

1995 Annual Report - Technical Commission IV "MAPPING AND GEOGRAPHIC INFORMATION SYSTEMS"

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TERMS OF REFERENCE

- Analog and digital mapping procedures and products
 - Revision of topographic maps and map databases
 - Data acquisition, data processing, analysis of data and visual representation in GIS
 - Application of GIS to land related record management (e.g., multipurpose cadastre and utility mapping) and decision making tasks
 - Radar and planetary mapping
 - Digital elevation models
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STATE OF SCIENCE AND TECHNOLOGY OF COMMISSION IV TOPICS

Accurate maps and digital databases from which large scale thematic maps can be prepared for resource inventory, change assessment and map revision tasks are needed by organizations concerned with applications such as preservation of the natural environment and urban planning. Pressures from urban development, loss of wetlands, intensified use of agricultural lands and clear cutting of timber all threaten the long-term sustainability of the world's resources and contribute to non-point source pollution. Also, the recent popularity of geographic information systems (GIS) as a tool for combining diverse data sets to manage land resources and model future land uses, threats to the environment and sustainability of resources has been a catalyst for the increased demand for accurate spatial information.

However, in order to effectively produce maps, generate statistics and model future developments, the various data sets must be thematically correct and geometrically positioned on a standard reference datum so that there is exact registration of the (map) data layers and an accurate "fit" to the earth's surface. Thus, although it is often overlooked in the enthusiasm to manipulate data, the first and most important requirement is to be able to assemble data layers of adequate detail and accuracy for resource management/inventory tasks. Consequently, there must be an understanding of positioning, measurement and analysis techniques and how they interrelate in the preparation of maps and databases.

In planning for the compilation of resource/urban databases and the eventual preparation of products in digital format, thoughtful consideration must be given to:

- project and end-product requirements;
- coordinate systems and GPS;
- mapping and database assembly techniques; and
- GIS analysis procedures.

In the upcoming years, new advancements in GPS, softcopy photogrammetry and GIS technologies, along with improvements in computer hardware processing power/storage capabilities and the acquisition of new high-resolution satellite image data from commercial satellites will be particularly critical to the successful implementation of projects requiring the preparation of maps and databases in digital format.

ACCOMPLISHMENTS OF COMMISSION IV DURING 1995

In June 1995, Dr. Welch and Dr. Remillard attended the ISPRS Joint Council and Technical Commission Presidents Meeting in Vienna, Austria. At this meeting, the upcoming XVIII Congress in Vienna, review procedures for abstract selection, and organization of Congress Technical Sessions were discussed. The Vienna Convention Center where the Congress will be held in July 1996 also was toured.

Several Commission IV Working Groups conducted Workshops in 1995. Dr. Marguerite Remillard participated in the WG IV/6 "International Workshop on Global Databases," held in conjunction with the "Global Land One-Km Base Elevation Data" (GLOBE) Meeting at the National Geophysical Data Center (NGDC/NOAA) during 30-31 May 1995 in Boulder, Colorado, USA. At this meeting, two papers were presented entitled "Remote Sensing and GIS for Regional/Global Scale Vegetation Mapping" authored by herself, and "Image and Map Data for Global DEMs" by Dr. Roy Welch. Dr. Welch and Dr. Remillard also contributed to the Proceedings of this Workshop (Edited by R. Tateishi) with two written papers.

Mr. Thomas Jordan of the Center for Remote Sensing and Mapping Science (CRMS), Department of Geography, The University of Georgia, represented Dr. Welch at the IUSM GIS/LIS WG Workshop held September 25-27, 1995 in Hannover, Germany. The Workshop, entitled "Current Status and Challenges of Geoinformation Systems", was organized by Prof. Gottfried Konecny, Chairman of ISPRS WG IV/2. Mr. Jordan presented a paper at this meeting authored by Dr. Welch. Dr. Welch also contributed a written paper to the published proceedings of this Workshop.

Dr. Remillard attended the ISPRS WG IV/2 "International Mapping from Space Workshop" held 27 November-1 December 1995 at Anna University, Madras, India and organized by Prof. Gottfried Konecny. At this meeting a paper authored by Dr. Roy Welch and Dr. Remillard was presented entitled, "U.S. Government and Commercial Remote Sensing Satellite Programs: 1995 - 2000".

In addition to attending these various workshops and meetings, Dr. Welch and Dr. Remillard have collected invited papers for a special issue of the *ISPRS Journal of*

Photogrammetry and Remote Sensing that will be focused on Commission IV activities. A total of five papers were reviewed, edited and submitted to the Editor of the *Journal* for inclusion in the June 1995 issue. The titles and authors of these papers are listed below:

- "Mapping from Digital Satellite Image Data with Special Reference to MOMS-02" by Gottfried Konecny and Jochen Schiewe, Institute for Photogrammetry and Engineering Surveys, University of Hannover, Germany,
- "Costs of Softcopy Orthophoto Bases for GIS Projects" by L. Harold Spradley, Survey Resources International, Inc., Houston, Texas.
- "Digital Images in the Map Revision Process" by Paul R. T. Newby, GEO-UK, Ltd., Hants, United Kingdom.
- "3-D City Models for CAAD-Supported Analysis and Design of Urban Areas" by Martina Sinning-Meister, Armin Gruen and H. Dan, Institute for Geodesy and Photogrammetry, Swiss Federal Institute of Technology, Zurich, Switzerland.
- "Mapping Evapotranspiration and Water Balance for Global Land Surfaces" by Ryutaro Tateishi and C. H. Ahn, of the Center of Environmental RemoteSensing, and the Department of Information and Computer Science, respectively, Chiba University, Japan.

COMMISSION IV NEWS

Commission IV is currently heavily involved in preparations for the XVIII ISPRS Congress to be held July 1996 in Vienna, Austria. Having received the largest number of solicited abstracts of any Commission (a total of 246), Dr. Roy Welch, Dr. Marguerite Remillard and the WG Chairpersons have finalized the selection of abstracts for the Technical Program. Commission IV has been allocated a total of 14 oral Technical Sessions and six Poster Sessions and will be involved in two Inter-Commission Sessions with one Inter-Commission WG III/IV session and one shared session with Commission I.

WORKING GROUP ACTIVITIES DURING 1995

- **WG IV/1 - "GIS Data and Applications"**

by Chairman:Dr. E. Lynn Usery (USA)
Co-Chairman:Dr. Kirsi Artimo (Finland)

State of Science and Technology of WG IV/1 Topics

The following statements relate advances in science and technology to the Terms of Reference for WG IV/1.

- *Digital technologies for the integration of photogrammetric and remote sensing data with GIS*
Softcopy photogrammetry:

- Continued improvements in performance of PC platforms are creating a significant market in areas where workstations are not affordable and extending softcopy photogrammetry to general GIS users.
- Advances in PC-based operating systems and windowing environments are providing common user interfaces for integrated raster/vector GIS in the commercial marketplace.
- Object orientation allows support of multiple applications including photogrammetry, remote sensing, and GIS on a single platform and in a single windows-based environment.
- *Role of GPS, photogrammetry, remote sensing and digital image processing in the construction and revision of GIS databases*
 - GPS/GIS integration is occurring with the use of GIS on notebook computers interfaced to GPS receiving units for real-time mapping and data collection.
 - Remote sensing and digital image processing provide fundamental inputs for GIS database construction and are included in the real-time mapping applications.
- *Status of computer hardware and software for GIS*

Hardware:

 - Continued improvements in CPU performance, memory and disk storage capacities, and notebook computers increase the spread of GIS to new applications and realtime use for data collection.
 - Advances include abilities to produce CD-ROM archives on a PC with the write devices below \$1,000 and the inclusion of multimedia capabilities on PC's.
 - A summary of multimedia advances was prepared for the WG by Loey Knapp and Fred Ris of IBM Corporation and is published in the **Proceedings of the Workshop on Mapping and Environmental Applications of GIS Data**.

Software:

- User interfaces have improved with new object-oriented approaches and easily support integrated raster/vector systems.
- Software support on a single system for GIS, image processing, and softcopy photogrammetry is now common on both PC and Unix workstation platforms.
- Traditional DOS-based applications are rapidly being migrated to windows environments.
- *Methods of applying GIS technology to mapping, planning and natural resource inventory at local, regional and global scales*
 - Applications of GIS continue to expand as evidenced by the growing number of GIS related conferences, magazines and publications. The **Proceedings of the Workshop on Mapping and Environmental Applications of GIS Data** provides an example of the diversity of methods and applications of GIS.

Accomplishments of WG IV/1 During 1995

- March 1995

WG IV/1 conducted a planning meeting at the American Society for Photogrammetry and Remote Sensing Annual Meeting held in Charlotte, North Carolina, USA.

- 28-29 September 1995

WG IV/1 held a meeting on "Mapping and Environmental Applications of GIS Data" in Madison, Wisconsin, USA. The meeting included 26 technical presentations to an audience of 75 attendees. Proceedings of the meeting including 23 technical papers were published.

WG IV/1 News

WG IV/1 is continuing the study of the development of cartographic objects from GIS. These objects are feature-oriented and provide complete information for placement on a map when the feature is selected from the GIS database.

WG IV/1 has finalized the selection of abstracts for the 1996 ISPRS Congress in Vienna. A total of 90 abstracts were submitted to WG IV/1. Three Technical Sessions have been allocated

- **WG IV/2 - "International Mapping from Space"**

by Chairman: Prof. Dr. Gottfried Konecny (Germany)
Co-Chairman: Donald Light (USA)

State of Science and Technology of WG IV/2 Topics

During the report period a tendency for the use of high resolution satellite imagery has become obvious. While the classical programs of NASA/NOAA, CNES, NASDA, ISRO all plan higher resolution imagery systems, the MOMS 02/D2 Mission has provided high resolution imagery at the five meter resolution level in addition to the release of Russian KWR 1000 and KFA 3000 high resolution photography. The ESA ERS-1/2 tandem mission for radar interferometry was launched at the end of 1995. In addition a number of commercial ventures for high resolution stereo imagery are in the planning stages for the next five years. The "Mapping from Space" interest has gained a great momentum.

Accomplishments of WG IV/2 During 1995

Since the 1994 Commission IV Symposium in Athens, Georgia, the WG members have participated in the following main events.

- June 1994

EARSeL Workshop "Topography from Space", Goteborg, Sweden
(Proceedings in print)

- July 1995

DLR-EARSeL Symposium "MOMS 02/D2", Cologne, Germany
(Proceedings in print)

The publications can be obtained at cost from the EARSeL Secretariat, 2 Ave. Rapp, F-75340 Paris Cedex 07, France, Fax: +33-1-4556-7361.

The proceedings of the WG IV/2 Workshop and Conference "International Mapping from Space" held in 1993 in Hannover, Germany, can be ordered at cost (DM 60,-) from the Institute for Photogrammetry and Engineering Surveys, University of Hannover, Nienburger Str. 1, D-30167 Hannover, Germany, Fax: +49-511-762-2483.

WG IV/2 News

The WG conducted a Workshop "International Mapping from Space" held from November 27 to December 1, 1995 at Anna University in Madras, India. This workshop concentrated on the topics:

- Space Programs
- Sensor Requirements
- Tests with Space Imagery
- International Mapping Projects and Updating
- -Evaluation Methods (Optical)
- Evaluation Methods (Radar)
- Interface with GIS Technology
- Applications in Thematic Mapping and GIS

46 papers were scheduled, of these 14 were from non-Indian participants.

The workshop helped to finalize the invited papers for the ISPRS Congress in Vienna and make recommendations on the topics given in the terms of reference.

General Comments

Topics on the work of the WG have also been presented at the following conferences establishing a new network of groups interested in space mapping.

- U.N. Cartographic Conference for Asia and the Pacific in Beijing in 1994
- EURISY Space Symposium in Vienna in December 1994
- Africa GIS Conference in Abidjan in March 1995
- MARISY 1995 Symposium in Ifrane, Morocco in October 1995
- The First Arab Space Conference in Damascus in October 1995.
- **WG IV/3 - "Map and Database Revision"**

by Chairman: Paul R. T. Newby (United Kingdom)

State of Science and Technology of WG IV/3 Topics

In a year without meetings of this WG it is hard to report on worldwide progress in research and development. However it is clear from correspondence that system developers and vendors are continuing to make progress in bringing digital photogrammetry toward real practical application in map and database revision. Leading practitioners continue to develop their own special approaches, and researchers are also assumed to be making progress which can be reported at the Vienna Congress. Meanwhile I have written a commissioned review paper covering progress through the whole session since 1992, which should appear in the **ISPRS Journal of Photogrammetry and Remote Sensing** just before the Congress.

Accomplishments of WG IV/3 During 1995

Unfortunately due to the pressures of my transition from government service to self-employment during the past year, it has not proved possible to hold a WG Workshop. However, in the course of 1995 I participated in the "Seminar on the Integration of Remote Sensing and GIS for Applications in SE Asia," in Kuala Lumpur, Malaysia. There I made a keynote presentation on "Developments in Map Revision" as well as giving a tutorial on practical developments in digital photogrammetry. I was also Manager, under contract from the Ordnance Survey of Great Britain, of the "Cambridge Conference for National Mapping Organisations." At both of these meetings it was possible to renew old contracts across the world of modern mapping.

WG IV/3 News

I followed these meetings by issuing a circular letter to my (now slightly reduced) mailing list of some 320 recipients. This still covers all those who have expressed interest in the WG over the past seven years, as well as ISPRS National Correspondents, and the bulk of ISPRS officers and sustaining members. This letter encouraged participation in the two WG IV/3 sessions and in post sessions at the Vienna Congress, and reached recipients just in time to stimulate them into submitting abstracts before the deadline of 16 October. The response is encouraging, particularly from developing countries which might not have been expected to contribute to the Congress without such a stimulus.

I have also submitted an abstract on my own account, to cover my WG Report to Congress as well as a review of progress in map and database revision during the session. The duration and content of this report and review will depend on the quantity and quality of material submitted for the WG sessions and will be decided in consultation with Commission President Roy Welch.

The WG sessions are provisionally entitled:

- "Map Revision : where are we now?" (Progress and Practice 1992-96)"
- "Change at the Millennium : is automation possible?" (Ongoing developments, with total automation the ultimate goal)

A useful subtitle may be "Graphic Revision and Digital Update -field, office and user." (Diverse needs, diverse processes: where should photogrammetry fit in?). However, final details will also await sight of all abstracts submitted.

- **WG IV/4 - "Digital Elevation Models (DEMs) and Digital Orthoimages for Mapping/GIS Applications"** Chairman:Dr. Luiz Alberto Vieira Dias (Brazil)

State of Science and Technology of WG IV/4 Topics

The major development was the increase in performance of personal computers, thus enabling GIS systems to be run on small computers, such as the "Spring for Windows".

The contribution of European (German, Austrian and Dutch) and American research in the WG is very strong. There are some contributions from Asia and Latin America, but very few from Africa.

Accomplishments of WG IV/4 During 1995

It was possible for the Chairman of WG IV/4 to attend some meetings and conferences during 1995. Below is an example of events held on the subject of DEMs and digital orthoimages.

- May-Jun 94-ISPRS Comm IV Symposium - USA
- Aug 1994-IEARSS - USA
- Sep 1994-Comdex - Brazil
- Sep 1994-EcoRio 94, ISPRS Comm VII Symp -Brazil
- Nov 1994-Space Conference of the Americas - Chile
- Apr 1995-SOSPAION - Brazil
- May 1995-Cartographer week - Brazil
- May 1995-The Space Congress - Germany
- Jul 1995-Fenas-Fi - Brazil
- Jul 1995-Brazilian Cartography Congress - Brazil
- Aug 1995-Comdex South America - Brazil
- Sep 1995-UN/ESA Meeting - Austria
- Oct 1995-Annual Meeting - Brazil
- Nov 1995-SELPER Meeting - Mexico

WG IV/4 News

As chairman of the Earth Observation Group at the Brazilian National Space Research Institute (INPE), I am in contact with Brazilian and Latin American persons involved in research dealing with the WG IV/4. This year I contacted Chinese researchers on geo-processing and DEMs. Increasing cooperation with the Chinese is expected. A contact was established with Italy, but the financial resources are not yet secured.

- **WG IV/5 - "Extraterrestrial Mapping"**

by Chairman:Dr. Sherman S. C. Wu (USA)
WG Members: 35

State of Science and Technology of WG IV/5 Topics

Research currently being conducted in Germany and the United States was reported at the Commission IV Symposium. Papers of note included German scientists' plans for the processing and analysis of image data acquired by the Mars '96 pushbroom cameras (Oberst, et al and Tang) and an Invited Paper on the Lunar Clementine mapping mission and Lunar Control Network by Davies (USA).

Accomplishments of WG IV/5 During 1995

WG IV/5 currently has over 35 members organized into eight Sub-Working Groups listed below. A major goal of these Sub-Working Groups is to produce a book entitled, "**Extraterrestrial Mapping**".

1. Cameras, remote sensing devices, and data acquisition.
2. Data processing, enhancement, and management.
3. Coordinate system and control network.
4. Mapping techniques and instrumentation.
5. Advancement of technology.
6. Archives and publications.
7. Planetary missions and coordination.
8. International cooperation.

WG IV/5 News

WG IV/5 has organized two sessions for the Vienna ISPRS Congress, one on "Mars Mapping Efforts" and one encompassing other planetary mapping missions such as the Lunar Clementine, Venus Magellan and Jupiter Galileo Missions. The first session will include presentations on mapping Mars from data acquired by the Russian Mars '96 Mission and the Mars Global Surveyor Mission.

- **WG IV/6 - "GIS and Expert Systems for Global Environmental Databases"** by Chairman:Dr. Ryutaro Tateishi (Japan)
Co-Chairman:Dr. Hiroshi Murakami (Japan)

State of Science and Technology of WG IV/6 Topics

The main topic of the WG is the development of global databases for key environmental variables to be used in global change studies and the establishment of global environmental policies. Though many organizations and individual researchers are developing global datasets of environmental variables such as DEM, land cover, soil type, population, etc., there currently is no standard framework. Subjects to be pursued for the development of better global databases are:

- establishment of several standards of legend/classification systems for categorized variables;
- methods for the estimation of accuracy and standard formats of recording accuracy/quality data;
- selection of map projections;
- data management/distribution system; and
- methodology of integration of local data into global datasets.

Accomplishments of WG IV/6 During 1995

The International Workshop on Global Databases was held on May 30-31, 1995, at the National Geophysical Data Center, Boulder, Colorado, USA. A report of the **International Workshop on Global Databases, Vol. XXX, Part 4W1 of the ISPRS Archives**, was published and is available from RICS Books (Fax: +44-171-334-3800).

A questionnaire about National and Regional Geographic Databases was distributed in order to collect the information about availability of geographic data such as DEM, Hydrology, Land use/cover, Soils/Geology, Political boundaries, Roads and Population. The result of 53 responses from 18 countries is available from the WG IV/6 chairperson.

WG IV/6 News

The WG activities are focused on:

- Development of standard of metadata
- Classification system of land cover
- Integration of local-data into global dataset

Coordinators of ongoing projects to develop global environmental datasets are encouraged to attend the WG IV/6 meeting at the ISPRS Congress in Vienna. Communications among active global dataset developers is the **MUST** to find better direction on where we should go.