

DIGITAL EARTH AND SYNTHETICAL QUAKEPROOF AND EARTHQUAKE DISASTER REDUCTION

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Abstract Earthquake is the calamitous natural phenomena with huge destructive power. Millions of casualties and hundred billions of dollars' economic loss have been caused by seismic disasters in this century. The synthetically quakeproof and disaster-reducing includes four main domains. This article has clarified the applied prospect of digital earth's concept in the natural disaster forecasted and prevented field to take for the example of setting up the synthetically technical system of reducing the disaster.

Key words: Earthquake; Earthquake disaster reduction; Digital earth; Quakeproof

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1 Conception of Digital Earth

Digit earth is a technique system regarding earth as the object by way of computer. It not only mostly researches natural or factitious information on earth surface, and also studies the whole information of substance and energy from ionosphere to the earth's crust Moho surface. Therefore in fact the digital earth means to set up a strong "stereo geographic information system of all over the world". It set up information on earth according to earth's geography coordinate (containing depth), also joined each other by computer network, so various macroscopic and microcosmic circumstances occurring on earth can be realized quickly and perfectly and imaginably by everybody on earth, and the effect of various resource can be exerted fully. Digit earth technique system is a new technological revolution. It changes our modus of obtaining and storing and processing and displaying information, and lets us process mass data including our earth and its environment, culture, economy and so on. It also provides a huge scientific calculating tools for geoscience, makes it possible that the extremely large and small experiment of geological, geographical, atmospheric, oceanic process and the forecast of a complex natural phenomenon which is never realized before it can come true.

The main features of digital earth are as following:

(1) "Digital earth" has the spatiality, digitalization and integrity. According to the specialists' analysis, eighty percents of the information in the world are concerned with the location. So it causes the "digital earth" to be the biggest and the most important information system

in the human history.

(2) Digital earth has the seamless structure with distributed data hierarchy. It can be substantiated rapidly and on-line by net, and also can blend and display the mechanism of the source data.

(3) Digital earth can provide part or whole data and information service by the picture, graph and text report. Different user has the different using authority for the different data and information.

(4) The service of the digital earth covers all parts of the society. Not only the government departments but also the common people can find the information needed from it.

The above features of digital earth have provided the excellent theoretical thinking and working platform for the work of quakeproof and disaster-reducing.

2 The Work of Quakeproof and Disaster-reducing Needs the Digital Earth Platform

(1) Earthquake is the calamitous natural phenomena with huge destructive power. Millions of casualties and thousand millions of dollars' economic loss have been caused by the earthquake from this century.

(2) The seismogenic system and its lithosphere belong to the complex huge system. They have the evident level and the auto-similar structure with overmesting, have the high nonlinear and high complexity, and have the strong regionalism and spatiality.

(3) The earthquake science has the strong observed property. Observation is the only source for all of the precursor and the earthquake information. The earthquake precursor and earthquake information have the evident property of spatial distribution.

(4) The synthetical quakeproof and disaster-reducing work includes the four fields: earthquake monitoring and prediction, earthquake disaster prediction, earthquake emergency, earthquake disaster saving and rebuilding. And the earthquake monitoring and prediction are the base of the synthetical quakeproof and disaster-reducing. The network of seismic monitoring has the evident property of spatial distribution and regionalism.

(5) The earthquake disaster prediction, earthquake emergency, disaster prediction saving and rebuilding are a huge system project. It needs to set up a huge data base according to the building, economic, people, lifeline project, traffic, communication and hospital. This kind of database has the evident property of spatial distribution.

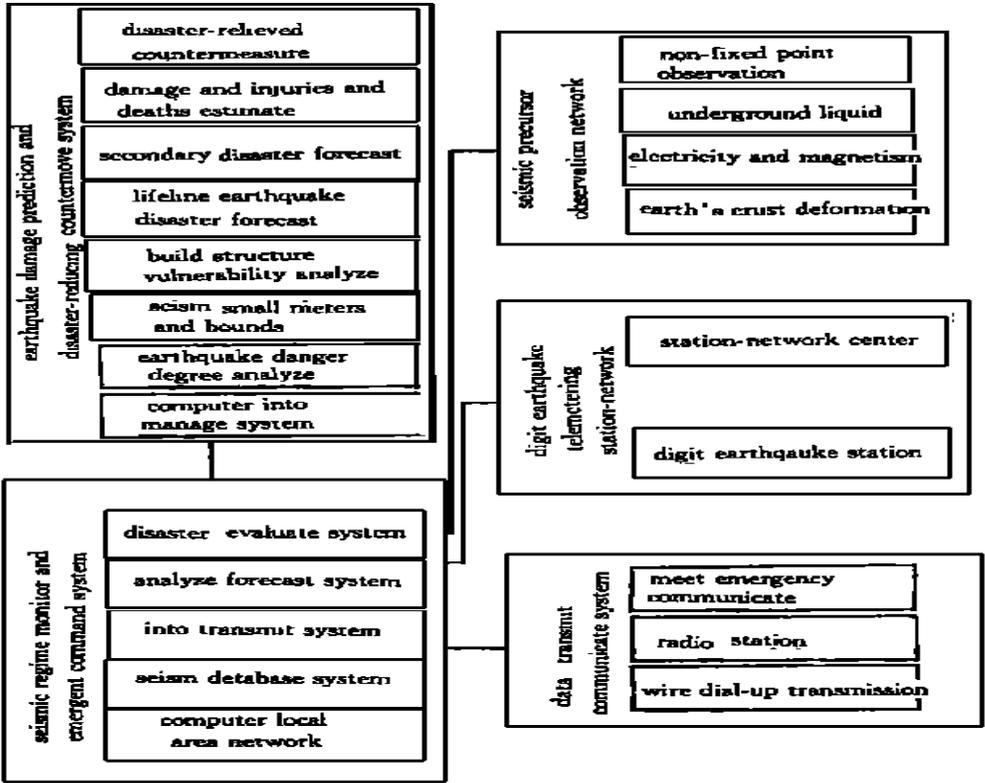
3 The Realization of Digital Earth in the Synthetical Quakeproof and Disaster-reducing Technical System

This article takes the regional synthetical quakeproof and disaster-reducing technical system as an example, expounds the use and prospect of digital earth concept in the natural disaster prediction and prevention field. The regional synthetical quakeproof and disaster-reducing technical system includes the following parts:

(1) Telemetry network (station) of digital earthquake;

- (2) Earthquake precursor network (station);
- (3) Seismic data transport and communication system;
- (4) Seismic regime monitor and emergent command system;
- (5) Earthquake damage prediction and disaster-reducing countermove system, Its each part composition and interrelation as following table;

Table 1 The regional synthetical quakeproof and disaster reducing techniques



4 The Efficacy of the Digital Earth in the Regional Synthetical Quakeproof and Disaster-reducing Technology System.

In order to make the full use of the efficacy of the above regional synthetic quakeproof and disaster-reducing technology system, the first point is to set up the relative close observatory, to collect the observational information of the earthquake and precursor as more as possible; the second point is to arrange, process and enter-base the observational materials of each observatory from beginning to now; the third point is; to collect, arrange, process and enter-base the varies geotechnical observational data and the ground deformation measurement (include GPS) in the field; the forth point is to set up the precision seismogeology, the fault distribution and the topographic material in the field; the fifth point is to set up a huge GIS database, include building, economic, personnel, lifeline engineering, traffic, communication, hospital and so on. In a word, this means to connect any information of any point in this field with the work of quakeproof and disaster-reducing, and to develop the GIS handling software with the powerful spatial analytic function. In fact

it's a digital spatial area and only it services work of the quakeproof and disaster-reducing, no harm we name it "Earthquake Digital Area". As the pregnant process of the earthquake is the most complicated, it's very difficult to describe the seismic pregnant process, seismic genetic process and earthquake prediction only by several parameters. So in the seismic zone and seismic multiple zone we should set up the detailed spatial database—"Earthquake Digital Zone" which is connected with each spatial point of the seismogenic zone and develop the spatial analysis and mathematics-handling software with powerful function. It's possible to make a penetrative headway in the earthquake prediction science field and to develop the work of quakeproof and disaster-reducing.

5 Conclusion

Through the above analysis, we can draw conclusions as following:

(1) The earthquake is a kind of the most complicated natural phenomena with exceedingly large destructiveness. The pregnant process of the earthquake is the most complicated and connected closely with the spatial distribution. It has concerned with many factors to describe its process, and needs a king of tool with the powerful spatial analytical function to handle.

(2) In fact the digital earth is a strong system of geographic information all over the world. It establishes the information of the earth according to the geographical coordinates, and joins the information together by net, to have a strong spatial analytical function. The digital earth has a strong spatial analytical function. The digital earth has provided an excellent theoretical thinking and working platform for the work of quakeproof and disaster-reducing.

(3) In the seismic zone and seismic multiple zone we should set up the detailed spatial database—"Earthquake Digital Zone" which is connected with each spatial point of the seismogenic zone and develop the spatial analysis and mathematics-handling's software with powerful function. It's possible to make a penetrative headway in the earthquake prediction science field and to develop the work of quakeproof and disaster-reducing.

(4) Through realizing digital earth in the synthetical quakeproof and disaster-reducing technical system, we can know that the digital earth has the wide applied prospect and great potentialities in the work of the natural disaster prediction, prevention and the synthetical quakeproof disaster-reducing.

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数字地球与综合防震减灾

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摘要: 地震是破坏力巨大的灾害性自然现象。本世纪以来全球因地震灾害造成百余万人伤亡和数千亿美元的经济损失。综合防震减灾包括4方面工作。作者以建立综合防震减灾技术系统为例, 阐明了数字地球概念在自然灾害预测预防中的应用前景。

关键词: 地震; 减轻地震灾害; 数字地球; 防震