

# CARTOGRAPHY IN JAPAN

## 2003-2007

NATIONAL REPORT TO THE 13<sup>TH</sup> GENERAL ASSEMBLY OF  
THE INTERNATIONAL CARTOGRAPHIC ASSOCIATION  
MOSCOW 2007

THE NATIONAL COMMITTEE FOR CARTOGRAPHY OF JAPAN  
THE JAPAN CARTOGRAPHERS ASSOCIATION

## CONTENTS

### PREFACE 4

#### I. ACTIVITIES OF THE NATIONAL COMMITTEE FOR CARTOGRAPHY AND RELATED ACADEMIC ASSOCIATIONS 5

1. Activities of the National Committee for Cartography (NCC) 5
2. Activities of the Japan Cartographers Association 6
3. Certification of GIS engineer organized by the GIS Association of Japan (GISA) 7

#### II. ACTIVITIES OF MAPPING ORGANIZATIONS 8

1. Geographical Survey Institute of the Ministry of Land, Infrastructure and Transport (MLIT) 8
2. Hydrographic and Oceanographic Department (HOD) of Japan Coast Guard, MLIT 23
3. National Land Survey by the Ministry of Land, Infrastructure and Transport (MLIT) 25
4. Ministry of Agriculture, Forestry and Fisheries (MAFF) 26
5. Geological Survey of Japan / National Institute of Advanced Industrial Science and Technology (GSJ/AIST) 27
6. Technical cooperation 27
7. Satellite for Cartography: Advanced Land Observing Satellite (ALOS) 33

#### III. ACTIVITIES OF PUBLIC CORPORATIONS, FOUNDATIONS, MUSEUMS AND LIBRARIES

1. Public Corporations and Foundations 36
2. Museums and Libraries 37

#### IV. ACTIVITIES OF LOCAL GOVERNMENT 38

#### V. ACTIVITIES OF PRIVATE SECTOR 40

1. Digital Services 40
2. Trends in Map Publication 41

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## PREFACE

This report has been prepared as the National Report for Japan to the 13<sup>th</sup> General Assembly of ICA and 23<sup>rd</sup> International Cartographic Conference in Moscow, Russia, 2007.

The purpose of this report is to introduce cartographic activities taking place in Japan largely from 2003 to 2007. The main contents are as follows:

1. Activities of the National Committee for Cartography and Related Academic Associations
2. Activities of Mapping Organizations
3. Activities of Public Corporations, Foundations, Museums and Libraries
4. Activities of Local Government
5. Activities of Private Sector

The cartographic works carried out in Japan over the past four years have been rather remarkable. Not only various kinds of digital maps and GISs have been published or constructed, but also mobile or ubiquitous map information systems have been developed.

We hope that cartographers of the many ICA members will be able to understand cartographic works in Japan through this report.

Takashi MORITA, Chairman, The National Committee for Cartography, Science Council of Japan  
Kazuo NAKAMURA, President, The Japan Cartographers Association

# I. ACTIVITIES OF THE NATIONAL COMMITTEE FOR CARTOGRAPHY AND RELATED ACADEMIC ASSOCIATIONS

## 1. Activities of the National Committee for Cartography (NCC)

The NCC is a branch of the Science Council of Japan (SCJ), a governmental organization reformed in 2006 (<http://www.scj.go.jp/en/index.html>), which directs Japanese academic research. SCJ is therefore a member of the International Cartographic Association (ICA), and NCC is a national committee of the ICA.

The members of the NCC are nominated by the SCJ on the application of members and associate members of SCJ. The committee currently has six members. The chairman of the current term, which is Prof. T. Morita, whose term runs from 2006 to 2009.

1) Activities for the 11<sup>th</sup> General Assembly of ICA and the 21<sup>st</sup> International Cartographic Conference in Durban, South Africa, in 2003.

A Japanese delegation of 12 members headed by Prof. T. Morita attended the conference. Seven papers were presented and five maps were exhibited in the Children's World Map Exhibition and around 15 maps were shown at the International Map Exhibition. The Commission on Ubiquitous Mapping proposed by Japan was admitted in the general assembly and Prof. T. Morita was nominated as a chairman of the commission.

2) Activities for the 22<sup>nd</sup> International Cartographic Conference in A Coruna, Spain, 2005

A Japanese delegation of 11 members headed by Prof. T. Morita attended the conference. Thirteen papers were presented and many maps were exhibited in the Children's World Map Exhibition and the International Map Exhibition.

3) Activities of Japanese members in the ICA Commissions (2003-2007)

The Commission on Ubiquitous Mapping proposed by Japan has achieved two international workshops, the First International Workshop on Ubiquitous, Pervasive and Internet Mapping held in Tokyo, Japan, September 7-9, 2004, and the second one held in Seoul, Korea, October 23-25, 2006. In both workshops many Japanese members has assisted actively through their scientific papers and also in the management of the workshops.

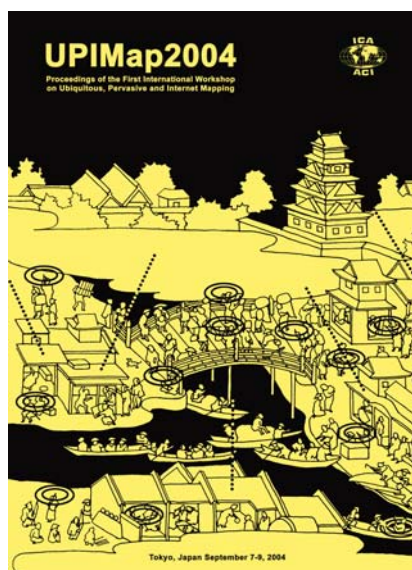


Fig. 1-1 Proceedings of UPIMap2004



Fig. 1-2 Proceedings of UPIMap2006

(MORITA Takashi)

## 2. Activities of the Japan Cartographers Association

The Japan Cartographers Association (JCA) is the only Japanese scientific association whose aims are for advancement of cartography in Japan. JCA is one of the cooperative academic societies of the Science Council of Japan (SCJ) and has close partnership with the National Committee for Cartography of the SCJ.

JCA was established in November 1962 at the time of the First International Cartographic Conference in 1962 in Frankfurt am Main. There are currently about 900 members and the secretariat's office is located in the Japan Map Center Building in Tokyo. The president is Dr. K. Nakamura, professor emeritus of Komazawa University.

The activity plan and budget of JCA are decided annually at the general assembly, which is usually held in late February. Concrete actions are operated by the standing committee, which is consisting of 18 members and chaired by Prof. Y. Kumaki of Senshu University.

The regular activities of JCA are as follows:

### (1) Annual Scientific Conference

A two-day conference including a special lecture is held annually in summer or autumn in Tokyo, with about 200 attendees. The mean number of presentations in aural session, poster session and symposia of 2003-2006 conferences is about 40. Proceedings are distributed to all JCA members before the conference. Maps, geographic information systems and cartographic materials are exhibited at the conference. Exhibitors are the Geographical Survey Institute, the Hydrographic and Oceanographic Department of the Japan coast Guard and other government organizations as well as commercial sectors.

### (2) Regional Conference and JCA Workshops

The regional conference is held once a year, usually in autumn, in a city excluding Tokyo. The number of attendees of a conference is 40-60. JCA Workshops, mostly a half-day program, are also held three to four times a year.

### (3) Excursions

A one-day or two-day excursions are held in conjunction with the annual scientific conference and the regional conference. The workshops occasionally include an excursion.

### (4) Commissions

JCA has eight commissions (see below), some of which correspond to ICA commissions. Each commission has its own activities directed by the leadership of chairperson. They sometimes plan symposia of the annual scientific conference or the regional conference, excursions and JCA workshops as well as the commission workshops. The JCA Commission on Ubiquitous Mapping managed UPIMap2004 (International Joint Workshop on Ubiquitous, Pervasive and Internet Mapping, 2004), which was held in September, 2004 in Tokyo by the ICA Commissions on Ubiquitous Mapping and on Maps and the Internet.

Commission on History of Cartography

Commission on Cartographic Terminology

Commission on Children and Cartographic Education

Commission on Professional Education and Training

Commission on Marine Cartography

Commission on Hypermedia maps

Commission on Ubiquitous Mapping

Commission on School GIS Education

#### (5) Publications

JCA publishes a quarterly journal '*Chizu -- Kukan Hyogen no Kagaku* (Map, Sciences of Spatial Representation). It is composed of scientific papers, various reports, book reviews and news. Each issue has a paper map (occasionally a CD) as an appendage. Since the appendages are selected from unique and not-easy-to-get materials, JCA members get many interesting maps in this way. Additionally, JCA published a Japanese translation of "Maps and Civilization" by Norman J. W. Thrower in 2003 and a reproduced edition of "Dai-Tokyo Chokan Shashin Chizu (Great Tokyo Bird's View Photo Map)" in 2004.

#### (6) Website and Mailing List

JCA makes its activities public through website (<http://www.jmc.or.jp/gakkai/index.html>). JCA also operates a mailing list, which is useful for exchange of information.

#### (7) Collection of Maps and Relating Materials

Maps and various materials relating to maps are collected principally by way of donation or exchange including those from foreign institutions.

#### (8) Commendation

JCA made a regulation of commendation 'JCA Award' in 2006. The first commendation ceremony was held in the general assembly of 2007 and two JCA members whose scientific papers in *Chizu* are excellent, a map-publishing company, a high school teacher, and 56 JCA members who contributed specifically to the promotion of JCA are awarded.

#### (9) Cooperation with Other Scientific Organizations

JCA is a member of the Japan Geoscience Union (URL: <http://www.jpгу.org/>) which is composed of 46 scientific societies in Japan covering geophysics, geology, geography and relating sciences. JCA conducts 'Mapping and spatial representation in geoscience' session as one of the regular sessions of the annual meeting of the Japan Geoscience Union. JCA also a member of both the Japanese Geographical Union (URL: <http://wwwsoc.nii.ac.jp/ajg/union/>) and the Committee on the Cooperation of Societies of Human and Economic Geography and Geography Education (web page is linked from <http://wwwsoc.nii.ac.jp/hgeog/index.html>). JCA takes actions for the promotion of cartography and its education through these unions. JCA supports many events of map exhibition, map contest, workshop, training course, etc. organized by the Geographical Survey Institute, Japan Map Center, scientific societies, local organizations, etc.

(KUMAKI Yohta)

### 3. Certification of GIS engineer organized by the GIS Association of Japan (GISA)

GIS Association of Japan (GISA) has started the certification of "GIS Senior Engineer" since October 2006. This activity aims to certify the capable GIS engineer to his/her organization, clients, and the society. GISA draws upon the method of GISCI in US and modifies it for Japan to evaluate GIS engineers. More than 35 people were certified in these nine months since the certification has started. GISA is expecting to certify more than 100 engineers until the end of fiscal 2007. ([http://wwwsoc.nii.ac.jp/gisa/en/ENG\\_top.html](http://wwwsoc.nii.ac.jp/gisa/en/ENG_top.html))

(OTA Morishige)

## II . ACTIVITIES OF MAPPING ORGANIZATIONS

Most of the cartographic works in Japan is carried out under the Survey Act. Main objectives of the act are to coordinate various survey works efficiently, to standardize accuracy and to avoid duplicated work.

Survey work is mainly classified into two categories by the act. The first one is the Fundamental Survey executed nationwide by the Geographical Survey Institute (GSI), and the other is the Public Survey for local governmental projects or special projects which are carried out by other governmental or public organizations such as the Forestry Agency, the Geological Survey of Japan/ National Institute of Advanced Industrial Science and Technology (GSJ/AIST), the Ministry of Land, Infrastructure and Transport (MLIT), etc.

Preparation of various kinds of charts and nautical publications is carried out by the Hydrographic and Oceanographic Department (HOD) of the Japan Coast Guard.

### 1. Geographical Survey Institute of the Ministry of Land, Infrastructure and Transport (MLIT)

#### (1) Topographic Mapping

##### 1) Medium Scale Topographic Maps

The first national base map series covering the entire country of Japan was 1:50,000 Topographic Maps, whose preparation began in 1895 and was completed in 1925 by GSI. In 1964, GSI adopted 1:25,000-scale Topographic Maps as the national base map, and have been replacing 1:50,000-scale maps by 1983.

Taking advantage of the vector database, GSI developed and implemented New Topographic map Information System (NTIS), a vector-based map revision system in 2001.

NTIS has the following five design concepts:

- Introduction of time series management of each vector object
- Realization of a seamless database for all Japan
- Adoption of implicit topology data structure
- Separation between data model and map drawing method

GSI now collects change information for map revision from local governments and public corporations through its ten regional branches to achieve near real-time map database revision for Topographic Maps.

##### 2) Large Scale Topographic Maps

In 2003, using technology of aviation laser scanner surveying, GSI started publication of very detailed and highly precise DEM (digital elevation model), which grid interval was 5-meter.

Table 2-1 shows the coverage of large and medium scale topographic maps prepared by GSI during the past three years.

Table 2-1 Coverage of Large and Medium Scale Topographic Maps by GSI

Title		Fy2004	Fy2005	Fy2006
1:10,000	New edition	-2	-	-
	Revision	25 sheets	46 Sheets	37 sheets
1:25,000	Revision	372.871 km <sup>2</sup>	372,879 km <sup>2</sup>	372,887 km <sup>2</sup>
1:50,000	Revision	-	54 sheets	45 sheets
	Recompilation	8 sheets(trial)	-	-

##### 3) Small Scale Maps

Small scale maps and others published by GSI are shown in Table 2-2 and Table 2-3 (June, 2007).



Table 2-2 Publication of Digital Maps

Title	Area
DM 2500 (Spatial Data Framework)	Urban Planning Area
DM 5000 (Land use)	Metropolitan Area, Kinki Area
DM 25000 (Spatial Data Framework)	All Japan
DM 25000 (Map Image)	All Japan
DM 25000 (Administrative Boundaries)	All Japan
DM 25000 (Geo. Names, Pub. Facilities)	All Japan
DM 25000 (Land condition)	All Japan
DM 50000 (Map Image)	All Japan
DM 200000 (Map Image)	All Japan
DM 5000000(Combined)	All Japan and Surroundings
DM 5m Grid (DEM)	Saitama, Tokyo, Nagoya, Kyoto&Osaka, Fukuoka
DM 10m Grid (DEM (Volcanic Areas))	24 Volcanic Areas
DM 50m Grid (DEM)	All Japan
DM 250m Grid (DEM)	All Japan
The National Atlas of Japan	All Japan

DM: Digital Map, DEM: Digital Elevation Model

Table 2-3 Publication of Paper Map Preparation

Title	Number of sheets	Size of sheets
1:10,000 Topographic Map	311 4	52.0 x 73.8 cm
1:25,000 Topographic Map	4,343 20	46.0 x 58.0 cm 59.4 x 84.1 cm
1:50,000 Topographic Map	42 1,249 4	46.0 x 58.0 cm 46.0 x 58.0 cm
1:200,000 Regional Map	130	46.0 x 58.0 cm
1:500,000 District Map	8 8	78.8 x 109.1 cm 78.8 x 109.1 cm
1:1,000,000 Nippon	3	78.8 x 109.1 cm
1:3,000,000 Japan and Her Surroundings	1	78.8 x 109.1 cm
1:5,000,000 Japan and Her Surroundings	1	78.8 x 109.1 cm
1:25,000 Composite Map	2	63.6 x 93.9 cm
1:50,000 Composite Map	3	63.6 x 93.9 cm
1:100,000 Composite Map	2 5	63.6 x 93.9 cm 78.8 x 109.1 cm
1:300,000 Composite Map	1	78.8 x 109.1 cm

## (2) Thematic Maps

GSI is engaged in various kinds of thematic mapping in cooperation with other governmental organizations for the purpose of providing basic geographic information for regional development, disaster prevention, etc. Table 2-4 shows some typical thematic maps prepared and published by GSI during April 2003 – March 2007.

Fig.2-1 and Fig.2-2 shows parts of “Land condition map of volcano Fuji San” and “Land condition map Kochi”, respectively.

GSI generates digital thematic maps by both digital mapping method and digitization from existing maps. Table 2-5 shows some typical digital thematic maps prepared and published by GSI during April 2003 – March 2007.

In 1999 GSI started to digitize thematic information of existing thematic maps in order to display and analyze with other information on GIS (Geographic Information System). Digitization of the land condition maps and active fault maps in urban area are on going, and other thematic maps are planned to be digitized in due course. GSI and MLIT (Ministry of Land, Infrastructure and Transport) promote establishment of portal site for hazard maps produced by local governments. GSI provides geographic information, such as land condition, for making various kinds of hazard maps.

Table 2-4 Thematic Mapping by GSI (Fy 2003 – Fy 2006)

Type of Map	Scale	Number of sheets
Basic volcano map	1:5,000, 1:10,000	19
Land condition map of volcano	1:25,000, 1:30,000, 1:50,000	3
Land condition map	1:25,000	10
Topographic map of coastal areas	1:25,000	1
Land condition map of coastal areas	1:25,000	1
Lake chart	1:10,000	2
Active fault map in urban area	1:25,000	28

Table 2-5 Digital Thematic Mapping by GSI (Fy 2003 – Fy 2006)

Title	Format	Item or explanation	Original Source
Detailed Digital Information (1981-, GSI)	10m grid	Land use for housing, covering the three main urban areas of Japan	City Planning Map, Aerial Color Photograph, etc.
Digital Map 5000 (Land use)	JPGIS		
Digital Map 25000 (Land condition)	JPGIS	Land condition	1:25,000 Land Condition Map



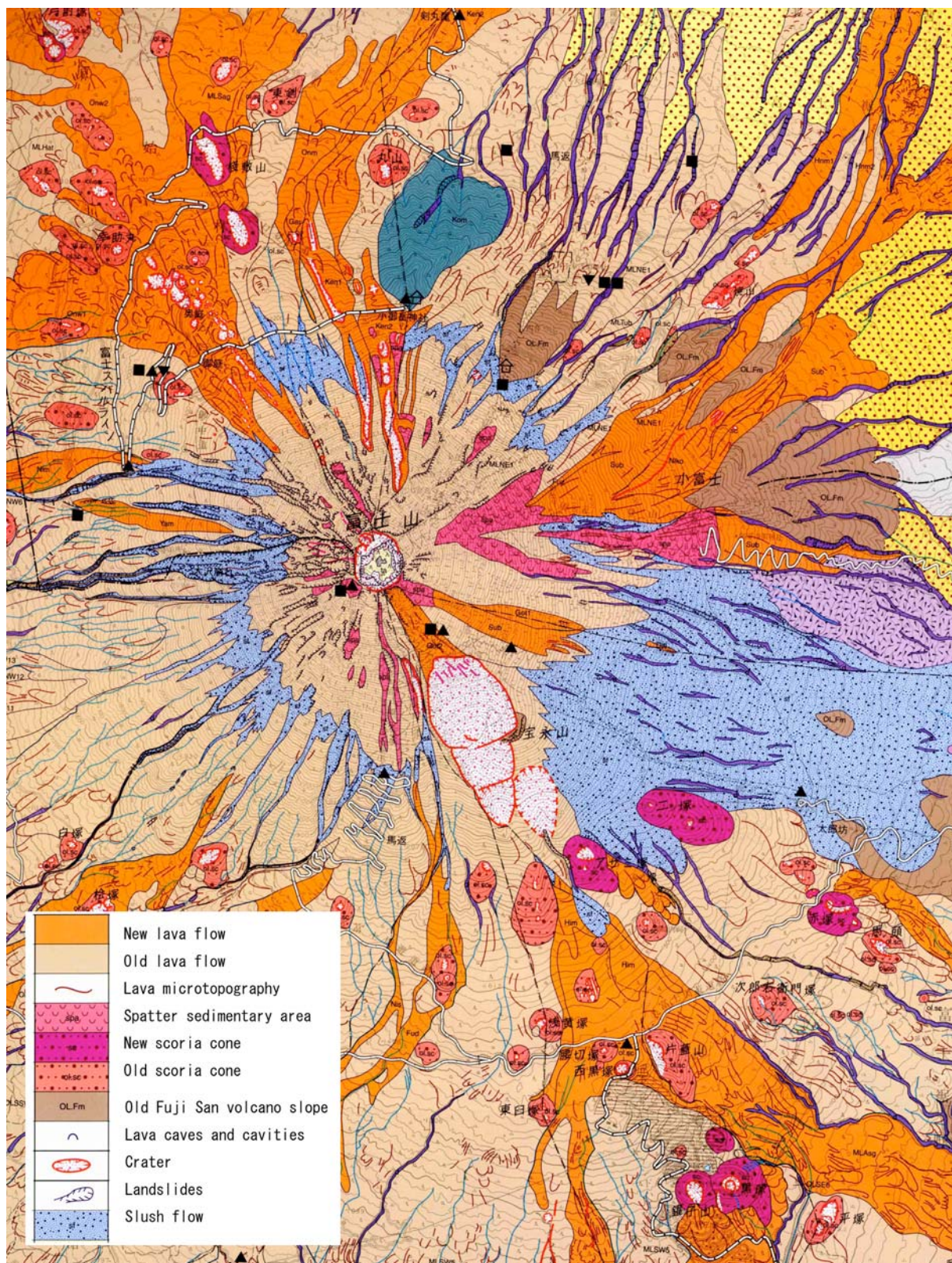


Fig.2-1 Land condition map of volcano “Fuji San”



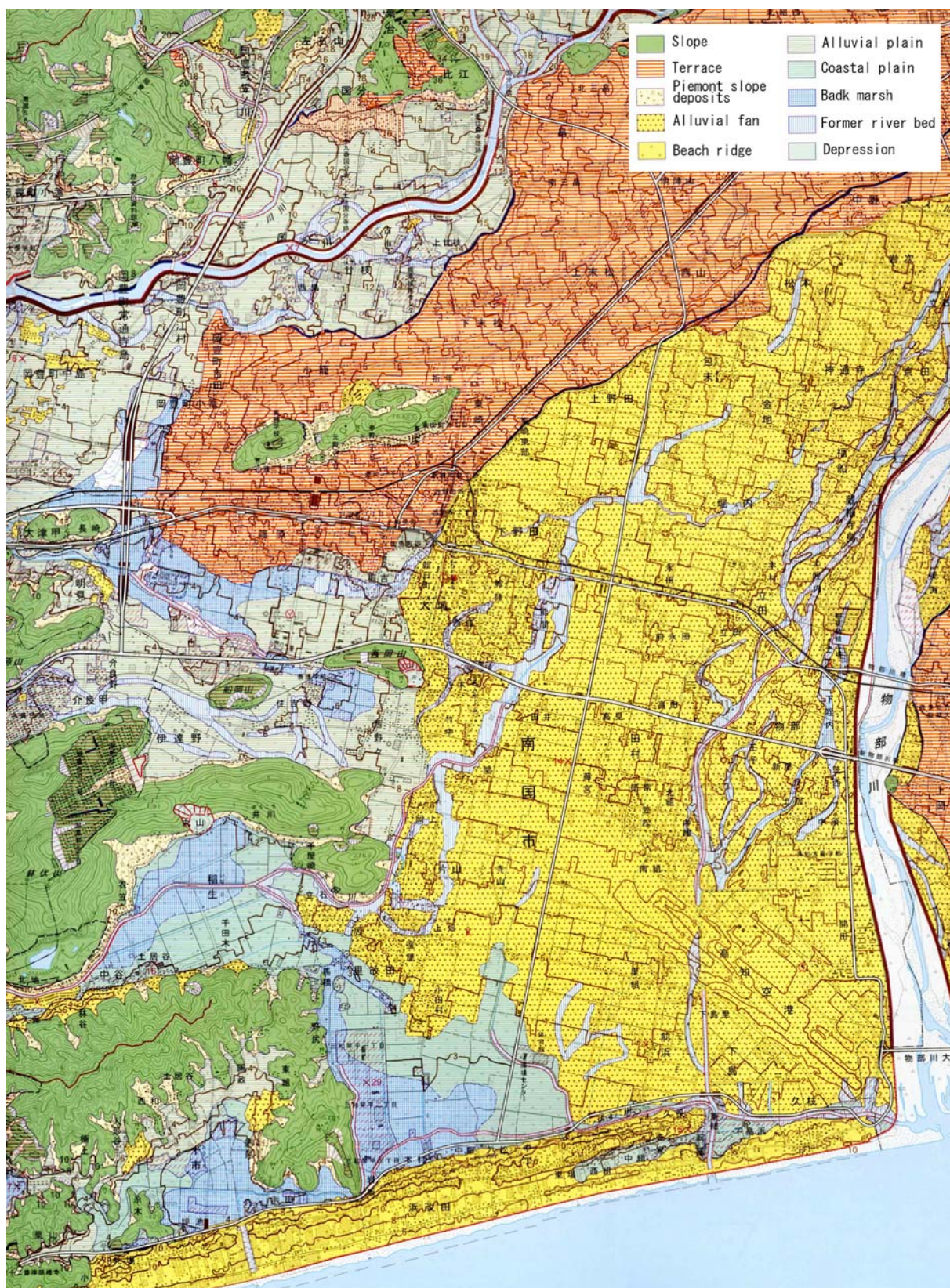


Fig.2-2 Land condition map “Kochi”



### (3) The National Atlas of Japan

The first edition of the National Atlas of Japan compiled by GSI was published in 1977. GSI revised the National Atlas of Japan, Revised Edition, in 1990. Furthermore, GSI has developed an Electronic Atlas System for the computer use, and a CD-ROM Atlas was published in 1997.

GSI is examining next generation atlas “Web Atlas” based on Web GIS.

### (4) Development of Geospatial Information Infrastructure

#### 1) GIS Action Program

The Liaison Committee of Ministries and Agencies Concerned with Geographic Information System (LCGIS) had continued its efforts for infrastructure development after the end of the Long-term Plan for the Development of NSDI in Japan, acknowledging once again the importance of promoting efficient and high-quality activities based on GIS in various fields. In September 2005, the Committee on the Advancement of Satellite –Based Positioning (SBP) and Geographic Information System (CAPGIS) was established. The LCGIS was abolished, and the CAPGIS has succeeded to the tasks of the LCGIS.

To meet the growing national needs for SBP and GIS and to ensure continuous efforts on SBP and GIS, the CAPGIS formulated the “GIS Action Program 2010” on March 22, 2007, for the period of fiscal 2006-2010. This Action Program aiming at an advancement of utilizing geospatial information envisions an IT society where the following are highlighted: efficiency, greater speed, better quality of the public services, creation of new business models in the industrial sector, and provision of better services in the overall public services at a minimum cost.

#### 2) Basic Act for the Advancement of Utilizing Geospatial Information

The government enacted a new law “Basic Act for the Advancement of Utilizing Geospatial Information” in May 2007. The purpose of this Law is to advance policies concerning the Advancement of Utilizing Geospatial Information (hereinafter, “AUGI”) in a comprehensive and well-planned manner by establishing basic principles and clarifying the responsibilities of State and local governments as well as specifying basic elements for measures on AUGI, in view of the fact that AUGI is essential in establishing the economy and society in which the citizens can lead a safe and quality life at present and in the future.

Given that geospatial information, including geospatial framework information, statistical information and geo-imagery, provides essential infrastructure for the improvement of the quality of the citizens’ lives and the sound development of the national economy, AUGI shall be conducted based on the comprehensive and systematic implementation of policies including accurate and proper development and distribution of digital geospatial information, promotion of technologies like GIS and SBP, capacity building, enhancement of coordination among State and local governments and related institutions.

In order to carry out policies concerning AUGI in a comprehensive and well-planned manner, the State Administration shall develop a Basic Plan concerning AUGI and the State and local governments shall take necessary measures including the development of geospatial framework information and its timely revision.

#### 3) Metadata and Clearinghouse

In Japan, LCMAC made an agreement to provide Japanese clearinghouse with metadata. Japanese Metadata Profile (JMP) defines schema for these metadata. Current version of JMP is 2.0 revised on May 2004, and based on ISO 19115:2003. JMP2.0 is composed of core metadata and additional elements such as keywords or distribution information to support clearinghouse facilities.

Each organization taking part in Japanese clearinghouse maintains one or more node servers which support ISO 23950 as its retrieval protocol. GSI provides server tools to support the Japanese language environment, and

has operated the Japanese clearinghouse gateway since 2000.

Now there are 23 clearinghouse nodes.

- 15 nodes by 7 ministries of the central government.
- 4 nodes by independent administrative institutions such as universities.
- 4 nodes by private companies.

The URL of the clearinghouse gateway (in Japanese) is

<http://zgate.gsi.go.jp/>.

#### 4) Preparation of fundamental geospatial data

Although GSI has provided precursory digital map data and open them to the public for GIS promoting since the early 1990s, it could not be achieved to provide basis of position that every nation can use practically. In addition, positioning inconsistencies in overlaying usage between each digital map data occurred since various municipal governments and private sectors had already prepared them originally and individually for each purpose.

In response to these issues, “Promoting Act for Practical Usage of Geospatial Information” as legislation by House members was approved in May, 2007. In cooperation with this activity, GSI appropriated about 8 billion yen from FY2007 to FY2011 budget for preparation of fundamental geospatial data, as basis for providing precise positions of various geospatial information.

GSI is planning to prepare fundamental geospatial data such as control points, coast lines, administrative boundaries, edge lines of roads, centerlines of railways, etc., by processing and abstracting from large scale digital map data prepared by especially municipal governments in a part of urban planning area. The fundamental geospatial data is to be opened to the public freely on the Internet, supposed to be used various purposes as basis of position.



Realize to keep interoperability independent on position relationship of added information by using same fundamental base map data

Fig.2-3 Preparation of Fundamental Geospatial Data

#### 4) Digital Japan

Digital Japan is a concept of a virtual space where users can utilize geographical information selecting from data sets stored and maintained by different organizations in the internet and integrating them for certain purpose based on the positional reference data. Digital Japan has various possibilities that enable us to search and analyze geographical information as an infrastructure, as well as to add information to them on demand of users.

To realize Digital Japan, GSI has launched “Denshi Kokudo Web System” in 2003, which enables us to overlap many kinds of geographical information on the data developed by GSI and some local governments on the Internet. There are over 500 sites using this system as of the end of May, 2007.

The portal sites’ URL of this system is <http://cyberjapan.jp/>, in Japanese.

#### 5) Aerial Photographs

GSI archives almost a million of aerial photographs. This archive covers all over Japan from 1946 to now, and includes films shot by USAF until 1957. All photographs are ready for browsing at the counter in GSI, and for ordering to copy as physical media. A part of photographs, which are shown in Table 2-6 (April, 2007), are also ready for web browsing (Fig.2-4-1, 2-4-2).

Table 2-6 Internet browsing services of archived aerial photographs

Period(Year)	Number of pictures(Approx.)
1946～1957	134,000
1992～2001	36,000
2003～2005	15,000



Fig.2-4-1 Internet Browser for Aerial Photographs (Search Result)



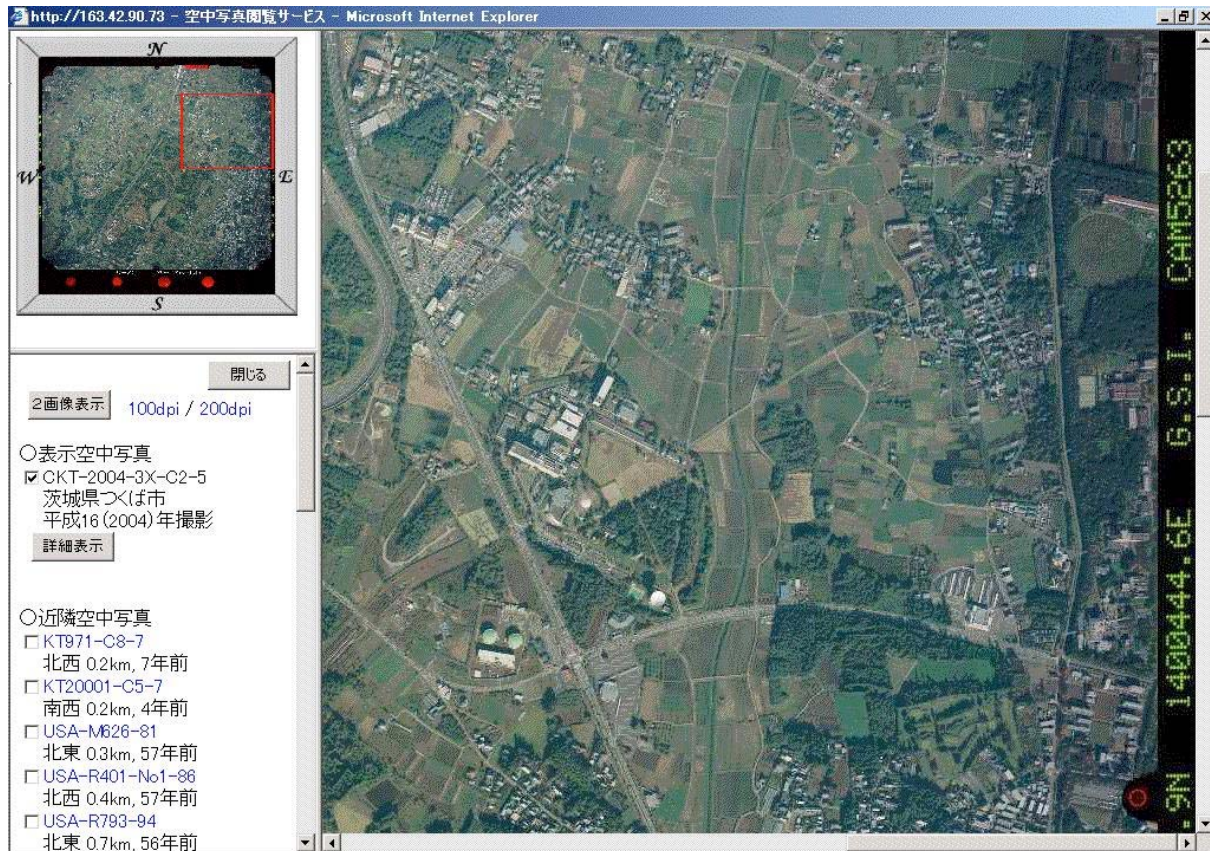


Fig.2-4-2 Internet Browser for Aerial Photographs

## 6) ISO/TC211 (Geographic information/Geomatics)

GSI has actively participated in ISO/TC211 since the foundation in view of the importance of standardization of geographical information and has promoted to develop Japanese Standards for Geographic Information (JSGI) in accordance with ISO/TC211.

The latest version of JSGI2.0 was published in March 2002. In addition, to promote use of standards, GSI developed the Japan Profile for Geographic Information Standards (JPGIS) in January 2005, as a practical profile of JSGI.

## (5) International Activities

### 1) Global Mapping Project

Global Mapping Project is the international cooperation project of National Mapping Organizations (NMOs) and partners to develop a set of global geographic data with verified quality based on consistent specifications. The project has been steered and promoted through International Steering Committee for Global Mapping (ISCGM) established in 1996. ISCGM Secretariat is situated at GSI. As of June 2007, 156 countries and 16 regions have participated in the project, and 35 countries' and 2 regions' Global Map data which cover 34.2 % on territorial basis and 17.6 % on population basis- of the whole land have been already developed and are being public through the Internet from the ISCGM website (<http://www.iscgm.org>). The present status of the project is summarized in Fig.2-5.

GSI is developing not only the Global Map Data of Japan but also the Global Map Data of developing countries mainly in Asia and the Pacific region in cooperation with respective NMOs. In 2003-2006, Global

Map of the following countries have been developed with GSI assistance: Swaziland and Honduras in 2003; Armenia, Azerbaijan, Bolivia, Oman and Tajikistan in 2005; and Cambodia, Congo (Republic of), Niger and Mauritania in 2006. GSI will continue to make efforts to implement Global Mapping Project as ISCGM Secretariat.

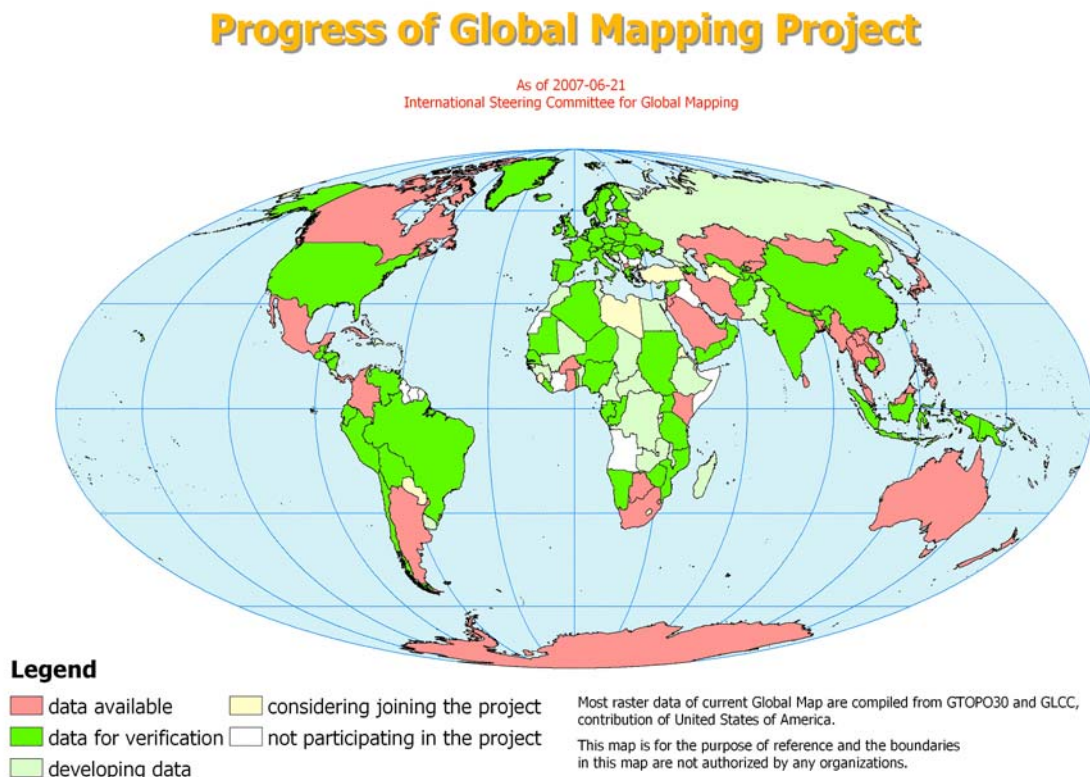


Fig.2-5 Present Status of Global Mapping Project

## 2) United Nations Regional Cartographic Conference for Asia and the Pacific (UNRCCAP)

UNRCC-AP was held at UN Conference Center in Thailand on September 2006 in conjunction with 12th PCGIAP meeting. Since there was no host country, the meeting arrangements and preparations were supported by GSI as the PCGIAP Secretariat. Mr. YAGUCHI Akira, Director General of GSI, was appointed as a rapporteur. During the Conference, a workshop focused on “Use of Geo-information for mitigating large scale disaster and attaining sustainable development” was held by the cooperation of PCGIAP, ISCGM and ICA. GSI as the Secretariat of ISCGM managed the Workshop.

## 3) Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP)

PCGIAP was established pursuant to a resolution of the 13th UNRCC-AP to cooperate in the development of a regional geographic information infrastructure. GSI served as the PCGIAP Secretariat and supported activities of PCGIAP between 2000 and 2006. The Vice President of PCGIAP was elected from GSI at the 12<sup>th</sup> PCGIAP held on September 2006. At the same time, a staff member of GSI became the Chairman of Working Group 1 (WG1), Regional Geodesy and has managed the WG1.

## (6) Research and Development



## 1) Application of satellite data and remote sensing

GSI studies satellite and remote sensing for effective map-making. Development of various sensors is pushed forward, and we begin to take the benefit. We introduce some sensor as below.

### a) The High-Resolution Image by Satellite

The 21st century begins, and the satellite with high resolution optical sensor such as IKONOS and QuickBird were launched, and there are several high resolution satellites in space now. The resolution of optical sensor of some commercial satellites is less than 1m.

The GSI has tested the quality of these satellites images and confirmed that the IKONOS and QuickBird images have almost same quality as conventional aerial photographs for making a topographic map of 1/25,000, but several problems still remain, such as geometric accuracy and high cost. The GSI continues to confirm its accuracy for making the 1/2,500 scale maps that almost all local governments need for city planning. The ALOS (Advance Land Observing Satellite) of Japanese was launched on January 24<sup>th</sup> 2006 by Japan aerospace exploration agency (JAXA). The major purpose of the ALOS is to generate 1/25,000 scale map, and the ALOS has the ability of making 1/25,000 scale map without any Ground Control Points. In addition, the cost of obtaining the image is much lower than commercial satellites. So the GSI has validated the ALOS data, such as whether the accuracy is enough or not to making 1/25,000 scale map. We expect the ALOS can be the first practical satellite in mapping (Fig.2-6).

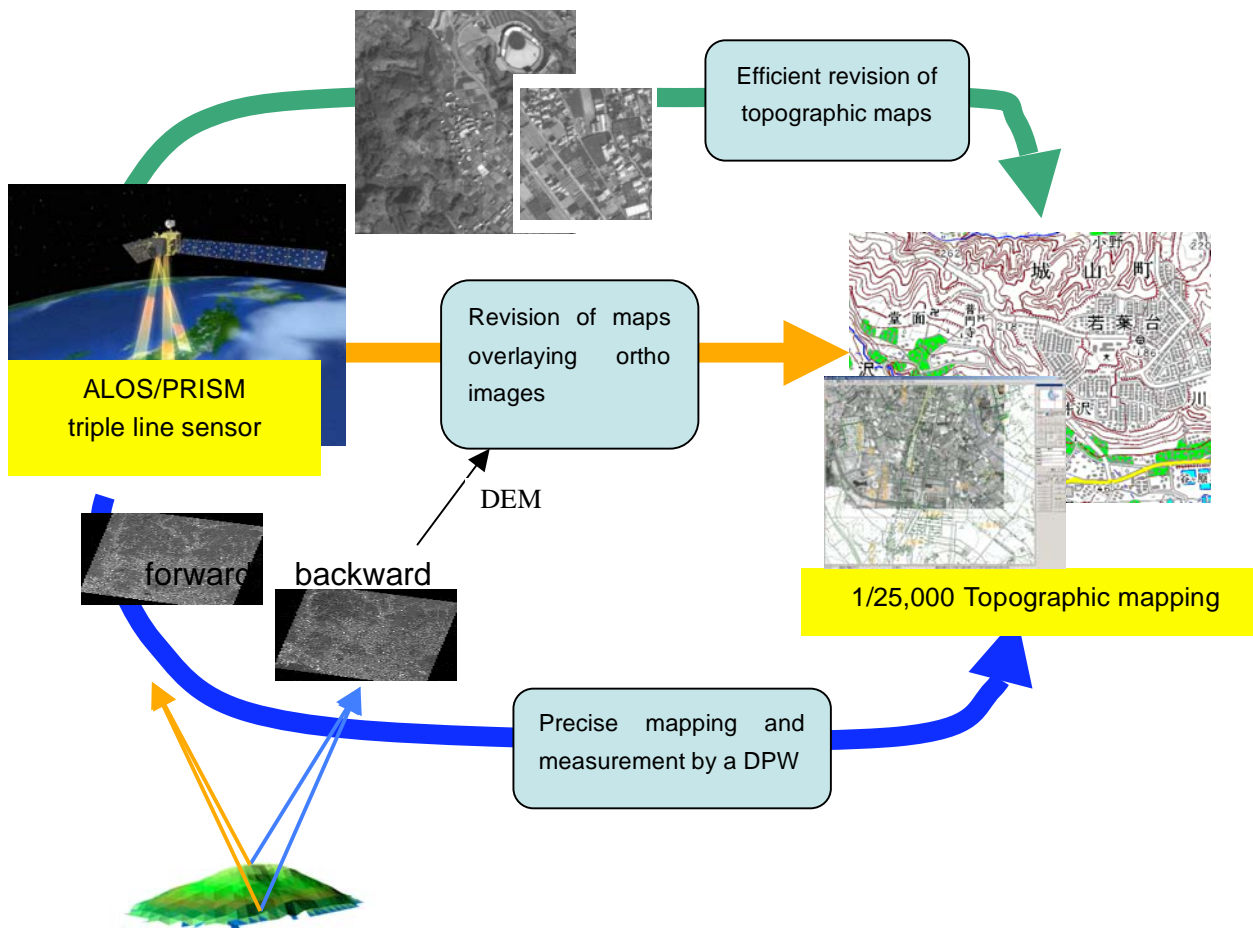


Fig.2-6 Application of ALOS for Topographic Mapping

### b) Airborne Laser Survey (LIDAR)

The Airborne Laser Survey is a distance-measuring technology that emits laser beams tens of thousands times per second as if scanning the earth's surface and measures the time from their emission till their return to the aircraft after reflecting from objects. The acquisition data are analyzed to make contour map or DEM. This new technology can be regarded as a kind of remote sensing. The positional accuracy thus obtained is, in optimal conditions, reported to be 30 to 50 centimeters in the horizontal direction and 15 centimeters in the vertical direction, though it is affected by the conditions of topography or vegetation in the target area. In Japan, major aerial survey companies started adopting the Airborne Laser Survey around 1997 for erosion control site in steep mountains. Making good use of this new technology, the GSI has started to publish the DEM of 5 meter grid data of plains in some metropolitan area since 2003. Moreover, in 2006, GSI made the '1:25,000 scale relief map' (Fig.2-7) as an example of the DEM of 5 meter grid data practical use. It was developed by superimposing topographic map at 1:25,000 scale on the shaded layer tint map generated from the DEM of 5 meter grid data. In addition, several aerial survey companies have individually begun to sell detailed building data for 3-D model and detailed topographic data.

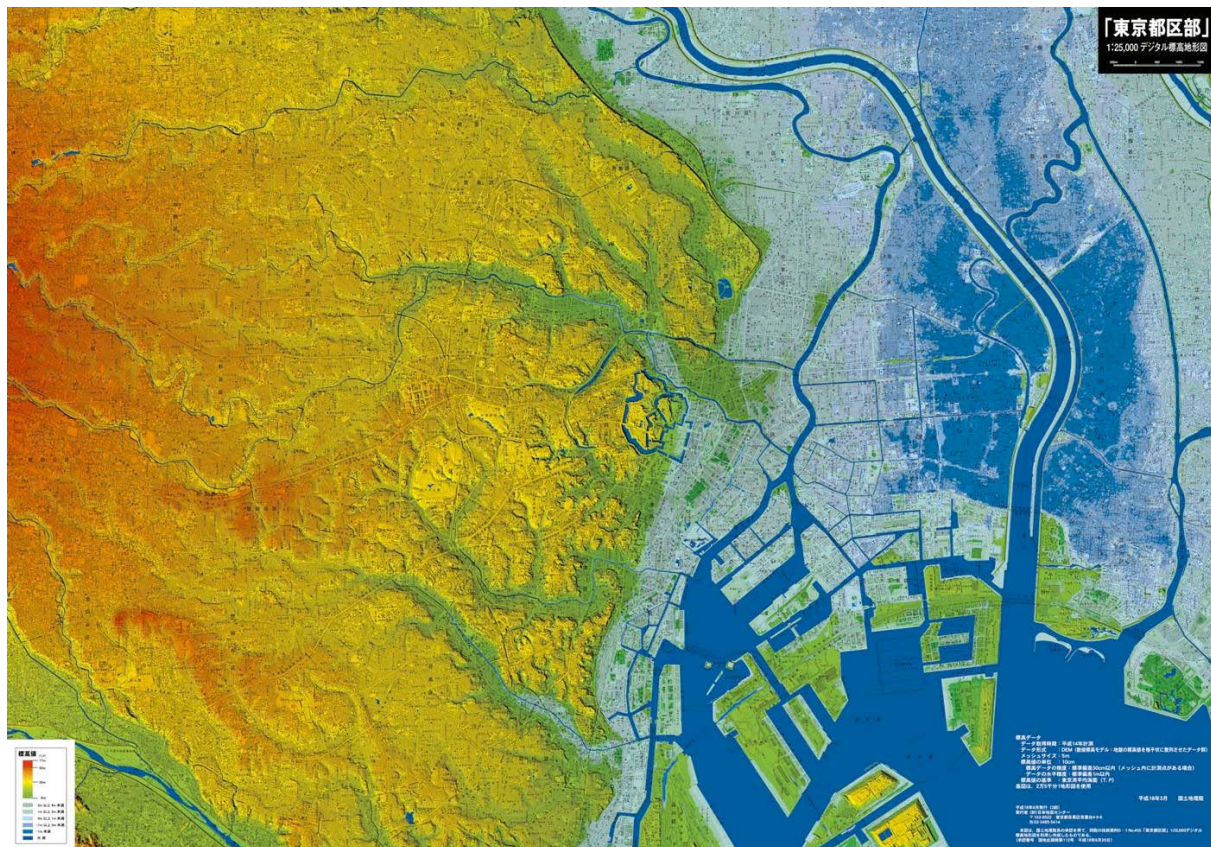


Fig.2-7 '1:25,000 scale relief map' (The 23-ward area of Tokyo metropolis)

### c) SAR (Synthetic Aperture Radar)

SAR is the imaging radar which acquires terrain imagery by transmitting microwaves and receiving their reflection from the earth's surface. Microwaves can penetrate through vapor so that SAR can observe through clouds, mists or volcanic fumes. Also as it is an active sensor transmitting microwaves, it can observe even in the night.

Since the major eruption of Asama volcano on September 1, 2004, GSI has repeatedly carried out AirSAR

measurements around the summit crater, and observed its topographic change (the movement of the erupted lava). Fig.2-8 shows a combined chart of the cross section of the crater (from northeast to southwest) modified by using the results of each measurement. From the series of these AirSAR observations, it is proved that AirSAR is effective in observing terrain under volcanic fumes, where ordinary photography is unavailable.

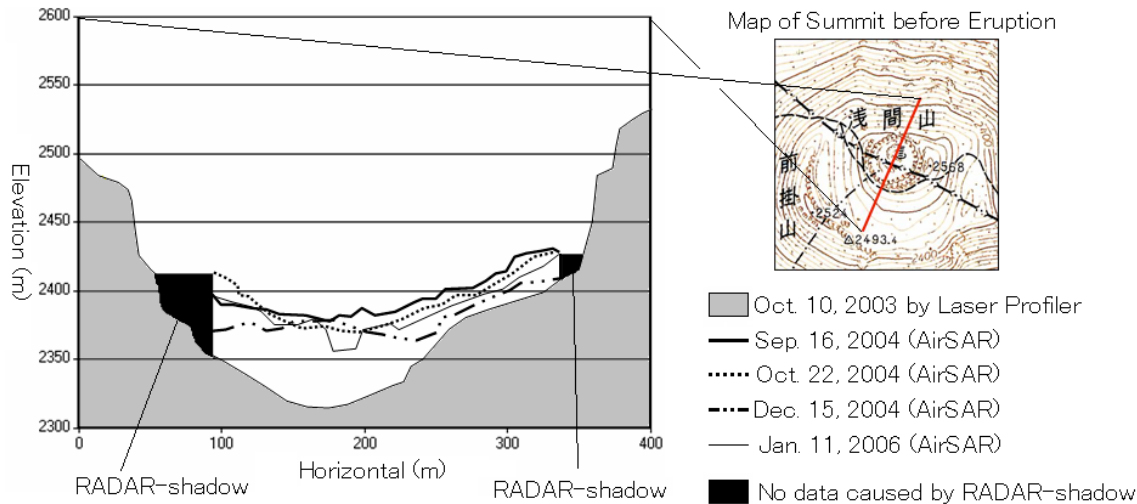


Fig.2-8 Change of topography in the summit crater of the Asama volcano

## 2) Application of geospatial information

GSI has been conducting various kinds of study for the purpose of advancement of utilization of geospatial information. An example is a study on GIS analysis of the relationship between earthquake damages and micro landforms using land condition maps. GSI clarified the geographical relationship between the variations of micro landforms and the degree of earthquake damages by combining the vector data of land condition maps and the information of earthquake damage distribution using GIS. Landform classification data of land condition map were overlaid with distribution map of housing damages by large earthquake. It was revealed that on terrace or fluvial fan, housing damages are relatively small, where on valley plain or flood plain, coastal plain or delta and natural levee housing damages are relatively large.

Another example is a study on application of time-serial geographic information such as outdated topographic maps and aerial photos. In this study, GSI verified the positioning accuracy of outdated topographical maps, and developed the method of colorizing of old monochrome aerial photos taken just after the World War Two. GSI also developed the method for detection of the artificial topographical changes by creating and comparing time-serial DEMs using aerial photos of different age.

## (7) Public Relations

### 1) Science Museum of Maps and Survey

This museum was established in the Geographical Survey Institute, Tsukuba City in 1996. It includes two exhibition rooms, the Standing Exhibition Room and the Special Exhibition Room where special thematic exhibitions are held irregularly. As a special exhibition, "Exhibition of Excellent Maps made by the Children and Pupils of the Primary and Secondary Education of the Whole Country" has been held annually since 1998, gathering selected excellent maps from the similar local map exhibitions and aiming to diffuse map education, to popularize maps and to make a network of the teachers and researchers of map education.



## 2) Map Exhibition

The Map Exhibition organized jointly by the GSI and seven public corporations and foundations makes a tour every year in larger cities. Recent exhibitions are as follows:

Table 2-7 Map Exhibitions in 2003 - 2006

Year	City	Duration	Total number of visitors
2003	Saitama	5 days	8,340
2004	Matsuyama	5 days	8,215
2005	Shizuoka	3 days	5,325
2006	Osaka	5 days	8,068

## 3) Children's Map Competitions

There exist more than ten local groups of teachers organizing children's map competitions. The oldest one has celebrated its 45th anniversary. Eight groups established a coordinating committee in 1998, and hold a joint exhibition once a year at the Science Museum of Maps and Surveys of GSI. A public foundation promotes a competition of children's work called My Town Map Concours. From 1999, applicants have had to send their maps in CD-Rs or MOs or send them through the Internet.

## 4) Exhibition of Ino's Maps

207 sheets of a large-scale map series of Japan were discovered in the Library of Congress of the US in 2001. The map series was surveyed by Ino Tadataka(1745-1818), most of them had been thought to be lost forever. The GSI, supported by some concerned parties, made a precise replica by taking high-resolution digital photographs of them and printing the digitized image. The GSI and the parties established a committee to promote exhibitions of these maps in Japan. The exhibitions started in 2004 till now.

The GSI has another series of medium scale of Ino's Maps, but they are old and worn. The GSI has been repairing those maps.



Fig.2-9 A part of Ino's large-scale Map Replica, No.90 (Hachiouji, about 25 miles west from Edo)

## 2. Hydrographic and Oceanographic Department (HOD) of Japan Coast Guard, MLIT

### (1) Hydrographic Work

#### 1) Hydrographic Surveying and Charting

The number of different types of hydrographic surveys carried out by HOD during the years between 2003 and 2006 are shown in Table 2-8. The results of these surveys have been used to produce new charts and new editions of existing charts as well as correction chartlets and other charts and maps as listed in Table 2-9.

Table 2-8 Hydrographic Surveys 2003-2006

Type of survey	2003	2004	2005	2006
Harbour	1	1	1	2
Updating	231	210	189	228
Coastal	9	9	7	4
Basic Maps of the Sea	0	0	0	0
Earthquake prediction	13	12	1	2

Table 2-9 Nautical and Other Charts 2003-2006

Type of chart		2003	2004	2005	2006
New Charts	Nautical charts	15	36	18	0
	Miscellaneous charts	0	7	8	2
	Basic Maps of the Sea	0	0	0	0
	Aeronautical charts	0	0	0	0
New Editions	Nautical charts	100	97	113	107
	Miscellaneous charts	0	3	3	1
	Basic Maps of the Sea	1	0	0	1
	Aeronautical charts	4	6	2	2
Total		120	150	144	113

#### a) Nautical Charts

There have been remarkable changes and increase in demands for hydrographic data and information in recent years as a consequence of the progress made in harbour construction works, dredging operations on shipping routes as well as the popularization of marine leisure activities.

With these remarkable changes in hydrographic data and information, HOD has been carrying out various surveys and observations in and around ports and harbours, and has been exerting effort to update the charts concerned, by issuing new charts and new editions of existing charts as well as by marking corrections with correction chartlets which are made available to users through Notices and Mariners. In particular, new editions of charts covering areas with considerable changes are compiled and published regularly either every year or every three years.

#### b) Basic Maps of the Sea

In addition to the production of nautical charts, which is the principal function of HOD, the Basic Maps of the Sea (BMS) series has also been produced and published since 1976 to provide fundamental data necessary for various maritime activities, including sea bottom and ocean development. The Basic Maps of the Sea series has been produced as shown in Table 2-10.

Table 2-10 Classification of BMS

Series	Scale	Coverage	Size	Type
BMS in Coastal Waters	1:10,000 1:50,000	Within 12M of the coast	Full 1/2	Bathymetry; Submarine structure
BMS on Continental Shelf Areas	Mainly 1:200,000	Continental margin	Full	Bathymetry; Submarine structure; Total magnetic intensity; Gravity anomaly
BMS in Ocean Areas	1:3,000,000	Ocean Area	Full	do. (except Submarine structure;)

The number of paper charts issued as of April 2007 is shown below:

Table 2-11 Number of Paper Charts Issued

Type of Chart	Number of Issues
Nautical charts	758
Miscellaneous charts	95
Basic Maps of The Sea	494
Aeronautical charts	25
Total	1,372

Note: The International Charts of the International Hydrographic Organization(IHO) under the responsibility of Japan as the produce nation, i.e. six of the 1:3,500,000 series and two of the 1:10,000,000 series have been published.

#### d) Electronic Navigational Charts (ENCs)

For efficient and safe navigation, Electronic Navigational Charts (ENCs) are published. Development of smaller scale ENCs covering the northwestern Pacific Ocean from the Japanese coast to the Strait of Malacca was completed. Larger scale ENCs covering major ports and harbours and their approaches have been published.

“Electronic Notices to Mariners” are issued monthly via Internet to update ENC.

Table 2-12 Number of ENCs Issued as of April 2007

Type of Chart	Number of Issues
Electronic Navigational Charts	609 cell

Note: The kinds of cell are 25 Degree, 8 Degree, 4 Degree, 1 Degree, 30 Minutes and 15 Minutes.

## 2) Marine Survey

### a) Survey of coastal Area

In order to cope with the establishment of 200-mile exclusive economic zone (EEZ) in accordance with the United Nations Convention on the Law of the Sea (UNCLOS), HOD is carrying out detailed surveys of low-water lines, topography and geological structure of the sea-bed in coastal area, particularly in those important areas around baseline defining the Japanese territorial sea. Japan concluded UNCLOS in 1996.

### b) Airborne Laser Hydrography

HOD and 6th Regional Japan Coast Guard Headquarters (RJCGH) has been carrying out airborne laser hydrography operations since 2004 for the mapping of very shallow waters. In 2005, HOD and 6th RJCGH surveyed the Island Sea, Setonaikai.



c) Survey of Continental Shelf Areas

HOD is carrying out hydrographic surveys south of Japan by using the large-type survey vessel “TAKUYO” and “SHOYO” equipped with modern survey instruments such as multi-beam echo sounder in order to obtain basic data required for the promotion of utilization and development of the continental shelf of Japan.

d) Surveys for Earthquake Prediction Program

HOD surveys for the earthquake prediction program. In order to obtain data information necessary for the prediction of earthquake, HOD has been carrying out surveys and investigations for submarine topography and/or active sea-bottom structures at specific areas off Miyagi, near Nankai trough, Tokachi and off Shimane.

3) International Lunar Occultation Centre

HOD conducts astronomical observation under international cooperation and makes efforts to improve the accuracy of ephemeris. Particularly from April 1981, upon the request of the International Astronomical Union (IAU), HOD took over the activities performed by the Royal Greenwich Observatory as the International Lunar Occultation Centre and started to collect and analyze observations all over the world in a homogeneous manner.

3. National Land Survey by the Ministry of Land, Infrastructure and Transport (MLIT)

The National Land Survey of Japan has been carried out under the direction and guidance of the Ministry of Land, Infrastructure and Transport (MLIT). The objective of the survey is to contribute to the promotion of effective use and conservation of national land. To reveal the present condition of national land, such as land ownership and its utilization, is another objective of this survey. It is expected to be based on the National Land Survey Act which was enacted in 1951, when the survey was initiated. This survey had not been promoted well, and in an attempt to do so, the acceleration Act, named The Act on Special Measures for Promotion of the National Land Survey was enacted in 1962. Three major items form the core of this survey; the land classification survey, the water use survey and the cadastral survey.

1) Land classification Survey and Water Use Survey

A land classification survey is the survey of the topographical and geological features, soil, and present land use. The results are compiled into atlases and books. A water use survey aims at investigating the basic statistics of a river, such as annual rainfall, discharge, present water utilization for farming or drinking and groundwater.

In the land classification survey, MLIT had developed a computerized mapping method in which a specific device, controlled by computer, can draw a colored map. By this method, one can easily identify various kinds of data related to land classification.

The above mentioned surveys are compiled into atlases and books as follows:

- a) Land classification maps (Geomorphological map, Surface geology map, Soil map, Present land use map, and Land use capability classification map), overlays (such as slope map) and an Explanatory data book.
- b) Land conservation maps (Natural condition map, Present land use and vegetation map, Natural disasters map, Land use tendency and designated areas map, Control and designated area for disaster prevention map, Valuable natural and cultural assets distribution map, Basic conservation map) and Explanatory data book.
- c) Water use maps and a descriptive catalogue of available information on major river system.
- d) Groundwater maps and Explanatory data book.
- e) Groundwater data ledger.

## 2) Cadastral Survey

The cadastral survey aims at clarifying the location, boundary, ownership, lot number, acreage, and current status of land use of each parcel. Local governments, such as prefectural and municipal governments, carry out the survey. They transact such affairs as planning the survey project, making contact with a surveying company, and supervising. MLIT plays a role in the survey by giving local governments a 50% subsidy of the total cost and some technical guidance as well. The executive body only has to share 1/20 of the total cost, since a special grant is given to the survey by the Japanese government. Because of present austere budget conditions, the progress of the survey has suffered a sharp curb. The progress of this survey at the end of FY2006 is as follows:

- Completed cadastral survey: 135,639 km<sup>2</sup> (1951-2006)
- Progress ratio: 47% (Target acreage of the survey: 286,200 km<sup>2</sup>)

The cadastral survey consists of the following stages; supplementary survey, detailed on-the-spot survey, measuring the acreage of each parcel, and making atlases and books. The supplementary survey comprises the control point survey which is to set up control points for cadastral surveying. The establishment of these control points is carried out by GSI. Scales of cadastral atlases differ from case to case depending on the mean acreage of a parcel. Scales of 1:250, 1:500, 1:1,000, 1:2,500, or 1:5,000 are used. Of these, the scales of 1:500 and 1:1,000 are the most commonly used. The required accuracy of measurement is classified into six types depending on the land use pattern.

Copies of cadastral maps and books are bound to be sent to registry offices after having been checked for accuracy and obtaining the legal approval of MLIT, or, in some cases, from the prefectural governor, to replace the old maps which were prepared about 100 years ago and are still used for levy and land registration.

## 4. Ministry of Agriculture, Forestry and Fisheries (MAFF)

### (1) Large Scale Topographic Maps

The Forestry Agency began promoting a similar project in mountainous areas as the National Large Scale Topographic Mapping Project by GSI, for the purpose of producing a Basic Forest Map (BFM) as the basis for surveying forests. The project covering mountainous areas was completed in 1980. Currently the Forestry Agency is promoting revision work of the existing Basic Forest Map.

Currently Forestry Agency is promoting Forest GIS (Geographic Information System) and digital mapping work of Forest Planning Maps. Table 2-13 shows the basic forest mapping work during the same period.

Table 2-13 Basic Forest Mapping

Title	2004	2005	2006	2007
1:5,000 Photomaps	899km <sup>2</sup>	554km <sup>2</sup>	496km <sup>2</sup>	916 km <sup>2</sup>
1:5,000 BFM Revision	2,172km <sup>2</sup>	1,044km <sup>2</sup>	777km <sup>2</sup>	1,128km <sup>2</sup>

### (2) Soil Maps

Soil maps in Japan are roughly divided into two categories; for cultivated lands and for forest lands. They are prepared by the Ministry of Agriculture, Forestry and Fisheries.

A 1:50,000 scale map series of soil types and productivity of cultivated lands has been prepared by the Agricultural Production Bureau since 1959, and the entire area of cultivated land, 51,000 km<sup>2</sup> in all, is covered.

A 1:20,000 or a 1:50,000 scale map series of soil types in national forests has been prepared by the Forestry

Agency since 1947. 65,000 km<sup>2</sup> were covered by this series. This agency has also prepared a 1:50,000 scale map series of soil types for many private forests.

## 5. Geological Survey of Japan / National Institute of Advanced Industrial Science and Technology (GSJ/AIST)

### (1) Geological Maps

GSJ/AIST has published most of geologic maps which cover the Japanese islands on scales of 1:50,000, 1:200,000, 1:1,000,000, 1:2,000,000 and 1:500,000. A series of basic geologic maps published by GSJ/AIST is prepared on the scale of 1:50,000. This basic series was once prepared on the scale of 1:75,000 and the scale was changed to 1:50,000 in 1952. The coverage over the land becomes 927 sheets published out of 1274 (72.8%) at scale of 1:50,000 and 106 sheets published out of 124 (85.5%) at scale of 1:200,000.

In addition, 15 thematic maps and 18 digital geoscience maps (CD-ROM) were also published in 2003-2005. Compiling these basic geologic maps and other geologic information, GSJ/AIST published smaller scale maps. The representative products are “Rupture probability map of major active faults in Japan” as Tectonic Map No.14 and “Interactive Geological Hazard Map of East and Southeast Asia, GeoHazardView version 2” as Digital Geoscience Map G-11.

### (2) Marine Geology

GSJ/AIST has been engaged in marine geological and geophysical investigation of the sea around the Japanese Islands, the western and central Pacific Ocean and the Antarctic sea. The investigation comprises basic studies of marine geology, mineral resources and geophysical prospecting, including sedimentological and environmental study of lacustrine and coastal areas. Marine geological maps (8 sheets) on the scale of 1:1,000,000 covering the Japanese islands were published and a series of marine geological maps on the scale of 1:200,000 (25 sheets of geological map and 21 sheets of sedimentological map) has been published around the main Japanese Islands. Since 2002, marine geological maps on the scale of 1:200,000 (1 sheet of geological map and 1 sheet of sedimentological map) have been published as CD-ROM.

## 6. Technical cooperation

In order to provide technical assistance and implement the transfer of technology in the field of cartography, the GSI, the HOD, the MLIT, the GSJ/AIST and other bodies are actively engaged in various technical cooperative projects, implemented by Japan International Cooperation Agency (JICA), which is commissioned by the Ministry of Foreign Affairs. Technical cooperative activities in the fields of surveying, mapping, hydrography, oceanography and geoscientific research can be grouped into three categories: namely, acceptance of trainees, dispatch of experts and cooperative projects.

### (1) Training

#### 1) Training Courses in Surveying and Mapping

##### a) Group Training Course in Planning and Management of National Mapping and Surveying (JICA)

At the Second United Nations Regional Cartographic Conference for Asia and the Far East held in Tokyo in 1958, the importance of professional education in surveying and mapping for technical personnel of developing countries was recognized. As an outcome of this conference, Japan started, after a five-year preparation period, a group training course in surveying and mapping in 1963. The curriculum of the course has been reconsidered and improved when necessary.

Especially in 1992, this group training course was largely reorganized to cover all fields of surveying and mapping technology, which had shown rapid progress, including geodesy, photogrammetry, cartography and map reproduction as well as Global Positioning System (GPS), Geographic Information System (GIS) and remote sensing.

This course was completed with a total of 371 participants from 62 countries, and was succeeded by a group training course in Planning and Management of National Mapping and Surveying in 2000. The new course is designed to support developing countries or regions to learn good practices of survey administration and project management, namely, laws and regulations, project planning and management, education and dissemination of information. Total number of participants from 2003 to 2006 was 31 from 17 countries.

Table 2-14 Number of participants in "Planning and Management of National Mapping and Surveying (JICA)"

Country	2003	2004	2005	2006	Total
Afghanistan				1	1
Bangladesh	1	2		1	4
China	1				1
Cuba		1			1
Colombia			1		1
Kenya		2	1		3
Kiribas				1	1
Malaysia			1		1
Mali	1				1
Mongolia	1			1	2
Pakistan				1	1
Philippines	1			1	2
Saint Lucia			1		1
Senegal				2	2
Swaziland	1				1
Syria		1			1
Tanzania(Zanzibar)			1		1
Thailand	1	1			2
Timor-Leste			1		1
Uganda		1	1		2
Vanuatu	1				1
Total	8	8	7	8	31

#### b) Group Training Course in Global Mapping (JICA)

A new group training course "Global Mapping-Contribution to Global Mapping Development by GIS" started in 2004 succeeding the former group course "Global Mapping" from 1999-2003. The new course aims at capacity building to promote Global Mapping project through transferring technologies of remote sensing and Geographical Information Systems (GIS). The cumulative number of participants of global mapping related courses from 1994 to 2005 reaches 58 people from 34 countries.

Table 2-15 The number of participants in the Global Mapping course(JICA) for the last five years

Region	Country	2001	2002	2003	2004	2005	Total
Asia	Afghanistan					1	1
	Bangladesh				1		1
	Cambodia				1		1
	China		1		1		2
	India			1	1		2
	Iran		1				1
	Laos	1					1
	Myanmar	1					1
	Nepal					1	1
	Oman			1			1
	Pakistan		1				1
	Palestinian Authority					1	1
	Philippines			1			1
	Saudi Arabia		1				1
	Thailand			1	1		2
	Uzbekistan					1	1
	Viet Nam		1				1
Africa	Algeria					1	1
	Ghana	1					1
	Tunisia				2		2
	Uganda	1					1
Europe	Macedonia					1	1
North-South America	Brazil					1	1
	Guatemala				1		1
	Nicaragua	1					1
Oceania	Fiji			1		1	2
	Samoa				1		1
Total		5	5	5	9	8	32

\*In all tables in this report, each year represents Japanese fiscal year which starts from April of the year and ends in March of the next year.

### c) Individual Training

The individual training program is prepared in order to meet the needs of each trainee and his/her home government. The training period lasts one to six months. From 2003 through 2006, 5 trainees from Bangladesh and Philippines were accepted.

### 2) Training Courses in Hydrographic and Oceanographic Department

From F.Y. 2003 to 2005, the HOD conducted one group training courses and several individual training courses under the JICA scheme as follows:

#### a) Group Training Courses in Hydrographic Survey

This Group Training Course has been authorized by the FIG/IHO International Advisory Board as Category B

Course pertaining to Specialization in Nautical Charting and Port and Near Shore Surveys since June 1, 1988.

- a. Purpose: This course is designed to improve the knowledge in modern theory and techniques of hydrographic surveying for technical personnel currently engaged in port and near shore surveying.
- b. Duration: From May to December every year.
- c. Curriculum: The curriculum of the course includes lectures and practical components strictly complying with the requirements under the International Standards of Competence for Hydrographic Surveyors, 8th edition, 1997.
  - Lecture: Approx. 77 days
  - Practice: Approx. 10 days
  - Field/shipboard training: Approx. 36 days
  - Observation and study tour: Approx. 12 days

Table 2-16 Number of participants accepted to Group Training in Hydrographic Survey (2003-2005):

Country	2003	2004	2005	Total
Bangladesh	2	1		3
China		1	1	2
Egypt		1		1
Jamaica			1	1
Indonesia	1	1		3
Kenya	1	1	1	3
Malaysia	2	1	1	4
Mauritius	1	1	1	3
Pakistan	1	1	1	3
Philippines	1	1	1	3
Sri Lanka		1		1
Laos			1	1
Thailand			1	1
Total	9	10	10	29

#### b) Individual Training

The HOD conducted individual training as shown in Table 2-17.

Table 2-17 Individual Training conducted in 2003-2005

Country	Subject	Term
Mauritius	Chart Compilation	2003 (2 months)
Philippines	Mapping Policy Administration	2003(3 months)
	ENC Data Producing	2003 (3 month)
	Management of ENC Updating	2003 (1 month)
	Planning and Management of ENC	2003 (2 weeks)
	Operator of ENCs Updating	2004 (3 months)
	Manager of ENCs Updating	2004 (1month)

#### 3) Training Courses in Geosciences

Training of technical personnel from developing countries in geosciences is conducted as part of the technical activities at Geological Survey of Japan (GSJ/AIST), and GSJ accepts researchers in the general fields of

geology geoinformation and geo-engineering.

## (2) Dispatching of Technical Experts

### a) Experts in Surveying and Mapping

In 1964, GSI sent out four senior staff members to survey the national boundaries between Saudi Arabia and adjacent countries. Since then, GSI has sent 331 senior, experienced engineers as technical assistance experts. 269 of them were dispatched as short-term experts, who generally remain from several weeks to two months, to carry out particular projects based on requests to the Government of Japan from the recipient governments, while others are long-term experts who stay longer than one year and cooperate with their host governmental organization by providing technical assistance.

Table 2-18 Dispatching of long-term experts (2003 - 2006)

Country	Subject	GSI or MLIT	Term
Kenya	Advisor, Survey of Kenya	GSI	2003 - 2005
Bangladesh	Advisor, Survey of Bangladesh	GSI	2001 - 2003
	Expert in Mapping Technology, Survey of Bangladesh	GSI	2003 - 2005
	Improving of Digital Mapping System of Survey of Bangladesh	GSI	2005 -
Senegal	Geographic Information Management	GSI	2001 - 2003
Philippines	GEO-Spatial Data Administration, NAMIRIA	GSI	2004 -

### b) Experts in Hydrographic and Oceanographic Department

From F. Y. 2003 to 2005, the HOD sent 25 staff members as experts in the field of hydrography. 23 staff members of them were dispatched as short-term experts.

Table 2-19 Dispatching of long-term experts after 1999 - 2003.

Country	Subject	Term
Philippines	Electronic Navigational Charts Database	2001-2005
Mauritius	Adviser to Hydrography	1999-2003

### c) Experts in Geosciences

The GSJ/AIST is involved in technical cooperation programs of the Japanese Government. The activities of the Survey personnel in the geo-scientific and geo-technical assistance programs cover a broad spectrum of the geosciences, not only for mineral and energy resources but also for groundwater management, environment, environmental geology, geohazards, and geoinformation technology.

## (3) Cooperative Projects

### 1) Mapping Projects

In 1971, Japan started its first overseas mapping project in Indonesia to prepare national base maps of that country. Mapping projects in developing countries are conducted as technical cooperation by JICA. The role of the GSI in these overseas mapping projects is to give advice to both the authorities concerned in Japan as well as in the recipient countries on all aspects of surveying and mapping of the projects, and to supervise the survey project.

The projects are, in general, assigned to a survey company in Japan, by JICA for implementation. GSI provides technical guidance through the Advisory Committee and other meetings with authorities concerned. Most of the projects are to prepare topographic maps as national base maps. In some cases, thematic maps such as land use maps are also made.

Table 2-20 Overseas Mapping Projects in progress as of 2005

Kenya (Study for Establishment of Spatial Data Framework for City of Nairobi)			2003 - 2005
Digital Topographic Mapping	1 : 2,500	170 km <sup>2</sup>	
	1 : 5,000	415 km <sup>2</sup>	
Spatial Data Framework	1 : 2,500	15 km <sup>2</sup>	
Aerial Photo	1 : 15,000	700 km <sup>2</sup>	
Model GIS		15 km <sup>2</sup>	
Bosnia and Herzegovina (Establishment of Digital Topographic Map)			2003 - 2005
Digital Topographic Mapping	1 : 25,000	7,800 km <sup>2</sup>	
	1 : 5,000	72km <sup>2</sup>	
	1 : 2,500	24km <sup>2</sup>	
Aerial Photo	1 : 40,000	51,000 km <sup>2</sup>	
Kyrgyz (Study for Planning of Total Development in Issyk-Kul Area)			2003 - 2006
Digital Topographic Mapping	1 : 100,000	14,000 km <sup>2</sup>	
Digital Topographic Mapping	1 : 25,000	2,300 km <sup>2</sup>	
Georgia (Study for Establishment of Digital Topographic Map)			2004 -
Aerial Photo	1 : 40,000	30,000km <sup>2</sup>	
Digital Topographic Mapping	1 : 40,000	30,000km <sup>2</sup>	
GIS Model System	1 : 50,000		
Nicaragua (Study for Disaster Prevention Map and Information Infrastructure)			2004 - 2006
Aerial Photo	1 : 20,000	1,400km <sup>2</sup>	
Aerial Photo	1 : 40,000	12,000km <sup>2</sup>	
Digital Topographic Mapping	1 : 50,000	20,000km <sup>2</sup>	
GIS Data	1 : 50,000	20,000km <sup>2</sup>	
Volcano Disaster Prevention Map	1 : 100,000	2 areas	
Earthquake Disaster Prevention Map	1 : 125,000	1 city	
Flood Disaster Prevention Map	1 : 7,000 and 1 : 3,500	1 river	
Tsunami Disaster Prevention Map	1 : 50,000	4 cities	
Macedonia (Study for Establishment of National GIS Data Infrastructure)			2004 - 2006
Aerial Photo	1 : 40,000	25,000km <sup>2</sup>	
Digital Topographic Mapping	1 : 25,000	14,415km <sup>2</sup>	
GIS Data	1 : 25,000	3,556km <sup>2</sup>	
Colombia (Formulation of Geographic Database of the Principal Cities in the Atlantic Coast)			2005 -
Digital Topographic Map	1 : 2,000	400km <sup>2</sup>	

## 2) Technology Development for ENC Projects

In response to the request of the Government of Republic of the Philippines, a technical cooperation project is conducting from 2000 to 2005 to carry out technology development for Electronic Navigational Charts (ENCs). The purpose of the project is to produce the ENCs and Electronic Notices to Mariners in the Philippines, under JICA's technical cooperation scheme.



Since the dispatch of the preliminary study team to Philippines in 1999, the HOD is involved in the project. In accordance with the agreement between the relevant authorities concerned of the two governments, the five-year project started in 2000. Government of Republic of the Philippines published the nine ENC's and three Electronic Notices to Mariners by December 2004 as the products of the project.

### 3) Geoscientific Research Projects

Geological Survey of Japan (GSJ/AIST) is actively engaged in international geoscience programs in collaboration with many foreign countries. Japan belongs to the region of East Asia where recent economic growth is very rapid, hence we are facing with some global science issues stemming from the social changes, such as environmental protection, mitigation of natural hazard, not to mention the geological assessment /exploration of energy and mineral resources.

Seeking the solutions for these issues through an international research network is one of the important goals of GSJ's research programs.

## 7. Satellite for Cartography: Advanced Land Observing Satellite (ALOS)

Advanced Land Observing Satellite (ALOS) is the Japanese first cartographer in the space. This satellite had been developed since 1998 and injected into polar orbit on January 24<sup>th</sup> 2006 by Japan aerospace exploration agency (JAXA) used with H-IIA launch vehicle.

Japanese earth observation activity started in 1978 by receiving foreign remote-sensing satellite's data. Thereafter, 5 earth observation satellites (MOS-1, MOS-1b, JERS-1, ADEOS, ADEOS-II) were developed and launched, and ALOS is the satellite that follows JERS-1 and ADEOS and enhances their land observing technology for generating 1/25,000 scale map by observed data.

In order to satisfy mapping requirement, following capabilities are needed to ALOS satellite system.

- 1) Providing 3 to 5m altitude accuracy Digital Elevation Model.
- 2) Providing "Mapping without any Ground Control Points" capability.
- 3) Providing "Distortion free image".

And the other major objectives of ALOS, largest earth observation satellite ever built in Japan, are regional observation, disaster monitoring, and resource surveying.

The size of the ALOS is roughly 9m in length and 28m in width and its mass is 4,000kg. In-orbit configuration of the ALOS is shown in Fig.3-1 and Table 3-1 shows ALOS's typical characteristics.

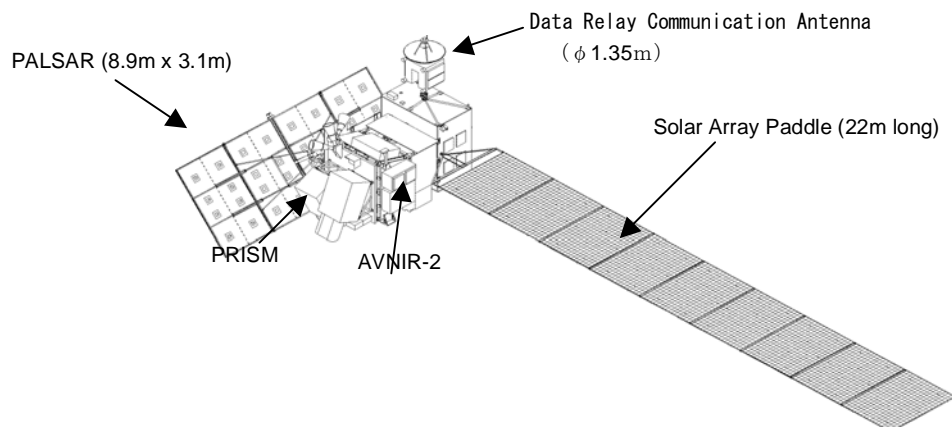


Fig. 3-1 ALOS in orbit configuration

Table 3-1 ALOS characteristics.

Item	Characteristics
Orbit	Sun synchronous, Sub recurrent
Altitude	691.65 km
Recurrent period	46 days, sub-cycle: 2 days
Inclination	98.16 degree
Generated power	More than 7 kW (end of life)
Weight	Approx. 4,000 kg
Data recorder	96 G bytes, solid-state
Data link	240 Mbps (via DRTS) 120 Mbps (direct down link)

To achieve mission requirements, ALOS has three remote-sensing instruments.

Panchromatic Remote-sensing Instruments for Stereo Mapping (PRISM) obtains precise land data with wide swath width. PRISM has three same telescopes looking forward, backward, and nadir to make digital elevation model for global mapping.

Advanced Visible and Near Infrared Radiometer type-2 (AVNIR-2) is a multi-band radiometer to obtain land coverage maps and land-use classification maps for monitoring regional environment.

Phased Array type L-band Synthetic Aperture Radar (PALSAR) is an active microwave sensor for all-weather observation. The development of PALSAR is the joint project between JAXA and the Japan Resources Observation Systems Organization (JAROS).

At present, ALOS has been under stable operation, three instruments have been used successfully for mission, and ALOS has transmitted about 3000 observation scenes per day via Data Relay and Tracking Satellite (DRTS) to ground station.

Particularly as for mapping mission, Geographical Survey Institute has validated ALOS data to modify topographic map quickly (Fig.3-2).

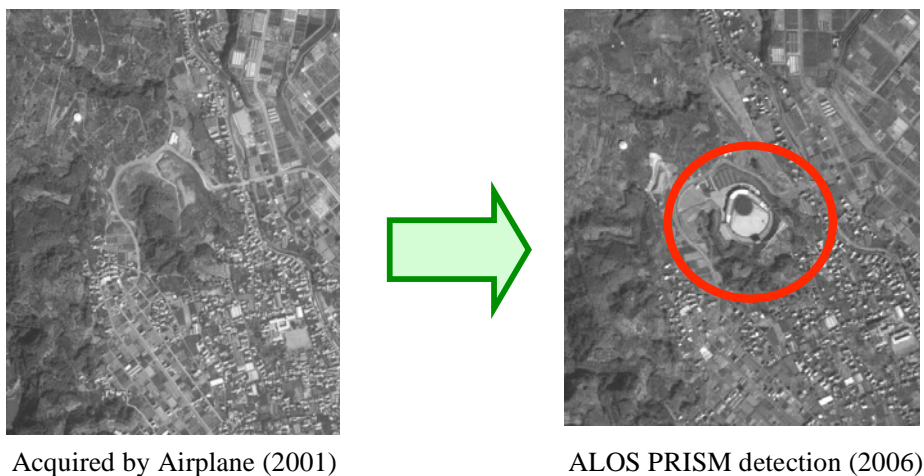


Fig. 3-2 ALOS data use for topography modification

So, it will be expected ALOS contributes to realize space utilization and effect innovatively to Geographic Information System (GIS).

(Editors: UNE Hiroshi, ISHIHARA Jyunichiro)

### III. ACTIVITIES OF PUBLIC CORPORATIONS, FOUNDATIONS, MUSEUMS AND LIBRARIES

#### 1. Public Corporations and Foundations

\* Special Member of the Japan Cartographic Association

##### (1) Japan Map Center\*

It is to distribute geographical information produced by the Geographical Survey Institute, to conduct research work on cartography and to promote map use. It started the Map Ability Quiz in 2004. The Quiz attracted the interest of not only those who engaged in cartography but also general public.

##### (2) Japan Hydrographic Association\*

It performs, among others, distribution of charts produced by the Hydrographic and Oceanographic Department of the Japan Coast Guard. It started to distribute Dual Badge Charts in 2006.

##### (3) Map Association\*

It is constituted of wholesalers and retailers of official maps prepared by the Geographical Survey Institute. Cooperating with the Japan Map Center, it plays an important role in smooth distribution of those maps.

##### (4) Japan Association of Mapping Enterprises\*

It is constituted of mapping companies and is to promote sound development of mapping industry.

##### (5) Japan Digital Road Map Association\*

It devotes itself to the preparation of a digital road map database for administrative use and for car navigation. Most new cars are equipped with car navigation system based on its digital road maps.

##### (6) Japan Association of Surveyors\*

It dedicates itself to the advancement of surveying technologies and the promotion of education and training of surveyors. It organizes Geoinformation Forum Japan every year.

##### (7) Association of Precise Survey and Applied Technologies\*

Constituted of leading surveying companies, it is active in promoting the Japanese GIS standards.

##### (8) Japan Geographic Data Center\*

It provides many kinds of geographical data of Japan. It was busy preparing those data of the consolidation of municipalities in recent years.

##### (9) Japan Construction Information Center

It is active in the field of GIS connected with construction.

##### (10) Infrastructure Development Institute –Japan

It is active in the international technical cooperation of surveying and mapping.

##### (11) International Cartographic Information Center

It collects and provides international cartographic information.

(12) Antique Map Society of Japan

It is going to be dissolved in 2007 after twelve year activities.

## 2. Museums and Libraries

(1) Science Museum of Map and Survey

Located in the Geographical Survey Institute, it was visited by 360,000 people from its opening in 1996. Special exhibitions such as old maps, children's maps, Antarctic maps were held in recent years.

(2) World Distribution Map Center of Gifu Prefectural Library

It is active in holding special exhibitions and lectures for school children, in publishing periodicals, etc.

(3) Map Gallery at Zenrin

Operated by Zenrin, a leading mapping company in Japan, the Gallery holds special exhibitions three times yearly.

(4) Yokohama Archives of History

It held special exhibitions of old maps and charts in recent years.

(NAGAI Nobuo)

## IV. ACTIVITIES OF LOCAL GOVERNMENT

### (1) Mapping Activity

Local government such as prefectures, cities and towns produce maps for various purposes, for example, road, river, upper water, sewer, forestry and property managements, and for city, industry, agriculture and facility planning. Most of the mapping is done in compliance with the Survey Act and the Public Survey Work Regulations. Major examples are shown in Table 1.

Table 1. Maps provided by Local Governments.

Titles	Scales	Status
Base Map for City Planning	1:2,500	It covers the urbanization promoting area in each city or town.
Road Management Master Map	1:500 to 1:1,000	It covers the roads (except on the national roads) managed by local governments.
River Management Master Map	1:2,500 to 1:5,000	It covers the rivers (except on the 1 <sup>st</sup> class rivers) managed by local governments.
Upper water management Master Map	1:1,000 to 1:2,500	It covers the upper water managed by local governments.
Sewer Management Master Map	1:1,000 to 1:2,500	It covers the sewer managed by local governments.
Fixed Property Map for Taxation	1:500 to 1:2500	It covers whole area managed by local governments.
Cadastral Map	1:250 to 1:5,000	More than 40% of whole Japan.

### (2) GIS Activity

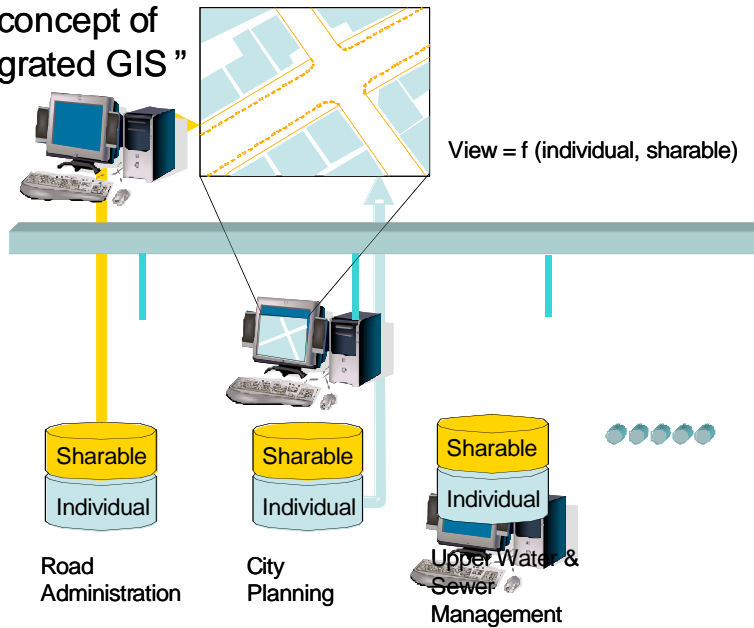
Local government in Japan started to introduce GIS for their work more than 20 years ago. The famous initiative called Urban Information System Project conducted by Ministry of Construction was started in early 1980s. Kitakyushu, Nishinomiya and other cities participated in this project and introduced GIS for their city planning. Nowadays, GIS is widely used in local governments not only for city planning but also for life line managements, agriculture, forestry, taxation and so on.

### (3) Integrated GIS

The Ministry of Public Management, Home Affairs, Post and Telecommunications adopted a concept of “Integrated GIS” in 1997 to promote the geographic data harmonization exchanged in the local governments. This idea was born affected by National Spatial Data Infrastructure (NSDI) promoted in US and other countries. Each GIS, even if the architecture of GISs is different, has interface to encode data in the standardized format and to decode them. In Japan, national and local governments use a profile of ISO/TC211 standards named as JPGIS (Japan Profile for Geographic Information Standards).

In case of Japan, local governments have the history of GIS more than 20 years as mentioned above, and during these years, each department has introduced and maintained its own GIS. It means that each department has its own data format, and it will be more difficult to exchange and share valuable data for other departments. This is the reason to promote Integrated GIS. Now, the Ministry of Public Management, Home Affairs, Post and Telecommunications subsidize local governments for their initiative to develop Integrated GIS. About 15% (272/1842) of local governments introduced Integrated GIS until 2006.

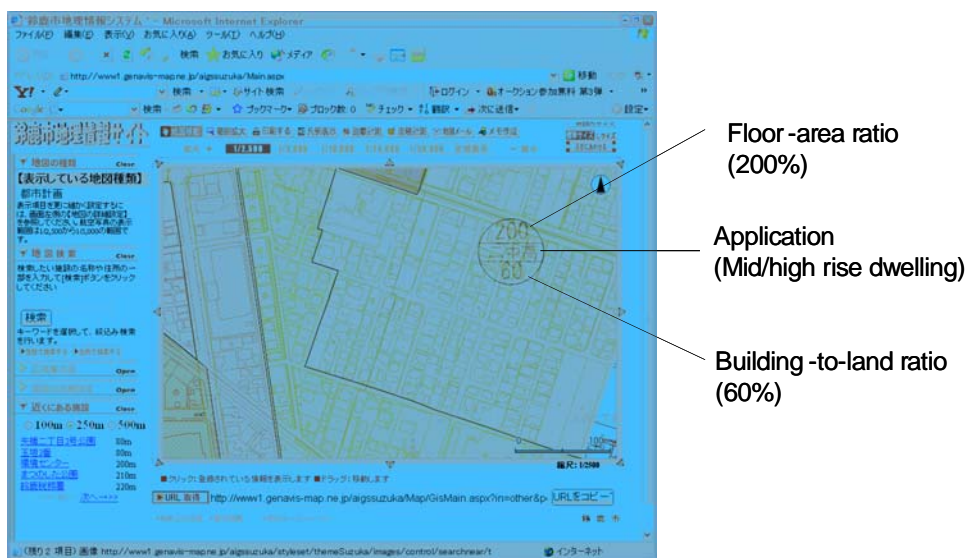
## The concept of "Integrated GIS"



### (4) Web Services

Integrated GIS is not only for the governments but also for citizens. Sharable geographic data should open to any people who need them. For example, if you have a plan to construct a building, you need to get information of zoning (building-to-land ratio, floor-area ratio, and application limitation, etc.) of the location in accordance with the building code. Nowadays, you can get the information through the Home Page provided by the local government. Web public service is a typical application of the Integrated GIS. The figure shown under is an example of Web public service provided by Suzuka City in Japan.

(<http://www1.genavis-map.ne.jp/aigssuzuka/Main.aspx>).



(OTA Morishige)

## V. ACTIVITIES OF PRIVATE SECTOR

### 1. Digital Services

There are many kinds of companies contributing in the fields of GIS and Mapping services in Japan. The main task of surveying company is the engineering survey, geographic data entry and maintenance, and cadastral survey under public organizations. However, many private companies have capability to consult, design and construct GIS for their clients such as national and local governments. Biggest companies such as Kokusai and Pasco contribute for the fields of GIS, photogrammetry, geological survey, civil engineering, overseas assistance, oceanographic survey, marketing, and so on. They keep more than 1000 employees and their annual incomes are more than 300 million US\$.

The mapping companies in Japan traditionally play a roll to supply maps for transportations, sight seeing, shopping and for public organizations. Nowadays, their business expands to the field of car and human navigations. Biggest companies in this field are, for example, Zenrin, Shobunsha, and Hokkaido-chizu.

Recently, human navigation service provided by, for example, Navi-time Japan, Ekitan, NTT Docomo and KDDI are growing rapidly. Such companies serve the direction to the destination and provide the information around the destination through cell-phones and the internet.

Companies	URLs
Kokusai Kogyo	<a href="http://www.kkc.co.jp/english/index.html">http://www.kkc.co.jp/english/index.html</a>
Pasco	<a href="http://www.pasco.co.jp/global/english/">http://www.pasco.co.jp/global/english/</a>
Zenrin	<a href="http://www.zenrin.co.jp/english/">http://www.zenrin.co.jp/english/</a>
Shobunsha	<a href="http://www.mapple.co.jp/">http://www.mapple.co.jp/</a>
Hokkaido-Chizu	<a href="http://www.hcc.co.jp/">http://www.hcc.co.jp/</a>
Navi-Time Japan	<a href="http://corporate.navitime.co.jp/en/profile/index.html">http://corporate.navitime.co.jp/en/profile/index.html</a>
Ekitan	<a href="http://ekitan.com/">http://ekitan.com/</a>
NTT docomo	<a href="http://www.nttdocomo.co.jp/english/">http://www.nttdocomo.co.jp/english/</a>
KDDI	<a href="http://www.kddi.com/english/index.html">http://www.kddi.com/english/index.html</a>

- Web Mapping

Web Mapping is a map presentation service provided on the Home Pages for sight seeing, reservation of restaurants, route guidance, weather forecasting, etc. National and regional information centers establish these sites, and user can access them through PCs, cell-phones and car navigation systems. Some of them realize the multi-modal navigation on foot, by train, by bus, and by airplane. These sites also serve the necessary time, transportation fee, and required times for connections. Typical web Mapping sites in Japan are shown below.

Japan National Tourist Organization	<a href="http://www.jnto.go.jp">http://www.jnto.go.jp</a>
Japan-guide.com	<a href="http://www.japan-guide.com/">http://www.japan-guide.com/</a>
Navi-Time Japan	<a href="http://corporate.navitime.co.jp/en/profile/index.html">http://corporate.navitime.co.jp/en/profile/index.html</a>
Ekitan	<a href="http://ekitan.com/">http://ekitan.com/</a>
Gurunavi	<a href="http://www.gnavi.co.jp/kanto/">http://www.gnavi.co.jp/kanto/</a>

- Car Navigation

The total amount of Car Navigation Systems shipped in Japan until March 2007 is over 26,120,000.



“Car-Navi” is more than Map System and it is now the Integrated Transportation System. Vehicle Information and Communication System (VICS) is mounted on recent Car-Navis. It can serve the shortest path considering the real-time traffic jam information.

Toyota	<a href="http://www.toyota.co.jp/en/tech/its/vision/index.html">http://www.toyota.co.jp/en/tech/its/vision/index.html</a>
Nissan	<a href="http://www.nissan.co.jp/en/navi.html">http://www.nissan.co.jp/en/navi.html</a>
Honda	<a href="http://www.honda.co.jp/navi/">http://www.honda.co.jp/navi/</a>
Panasonic	<a href="http://panasonic.jp/car/">http://panasonic.jp/car/</a>
Pioneer	<a href="http://pioneer.jp/carrozzeria/products/">http://pioneer.jp/carrozzeria/products/</a>

- Cell-phone

The total amount of cell-phones shipped until March 2007 in Japan is over 48,750,000. Some of them install GPS and users can get accurate maps around them in real time, and they provide the shortest path to the destination applying human navigation services through the internet.

- Security

Cell-phones with GPS are used for security of children and aged people. Their guardian can check where they are. For example, Parent can confirm that his/her child is on the right way to/from school or not. Aged person can send warning to the ambulance if he/she becomes bad condition, and ambulance or hospital can send the specialist to the place where he/she is.

SECOM	<a href="http://www.855756.com/">http://www.855756.com/</a>
ALSOK	<a href="http://e-shop.alsok.co.jp/consumer/anshin_mate/index.html">http://e-shop.alsok.co.jp/consumer/anshin_mate/index.html</a>

- Site selection and sales promotion

GIS is recognized as the powerful tool for site selection. Convenience stores, gas stations, restaurants, and super markets will be located at the place decided by prediction of sales.

- Newspaper

In Japan, newspaper is delivered from the newspaper agent located in a small district. Advertisement paper inserted in the newspaper is frequently used to call more people to the shops, and ad paper distribution is done in each territory of the agent. Advertisement Company uses GIS to determine the best-suited area for the particular advertisement.

(OTA Morishige)

## 2. Trends in Map Publication

In the map publishing business, market sales data by company and by the type of map are not officially announced and it is difficult to extract the sales statistics. Therefore, we will look at the sales of topographical maps, which is the national fundamental map, and digital maps.

It is found that the sales of digital data based mainly on spatial data are increasing while those of paper-based topographical maps are decreasing continuously. Among digital maps, the 1:25,000 topographical images are selling the most and their sales is growing at a rate of 114%. They are supposed to be used for GIS.

Also, a high growth rate of the 1:25,000 Land Condition Map sales seems to be caused by increasing demands for environmental researches that declare “Safety and Security” as keywords.

The sales of paper-based maps are decreasing and the trend toward increasing use of digital maps is expected to

become more and more prominent.

Changes are also seen in paper-based topographical maps. The practice of hiking, walking, mountaineering, and cycling in leisure hours are increasingly becoming popular among the middle-aged and elderly retired people in recent years. As a result, the middle-aged and elderly people who will buy topographical maps are increasing. (From the customer analysis by Buyodo, Inc.)

This behavior shows that, while the digitalization of maps is accelerated, there is a trend of changes in the demand of paper-based maps. At the present, paper-based maps are more convenient in mobile uses and a little ahead of the ubiquitous mapping that requires carrying communication terminals.

- Residential Map

In a residential map, the ground plan of individual housing and building can be identified and each building is provided with such information as occupants' name and name and address of the building. In addition to such information as names of the building and tenants, road traffic information such as locations and names of bus stop, traffic signals, crossings, street names and one-way traffics are also indicated.

The scale of those maps is usually large as ranging from 1:1,000 to 1:5,000. Residential maps cover about 95% of more than total 2,800 local municipalities throughout Japan. They are drawn up and sold by several private firms and usually made into a bound book edited for each city, town or village.

All basic data for those maps are solely collected by a private field survey. Data update by a field survey is usually done annually for cities where changes are frequent, and once every 2 to 5 years for the rest of areas. As the information update is done regularly, those maps are used in wide applications such as delivery service and moving industry, ambulance, police, and security service works and marketing researches.

Recently, residential maps are shifting from a booklet-style to a digital form. In addition to the sales in CD-ROM and DVD format, the form of sales and use is shifting toward wide area of applications in car navigation and via the Internet. Their total sales in digital applications are now exceeding the sales of paper-based maps.

(TAKAHASHI Norio and SAITO Tadimitsu)

- Historical Map

207 sheets of full-scale handwritten copy of the "Inoh's Large Scale Map", which was prepared by Tadataka Inoh with modern surveying methods for the first time in Japan at the end of the Edo era (early 19th Century), was found at the U.S. Library of Congress in Washington D.C. in 2001.

After that, Kawade Shobo Shinsha published the "Compendium of Inoh's Maps" in December of 2006, which was edited by Japan Map Center and includes reduced replica of complete 225 maps. Despite of very expensive pricing, 300 copies of the map published were sold out in three months.

(TAKAHASHI Norio and SAITO Tadimitsu)

- Tourist Map

Recently, the market of tourist map category, including various guidebooks, maps for hiking and walking and travel-guide magazines, is expanding.

A major factor contributing to this trend is an increase of tourism-related thematic topics such as hot springs, Japanese-style hotels, gourmet, and hiking among middle-aged and elderly people. Simplifications of map production and decrease in production costs with the help of computer technology are also contributing to this trend. Opportunities of general public to come across maps are increasing as popular shops and reputable restaurants are introduced in magazine articles attached with deformation maps along with other information such as address and telephone number.

Photographic maps that use aerial and satellite photographs in the background are also produced.

As the Internet becomes increasingly popular, various websites that belong to the category of tourist guides are

emerging. In the printed publications, many special feature articles on tourism are appearing in the magazine but the publication of independent books of this category is decreasing.

(TAKAHASHI Norio and SAITO Tadamitsu)

- Urban Map

The urban map is a general guide map of urbanized areas. A large scale ranging from 1:5,000 to 1:30,000 is usually adopted for this kind of maps. It is one of the most widely used maps in Japan and many private companies are entering in the production and publication of such maps.

The merger of cities, towns and villages is being carried out in Japan in recent years, and the area of each city is expanding. As a result, revisions of old maps become more and more frequent and more than 800 maps for almost all major cities are now published.

Information expressed on a map ranges from residence designation with the names and numbers of towns and blocks, bus routes with the names of bus stops, the names of crossings, road signs such as “No Right/Left Turns” or one way traffic, all of which are useful for urban life. Public facilities such as government and municipal offices, big businesses, shopping centers, hotels, schools and so on are depicted with reduced building plans.

Some maps are also coming up with intuitively recognizable ideas such as showing familiar logo-marks of the shop frequently seen in downtown streets.

The information is usually updated once or twice a year, and the field survey is regularly performed to respond to rapid changes.

Its format is roughly divided into two, a sheet-type of B2 to A1 sizes and a book-type of B6 to A3 sizes. Both formats are widely used.

In the book-type format, each map section is compiled by meshed division instead of administrative unit, and mostly published as an atlas that also serves as a road map.

Also, the “Support Map for Reaching Home at Earthquake Disaster” published by Shobunsha Publications, Inc., that targets large cities is gaining huge success among general public.

This map was awarded with the first “Best Product Prize” of the “Japan Cartographers Association Prize” that was inaugurated in 2006.



Fig. 4-1 Support Map for Reaching Home at Earthquake Disaster

In most map publications, the map is made from digital data and the printed map is produced through CTP(Computer-to-Plate) using those data.

(SAITO Tadamitsu)

- Road Map

The number of company that publishes road maps decreased in 2006. Although there had been six companies that publish road maps covering the whole country, one was applied with the Company Resuscitation Law and

had withdrawn from the map publication business. Another one was a company specialized in the road map, but was taken over by a company in different specialty and its future is uncertain whether it will continue the road map business. Moreover, another company is barely continuing to publish the whole country version but suspended the publication of regional maps. Presently, only one company is continuing to comprehensively publish both whole country and local versions of the map.

In response to the progress toward aging society in Japan, the map using large printing type is becoming popular in the printed publication items for sale, not only for road maps but also for historical and urban maps. The major reason for the slack of road map publication business is the diffusion of car navigation. Car navigation systems are now installed in 80% of new cars sold, and products that are automatically updated with communications technologies to cope with the changes or that of portable size, which can be removed from the car and used as a freely portable walking navigation system, are emerging. Now the road map is losing the position as an indispensable item for driving.

Another factor that cannot be overlooked is the improvements in provisions of road and road sign. Although there is some imbalance in road provisions by locality, roads are well provided in areas around ordinance-designated cities where a large proportion of Japanese population is concentrated. Although roads that connect cities or detour large cities to connect high-spec roads are still somewhat lacking, the trunk-line road network is well provided. At the same time, provisions of road signs are also improved. Provisions of information by electric bulletin boards about latest traffic congestions and accidents are increasing. Also, the visibility is improved by larger road signs and enhanced nighttime lighting, and the driving in unfamiliar lands is becoming much easier.

(TAKAHASHI Norio and SAITO Tadamitsu)

- Globe

As the internationalization progresses, the demand for globe is increasing as a result of customers' wishes to know the detail of topical areas or necessities to exchange with foreign countries. Globes of the size 21cm(1:60 million) to 32cm(1:40million) are popular for home use.

Globes are popular gift items for students at the occasions of school entrance or going on to higher schooling. In this case, the demand is divided into two extremes, modestly priced ones and high-end expensive products. The globe is also an indispensable teaching material for school education. Budgets are appropriated for furnishing globes to schools not only for social studies and geographical classes but also in other course of studies including international understandings and environmental education. New types of globe such as a blank map globe, English-language globe and environmental globe are also produced. For the learning aids, globe sizes of 43cm(1:30million) and 51cm(1:25million) are popular.



Fig. 4-2 Environmental Globe



Fig. 4-3 Balloon Globe

The environmental globe that shows surface vegetation and ocean temperature based on data obtained by the U.S. NOAA's weather satellite is favorably received.

Furthermore, the inflatable balloon globe is well received because it can be folded up when not in use.

There are mainly two kinds of production method for the globe. The conventional one is to print a map on a piece of ship bottom-shaped paper in polyconic projection by 20 or 30 degrees in longitude and paste it on a hollow sphere. The other is to print a pole-centered projection map of northern and southern hemispheres on two pieces of plastic sheets and mold them into hemisphere and join together at the equator. Presently, the latter method is widely used. Also, the globe made by acrylic resin is increasing due to the non-vinyl chloride movement arisen from recent environmental concerns.

(HIGUCHI Yonezo and SAITO Tadamitsu)

- Wall Map and Relief Map

In the education of social studies and geographical classes in primary, junior-high and high schools, large sized maps of whole and regional Japan and world have been used. They are mainly 150x210cm in size, made by joining 4 pieces of "Shiroku" sized paper together, and at a scale of 1:1million for whole Japan and 1:20million for the world (Mercator projection). Because the materials for education have become diversified and smaller sizes are easy to handle, half-sized wall maps are more commonly used these days.

In the production of wall map, the Japanese traditional cloth coating, axis-coated method is mainly used. Also, a scroll map equipped with a stroller is becoming popular for convenience in handling and storage.

In order to cope with the de facto English education at primary schools brought about by the increasing globalization and the requirement for studies of international understanding, English-version of world maps at a scale of 1:27.5million are published. Also, environmental world maps for environmental education are published.

A magnetic wall map that comes with magnet cards is also produced. On the surface of magnet cards, words such as the name of World Heritage, geographic name, country name and industry are printed and a student can select a card and place it on the map. The number of company that specialized in producing large-sized wall map is small because the market is limited to school education areas.

The map internationally called a relief map is called a three-dimensional map in Japan. It is mainly used for educational purposes at school but a relief map for the tourist resort or a particular locality is also produced for general use. Relief maps of distinctive topographical features such as calderas, alluvial fans and ria coastlines are often used in the classroom of geographical education. The recent trend is toward production of relief maps relating to nature and environment.

(HIGUCHI Yonezo and SAITO Tadamitsu)

- Tactual Map

As the national and local governments are pushing ahead with barrier-free policies to cope with the aging society, one often comes across not only elevators at the station and low-step busses but also tactual maps and audio assisted signs in the station, government office, amusement facility and stadium.

However, the publication of tactual maps for visually impaired person is heavily dependent on volunteers and social welfare corporations, and they are not readily available right now.

A system of producing tactual map using the digital data of the Geographical Survey Institute was realized by the digital map data, three-dimensional photocopy machine used in the school for the blind and the successful completion of tactual map production software. These self-produced tactual maps are playing an important role in the educational scene.

Tenyukai, a volunteer group in Kyoto, is publishing tactual maps of Japan by administrative division and of world by region.

(HAGIWARA Yasuyuki and SAITO Tadamitsu)



- Bird's-Eye View

Publication of traditional manually drawn bird's-eye views has sharply dropped. Akira Muramatsu, a pictorial map artist, published the pictorial maps with sightseeing information such as “Scroll Painting of the Excursion in the Lake Hamanako”, “Scroll Painting of Strolling along the Nogawa River” and “Pictorial Map of Strolling in Karuizawa” that use bird's-eye view techniques. Tadashi Ishihara, a bird's-eye view painter, published pieces entitled “New York” and “One Day in Midtown”. Tatsuya Kurosawa painted “Diorama Tokyo” that expressed the Great Tokyo Area.



Fig. 4-4 Relief Map of Tokyo (Part)

“Relief Map of Tokyo”, an illuminated relief, layer-tinted map, produced from the “Tokyo Numerical Map 25000” and 5m elevation mesh data and published by a technical book publisher under the edition of Tokyo Map Research, is drawing interests.

(HAGIWARA Yasuyuki and SAITO Tadamitsu)

- Atlas

Recently the national and local governments have been inactive in atlas publication. In private sectors, the mainstream products are revised editions of school atlas and their arrangement of compact atlases of B5 and A4 sizes. As for a new edition of large-sized atlas, only the Deluxe World Atlas by Shobunsha Publications, Inc., Great Atlas of the World and Great Atlas of Japan by You Can Inc. have been published recently. Road maps and urban maps formerly published in the form of single sheet are now published in a book-format and a style of city atlas by Prefecture.

While younger people are said to be reading books not much, middle-aged people are getting older in the

Japanese society. Maybe reflecting these changes, “Maps Using Larger Character”, an atlas with larger type sizes, and binder-type atlases in ring-file format are published in a series fashion.

In the atlas produced by private sector, an information map of the world that explains economy, culture, people and history of the world and an information map of Japan that introduce economy, culture and history by region are published annually from publishers specialized in practical articles and drawing wide interests.

These types of atlases are published from a few companies and some of them are selling over 30 thousand copies annually.

(HAGIWARA Yasuyuki and SAITO Tadamitsu)

- Electronic Publishing

In the area of electronic publishing, digital maps as an official map data are published and sold as electronic books in the form of CD-ROM combined with draw and display software. In the private sector, several companies such as Zenrin Co., Ltd. and Shobunsha Publications, Inc., are selling map software utilizing maps used in the car navigation system and residential map software utilizing the electronic residential maps.

Driven by improvements in the performance of personal computer and diffusion of various software, three-dimensional map software that integrate elevation data, map image data and satellite image data are published in recent years.

By connecting images seen from various directions and changing the viewing position and angle, it becomes possible to experience virtual tour or walkthrough while freely moving in the three dimensional space. CD-ROMs that contain panorama movies such as walkthrough in ocean floor panorama terrain using such technology are sold.

This technology area is expected to develop rapidly in the same way as the area of game software, and variety of relief maps are expected to come out in the future.

Unlike flat maps or oblique photographs, relief map that shows panoramic view is fun to look at. Popularity of the relief map is persistent because it can make the reality into much easier to understand visual images by appropriate exaggeration and omission.

However, in the trend of map data directed to consumers in Japan, electronic publishing including CD-ROM is experiencing a difficult time because of explosively popular map distribution via Internet, typically represented by “Google Map”.

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