

DIGITAL EARTH SCIENCE PLATFORM: DESP/CAS

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ABSTRACT:

On the basis of Digital Earth Prototype System (DEPS/CAS) version 1.0, the Center for Earth Observation and Digital Earth of the Chinese Academy of Sciences is developing the Digital Earth Science Platform: DESP/CAS. The contents of the system are to build an area of 600m² demonstration hall with high performance computers, to construct an all-in-one space information system with capacities of processing and analyzing data acquired by 3 ground receiving stations of the Chinese Academy of Sciences which are distributed in Beijing, Xinjiang and Hainan, data acquired from remote sensing satellites, airborne remote sensing system as well as other comprehensive data, and to build a large simulation system to simulate earth system change, so as to serve to global change research and sustainable development research.

1. INTRODUCTION

Digital Earth is a mega-data system about the Earth in regard to the information of natural and human society, the model of earth evolvement and society development, information technology system, and the geo-spatial information obtaining system; is a development of geo- and social science in the computer technology, web system technology, web sensor technology, satellite remote sensing technology, global positioning system, geography information system, virtual reality technology, data storage and database technology; is a strategically systematical program for a country.

Based on digital earth research, people can clearly understand and represent the change of the Earth, identify and measure the main factors causing the Earth's change, ascertain the effect of human civilization progress on the changes of the Earth system, and realize the forecasting of the future changes of the Earth system in order to provide scientific and external support for the significant strategic decision-making of a country. The establishment of the digital earth science system can speed the obtaining of geoinformation to further offer services to the government and the public.

In the past 10 years, digital earth was largely developed globally. The Google Earth which was produced by Google Co. in June 2005 brings digital earth technology application into a new stage. Google Earth technology made a great progress by integrates international computer technology and 3S technology in the aspects of data and application. Google fully utilizes his powerful search engine and web serve system around the world to successfully realize the mega-remote-sensing-data based functions, such as browse, query, measure, path analysis, orientation service (connected with GPS) and so on, and realize serving the public with the information by popularizing the

application of digital earth science and technology for the common user on the web.

2. DIGITAL EARTH PROTOTYPE SYTEEM

The Chinese Academy of Sciences started the research on Digital Earth Prototype System since 2000 and successfully established the first version of Digital Earth Prototype System of China (DEPS/CAS 1.0). Meanwhile, the research on digital provinces, digital industries and digital city has been paid much attention to in China.

DEPS V1.0 is composed of subsystems with data receiving, fast processing and grid computing, meta-data service, spatial information database, model base, map service and virtual reality. During the whole working procedure, from data acquisition to data analysis and display, subsystems are compactly linked up to form the working platform of digital earth.

The construction of DEPS V1.0 takes the concepts of breaking subjects' edges, implementing system integration, developing new thoughts, and exploring new directions, provides synthetic analysis and cross-subjects digitization working platform and network operation platform for different research fields. The construction of DEPS sets up a favorable basis for the research of digital earth. Nowadays research to digital province and region, digital fields, and digital city has been vigorously developed.

With the rapid development of the integrated research on the space information serve system and geo-system science in the world wide, to establish the China's digital earth science platform becomes the most urgent task. Only the unified

standard of digital earth system can meet the demand of a country.

3. DIGITAL EARTH SCIENCE PLATFORM

3.1 Background

The research on digital earth science platform aims to build up the China's digital earth science research platform with two phases in the coming 10 years to meet the country's demand of space information, to develop the digital earth at a world scale, and to contribute to the space to earth information science.

To establish the research platform of China's digital earth science, it is necessary to develop digital earth scientific theory system and to promote the obtaining and fusing of geoinformation and the development of assimilation technology; to build up the regional digitalization geoinformation database system of China, to conduct the regional research on the interaction and change model among different spheres of the Earth in China, to construct the support system of digital earth information technology, to study the standard of digital earth information technology, to improve the information mining method, to perfect the digital earth information obtaining technology and system, and to carry on the research on the information fusing and assimilating system of digital earth.

The establishment and improvement of digital earth science platform of China will recur and forecast the geoinformation of the development and changes regionally in China and some other hotspots around the world, and will serve for the realization of development aims of China within the first twenty year of this century.

3.2 Content

Digital earth science platform is to be built up to meet the significant national requirement and to address global issue and international hotspot issues. This platform includes digital China and digital Earth with space-based dimensions of different regions, 10 region-based dimensions of special requirements, time-based dimensions of different spans, and the resulting science-based dimension, totally four dimensions.

As for digital China, space-based dimension includes the relevant information of 34 provinces, municipal cities, autonomous regions, and special administrative regions; region-based dimension mainly focuses on digital disaster, digital health, digital energy, digital hydrology, digital atmosphere, digital ecology, digital heritage, digital environment, digital ocean, digital city and so on; time-based dimension studies the changes of several ten-years to hundred-years time length according to different study objectives; science-based dimension is directed to the issues related to sustainable development.

As for digital earth, space-based dimension focuses on the global issues that human beings concern; region-based dimension mainly conducts the research on global hydrocirculation, global crop, global aerosol, global environment change, global large disaster and so on; time-based dimension studies the changes of different objectives; science-based dimension focuses on the spatial-geo information science and its relationship with the earth system science.

On the aspects of system construction and core technology, research on the web technology, computer technology, database technology, data processing technology, and data fusing technology significantly bases on mega- multi-dimension, multi-phase and multi-style earth observation data, ground observation data and social and economic data of digital earth, so as to establish the soft and hard environment of the digital earth scientific research.

3.3 Implementation

Relying on the research ability of the Center for Earth Observation and Digital Earth (CEODE) and other research institutes of CAS around the country, digital earth science platform is to be constructed based on relevant data from satellite ground receiving stations and airborne remote sensing system.

- 1) The mechanism construction of the four dimensions on Digital China
 - i) space-based dimension: collaboration with 34 provinces, municipalities, special administrative regions with 10 PI from CEODE and 34 PI from these local institutions.
 - ii) Region-based dimension: collaboration with 10 national ministries with 10 PI from CEODE and 10 PI from these national ministries.
 - iii) Time-based dimension: collaboration with relevant departments using the data archives of different time series and virtual reality and emulation technology.
 - iv) Science-based dimension: collaboration with relevant research organizations and colleges.
- 2) The mechanism construction of the four dimensions on Digital Earth
 - i) space-based dimension: starting the research in some regions with better situation and conducting global research in some individual research fields.
 - ii) Region-based dimension: collaboration with relevant organization in United Nations and some international academic organizations.
 - iii) Time-based dimension: the same as that of Digital China.

Science-based dimension: collaboration with international scientific plans and academic organizations in China and abroad.

4. CONCLUSION

The purpose and advantage of establishing digital earth is that through digital earth, various natural, social and economic information on the Earth can be integrated to provide the foundation for the research on the Earth's evolution and development, the realization of recurring the Earth's history and forecasting the Earth's future, and further studying the interaction of human beings and the nature. In the past decades years, several models of the Earth on its various aspects have been built up, but these models could not represent the Earth, and even could not represent some parts of the Earth. To model the Earth, a kind of model of the Earth must be established under the digital earth framework. In order to provide the precise original data to the model of a region, data fusing should be developed. With this, digital earth model could well and reliably predict by assimilation methodology.

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