large volume since 1978 with the successful launch of NASA's Coastal Zone Color Scanner (CZCS). Now several new ocean color sensors have recently been launched and still more are planned for the near future by various space agencies [1]. As a kind of basic marine information resource, remote sensing ocean color data have been applied extensively, such as ocean meteorology, marine environment, Marine water quality and some others. China has already established many sets of system which can get parameters of ocean color and temperature environment, (brief name is the NORAS system), by the Second Institute Oceanography. The NORAS system can automatically receive and deal with datum from 10 ocean color and temperature satellites, and manufacture special products of ocean environment information with these datum for customers directly or indirectly. However data extraction and information retrieval from such a great volume of data set always is a tedious and difficult work, so an effective and efficient technology for searching for desired data becomes increasingly important.

Metadata [2] data about data, describes the content, quality, condition, and other characteristics of dataset. The following are some of the important metadata standards used to describe marine data and information in table1.

We Reference the ISO 19115 and GB/T19710-2005 to catalog ocean color remote sensing metadata because of its space-time characteristics. And it is described and standardized metadata, which will help to achieve an effective data discovery, management, sharing, exchange and integration.

The eXtensible Mark-Up Language (XML) [3] [4] [5] developed by the World Wide Web Consortium can be used to develop a framework of metadata that improves the interoperability of ocean color remote sensing data. The XML Schema, a formal schema language and definition language, is the people readable and interpretable for computer software. The XML-based ocean color remote sensing metadata, it is convenient for user to query, retrieval and access marine information. Ocean color remote sensing metadata framework can give detail description and standardization of ocean color information, which helps to discover, manage, share, exchange and integrate ocean color data.

[*] Corresponding Author: Kang Yan; kangfu7804@163.com.

Earth Resources and Environmental Remote Sensing/GIS Applications, edited by Ulrich Michel, Daniel L. Civco,
Proc. of SPIE Vol. 7831, 783117 · © 2010 SPIE · CCC code: 0277-786X/10/$18 · doi: 10.1117/12.864888

Table 1 common metadata standards of describing marine data

Name	Organization	Description
Cruise Summary Report (CSR)	IOC	The Cruise Summary Report (CSR) is an established international standard designed to gather information about oceanographic data collected on Research Vessels.
Directory Interchange Format (DIF)	NASA	The Directory Interchange Format (DIF) is a metadata standard used to describe Earth science datasets and is used to create records for the NASA Global Change Master Directory (GCMD)
ISO 19115	The International Organization for Standardization (ISO)	ISO 19115 defines how to describe geographical information and associated services, including contents, spatial-temporal purchases, data quality, access and rights to use. The standard defines more than 300 metadata elements with 20 core elements.
The Content Standard for Digital Geospatial Metadata (CSDGM)	Federal Geographic Data Committee FGDC	often referred to as the FGDC Metadata Standard, was developed and is maintained by the US Federal Geographic Data Committee and is the official US Federal Metadata Standard and includes about 300 mandatory and optional fields
Dublin Core	Dublin Core Metadata Initiative	The Dublin Core Metadata Element Set, Version 1.1 includes fifteen metadata elements for use in resource description. These "core" elements are broad and generic, and can be used to describe a wide range of resources.

We design and develop Ocean color metadata web service system, in order to achieve, modify, publish and share the Ocean color data. In this paper, we apply the XML Schema to designing and developing the Ocean color metadata. In section 2 we introduce the details of ocean color data. In section 3 we give the details of the main elements of ocean color metadata XML structure. In section 4 we design the Ocean color metadata web service system.

2. SYSTEM ARCHITECTURE DESIGN AND DEVELOPMENT

2.1 The structure of ocean color remote sensing Metadata

Ocean color remote sensing data have special and temporal properties, so ocean color remote sensing metadata is as special metadata that is simply description documentation of a digital geospatial dataset , Metadata is an important component of ocean color remote sensing data resource. Its metadata describes “who, what, where, when, why and how” about the data and can answers a wide range of questions about the dataset, such as [6]:

Who created and maintains the data?

What is the content of the data?

Where is the geographic location?

Where is the data stored?

When was the data collected?

How was it produced?

How can it be accessed?

What data quality can you expect?

According to the above definition we draw the concept structure of ocean color remote sensing metadata in Figure 1. The specific content of ocean color remote sensing metadata shows in Table 2.

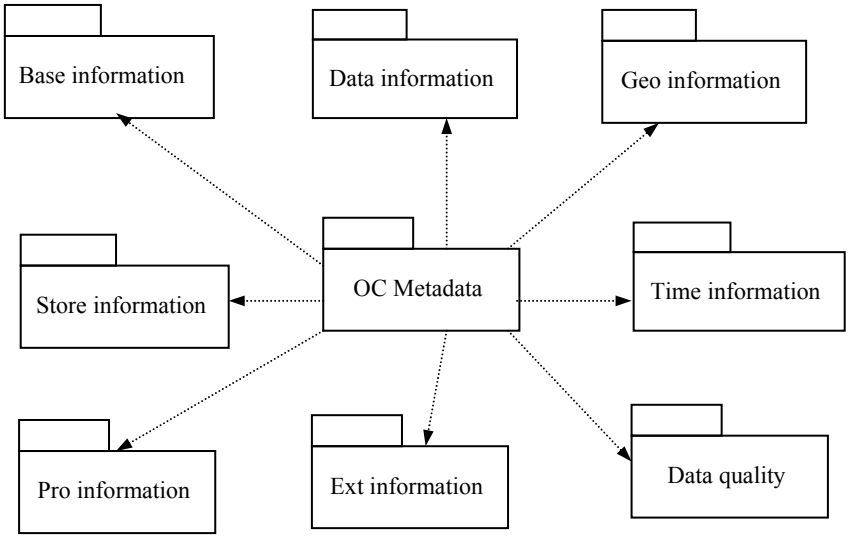

Fig.1. Concept structure of ocean color remote sensing metadata

Table 2 ocean color remote sensing metadata element

content	XML element	description
Metadata	OC_Metadata	The entire metadata elements of ocean color data
Base information	Baseinfor	The metadata base information, e.g. metadata producer
Data information	Datainfor	Data format, type, class, size, unit, etc
Geo information	Geoinfor	Geo reference, range, etc
Store information	Storinfor	Data storage address, people responsible for contact, etc
Time information	Timeinfor	Data produce time information
Pro information	Proinfor	Data producer, Data-producing agencies, etc
Ext information	Extinfor	Data Extended Information, e.g. modify the information
Data quality	Quainfor	Data quality information

Ocean color remote sensing metadata XML structure has been designed to encapsulate characteristics of ocean color dataset or product data. The root element of this XML file is the OC_MetaData element. Child elements of OC_MetaData are used to describe eight parts details of the base information, data information, geography information, store information, time information, produce information extend information and data quality. The details of the ocean color remote sensing metadata XML schema are as follows in figure 2.

2.2 Service system architecture

The ocean color metadata service is the important part of the ocean color remote sensing data sharing platform. Its system service architecture is showed in figure 3. The architecture has three levels, that is, user layer, service layer and data layer. User not only can produce, revise and release the metadata, but also query, retrieve and access to the metadata from ocean color data sharing site in the user layer. Service portal provide ocean color 1A class to 4A class metadata services. The service portal offers a centralized, uniform interface to user layer and data layer. The data layer store many kinds of data. These data have metadata sets, metadata databases, databases and datasets of ocean color.

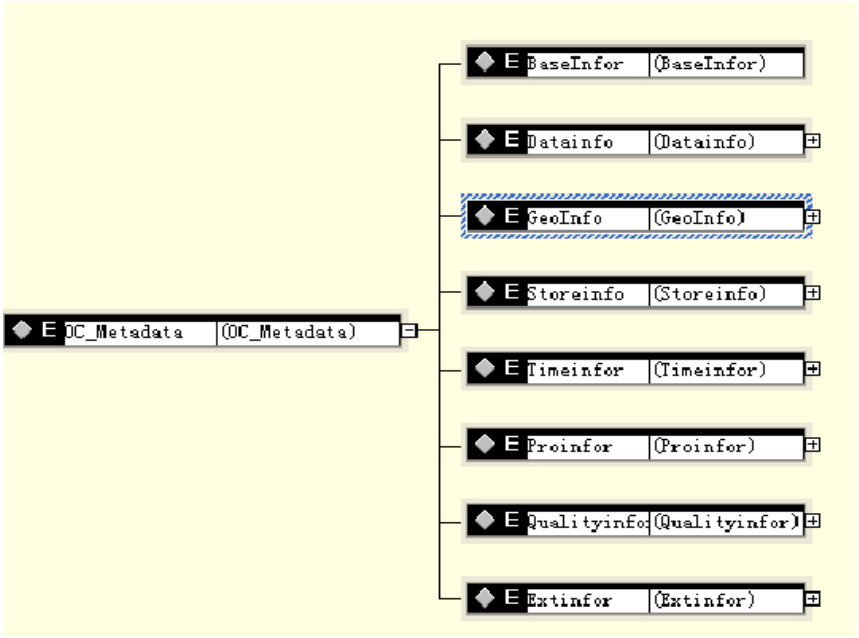

Fig.2. Ocean color remote sensing metadata XML schema

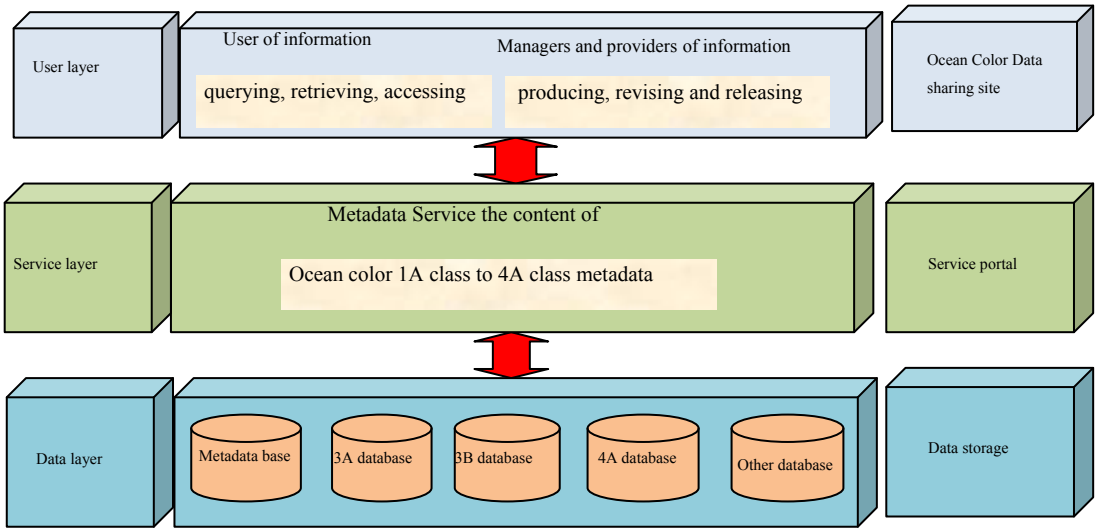

Fig. 3 Ocean color remote sensing metadata service architecture

3. THE APPLICATION

The application of the ocean color metadata system is the important parts of the ocean color sharing web site and user can create, edit, query, release and display their ocean color metadata as showing in Fig 4. Metadata are created and collected by three methods: production simultaneously with the data set collected, collection after completed data sets, querying from other metadata conversion different standards. So the metadata acquisition service must fulfill these needs. Metadata management service metadata base management, update and release, etc. The applications also manage the all kinds of users, and give them different permissions that can complete different tasks.

The application creates, gatherers, neatens, manages the ocean color remote sensing data on the web-service. User query their data and information from web site and web site return and display the results to user by Web GIS and Google Earth.

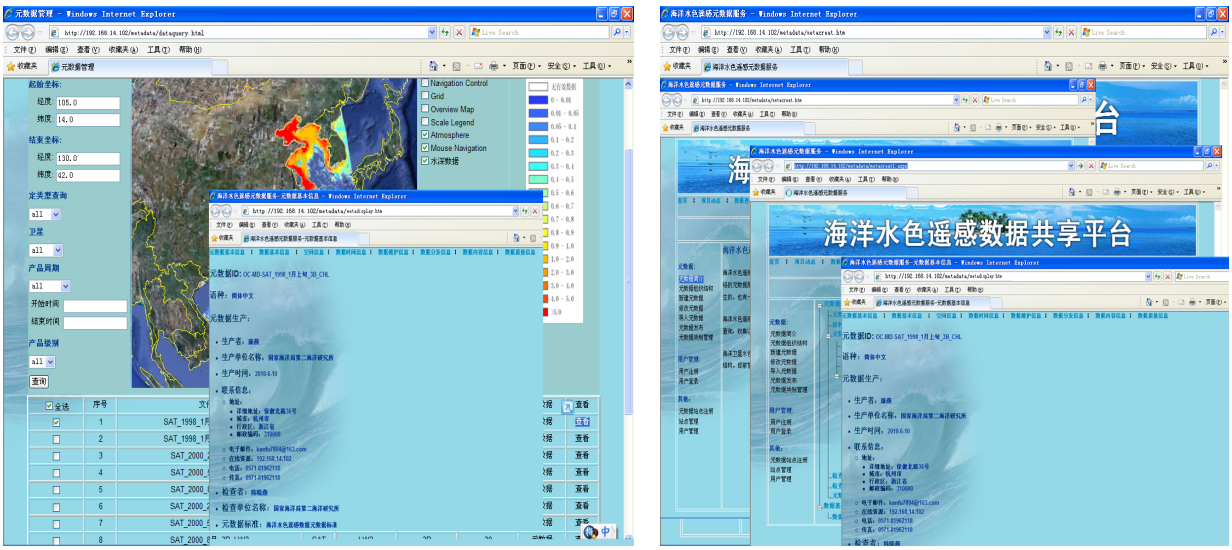

Fig 4. The application interface of the ocean color remote sensing metadata

REFERENCES

[1] http://www.ioccg.org/
[2] http://www.fgdc.gov/metadata/metadata.html
[3] Bray, T., Paoli, J. Sperberg-McQueen and E. Maler, "Extensible Markup Language (XML), Version 1.0, 2nd ed.", W3C Recommendation(2000).
[4] Isenor, A.W. and Lowry, R.K, "Final Report of the ICES/IOC Study Group on the Development of Marine Data Exchange using XML, " Defence R&D Canada-Atlantic Technical Report TR2005-005(2005).
[5] Isenor, A.W., J. Robert Keeley and Joe Linguanti, "Developing an eXtensible Markup Language(XML) Application for DFO Marine Data Exchange via the Web", Defence R&D Canada DRDC Atlantic ECR 2003-025(2003).
[6] http://www.oceanteacher.org/OTMediawiki/index.php/Metadata