APPLICATION OF<<4D>> TECHNIQUES IN FLOOD MONITORING IN CHINA 1998

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INTRODUCTION

4D is produced by combining modem remote sensing and GIS technology and forms the basic mode of digitized products for surveying and mapping. It includes a Digital Elevation Model (DEMDE), Digital OrthoQuards Qu (DOQDO), Digital Raster Graphics (DRGDR) and Digital Thematic Information (DTIDT). A *4D* flood-protection technical institution was established including; a remote sensing helicopter, a *4D*-background database of potential disaster areas and a data management system, a flood prediction and risk assessment service system, topographic maps in a background database and a dynamic monitoring system of land-use. This institution was active during the floods in 1998 resulting in detailed flood monitoring and assessment that were provided to the decision-making department and provincial government. The following tasks were performed:

1. Prediction of potential flood areas and water volume at various water levels.
2. Acquisition of infrared color images of important cities of Dongting-lake and Poyang-lake areas at the highest water level.
3. Statistics of flood range and flood area in the same areas at the highest water level.
4. Compilation of an atlas of risk zones in the areas during the 1998 super flood.
5. Video tape monitoring of the flood.
6. Reconstruction homestead including an updated topographic map for YangZi river and NenJiang river.

METHODOLOGY

Remote sensing monitoring by helicopter at low-altitude

This system includes a Mig-8 helicopter with GPS navigation positional system, light aerial optical measurement camera, CCD digital camera and digital VCR. The system was used over the Dongting and Poyang lakes from 1st Aug, 1998 to 10th, i.e. during the most dangerous period, flying under the clouds between raining days. Data was obtained as listed below:

- Black and white aerial photo of the two lakes at 1: 8000 scale.
- Color infrared aerial photo important cities at 1:8000 scale.
- GPS data record for flight tracks

- VCR tapes from aerial camera
- 300 color pictures of low lakes

4D background database of potential disaster environment and data management system.

The content of the database is listed below:

Digital Orthquard database: created by using 1:35000 new aerial photos and SPOT panchromatic image

Digital Raster Graphics database: created using 1: 10000, 1: 50000 new topographic maps.

High accuracy Digital Elevation Model database: digitized from new 1:10000 contour line for topographic maps. The resolution is 5 meters and the accuracy in plane regions is 0.5 metre; in mountainous areas the accuracy is 2.5 metres to 5 metres.

Digital Thematic Information database includes:

- Land-use classification data
- Boundary data, road and embankment data in vector version
- Important point data including location for government, density habitat, large factories
- And mines
- Hydrological Station information
- Population and economy information
- Flood protection engineering information

The database is in 1:50000 scale and most data is in a raster format also compatible with vector data, statistical data and report text data. The software was developed for an ARC/INFO platform with functions including registering, querying, displaying and overprinting. All data can be managed in normalizing way with spatial positioning.

POTENTIAL APPLICATIONS

Flood forecasting and loss assessment service system

This system offers several methods of selection to different scales to compile map sheets of counties, enclosing-dikes and the whole region. Supported by *4D* background data, the system quickly constructs maps of flood submerging range, place, area, water depth water accumulation volume and economic losses. It

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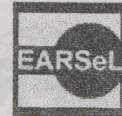
offers a highly efficient service for flood management and self-saving planning after a disaster. Thus, the system offers functions such as region selection, monitoring data input, flood model calculation and data calculated from real-time water levels, GPS data and monitoring data from remote sensing image

Topographic map in background database quickly updating system.

The background data elements such as rivers, roads and dikes can be updated rapidly using new aerial photos and SPOT images based on color topographic map and layouts with segmentation method, so that updated information can be carried on the targets.

The dynamic monitoring system of land-use

Land use changes in potential disaster areas can be monitored using new and old remotely sensed images and slope and aspect maps obtained from high-accuracy DEM data. Plough-land classification area that has a slope greater than 25 % can be made to support engineering planning and plans for returning plough-land to forest and cropland to lakes and flood discharge areas within enclosing-dikes.