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A NATIONAL PROGRAMME IN REMOTE SENSING IS COORDINATED BY THE DEPARTMENT OF ENERGY, MINES AND RESOURCES IN CO-OPERATION WITH OTHER AGENCIES OF THE GOVERNMENT OF CANADA, PROVINCIAL GOVERNMENTS, INDUSTRY AND CANADIAN UNIVERSITIES

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EOSAT Takes Over Operation of Earth Resource Satellites

The U.S. government finalized the transfer of its LANDSAT program to the private sector when Secretary of Commerce Malcolm Baldrige authorized a contract with the Earth Observation Satellite Company (EOSAT) in September 1985. EOSAT is a joint venture/partnership formed by Hughes Aircraft Company and RCA Corporation. RCA's Astro-Electronics Division, Princeton, N.J., and Hughes' Santa Barbara Research Center, Goleta, CA, will serve as subcontractors to EOSAT.

As part of the contract, EOSAT will undertake a 10-year program, beginning with the immediate assumption of operations of LANDSAT-4 and -5. It will be the primary point of contact for marketing, ordering and distribution of the data from these spacecraft. In addition, EOSAT will receive $250M to begin construction of the next generation of LANDSAT spacecraft, the first of which will be launched late in 1988. EOSAT's ability to quickly bring LANDSAT-6 into service will help minimize potential data gaps.

EOSAT will rigorously follow the "non-discriminatory access" policy, set forth in U.S. Public Law 98-365, by making LANDSAT data equally available to all requestors. Specifically, all requests for data will be filled at published prices to anyone who requests it. This will include all data currently in process or in archive. Satellite data will continue to be made available to all users through the Department of Interior's EROS Data Center in Sioux Falls, S.D.

Foreign ground stations currently capable of receiving LANDSAT data will continue to operate under the existing agreements negotiated between the operators and the U.S. Government. Simultaneously, EOSAT will begin to establish improved foreign LANDSAT reception capabilities where appropriate, in parallel with a worldwide marketing effort to stimulate use of the LANDSAT remote sensor data as a tool for managing the Earth's natural resources.

Existence of the commercial LANDSAT system establishes continuity of data to users through the mid-1990's, including Thematic Mapper quality data through this period. Furthermore, EOSAT intends to expand applications and R&D, predicated on finding new uses for LANDSAT data. Although EOSAT is not a value-added company, it has indicated its commitment to developing a vigorous value-added industry capable of serving the many and varied disciplines that use remote sensing data worldwide.

EOSAT will maintain its headquarters in the Washington, D.C. area, with a staff for administration, marketing, applications, and all other disciplines required to function as an independent entity. RCA and Hughes, in addition to their joint venture role in EOSAT, will supply the next generation spacecraft and instruments respectively, through the RCA Astro-Electronics Division and the Hughes Santa Barbara Research Center.

Dick Mrocyzynski
The Earth Observation Satellite Company

Proceedings of the Ninth Canadian Symposium on Remote Sensing

The Ninth Canadian Symposium on Remote Sensing was held from August 14 to 17, 1984, at the Memorial University of Newfoundland, in St. John's, Newfoundland. The papers published in the Proceedings cover a variety of remote sensing applications for the management and development of resources, with sections on remote sensing related to ice, oceans and water, geology, forestry and agriculture, and land use. Additional topics include satellite programs, systems and methodology, and digital terrain modelling. The papers were technically reviewed before being accepted for publication.

The Proceedings include 85 papers, with 821 pages, and 12 colour figures. Copies of the Proceedings are available from Canadian Aeronautics and Space Institute, Suite 601, 222 Somerset Street West, Ottawa, Ontario, Canada, K2P 0J1, and cost $54.00 (Canada and U.S.A.) and $56.00 (overseas), in Canadian funds.

Editor's Note

The editor of "Remote Sensing of Canada" extends warm thanks to all contributors of material for this issue. Submissions for future issues are always welcome and should be addressed to:

The Editor
Remote Sensing in Canada
Canada Centre for Remote Sensing
240 Bank Street, 5th Floor
Ottawa, Ontario
K1A 0Y7

Deadline for articles to appear in the next issue: January 6, 1986.

Canadian Program Continues To Revise Topographic Maps From LANDSAT Images

Gregory Geoscience Limited is pleased to announce the beginning of the second year of its five-year national mapping program for the Surveys and Mapping Branch of the Canadian Department of Energy, Mines and Resources (EMR). The program, believed to be the only one of its kind in the world, consists of two elements. The first is to provide revision information for topographic maps at a scale of 1:250 000 and the second is to map changes in land cover at a scale of 1:50 000. The latter element is used to direct EMR's aerial photography program to areas of greatest change, thus assuring rational use of existing fiscal resources.

The procedure employed for this program is to enlarge and register recent LANDSAT MSS composites onto 1:50 000 scale base maps with an optical instrument called PROCOM-2. Other data sets may occasionally be used. The amount of information interpreted from the registered image and the accuracy of positioning of features of interest will vary according to the program element. For map revision, the average error in relative position is between 25 and 50 m, which easily meets Canadian class A standards for 1:250 000 mapping. The revised 1:50 000 maps are subsequently reduced to 1:250 000 scale. For change detection, the positioning requirement is less precise.

During the first year of the operational program, the company examined 2700 maps representing about 2 million square kilometres of Canada, an area about twice the size of Venezuela. The initial program requirements were for 1700 maps, but the requirement was revised to include an additional 1000 maps when it was found that the amount of change information was greater than expected. The entire first year program was completed in nine months.

The second-year program will involve approximately 1000 maps of which about one-third will be used to revise 29 1:250 000 scale maps. Several challenging areas of the country are to be examined for change including thousands of square kilometres of land flooded by the development of the huge James Bay hydroelectric complex.

The average cost for the combined program of map revision and change detection is 21¢ per square kilometre (15¢ U.S./km^2) or $210.00 per 1:50 000 map ($153.00 U.S.). A report on the program entitled, "Economical Maintenance of a National Topographic Database Using LANDSAT Images" may be obtained from the company. Please contact:

Mr. Jacques Guerette
Head of Marketing
Gregory Geoscience Limited
1794 Courtwood Crescent
Ottawa, Ontario, Canada
K2C 2B5

Tel.: (613) 224-9565
Telex: 053-4370 OTT.

Knudsen Engineering Limited Expanding Markets

Although a new face to many in the remote sensing industry, Knudsen Engineering Limited has quietly been building a reputation for state-of-the-art airborne remote sensing systems throughout its 4-year history.

Three versions of the company's ALICE (Airborne Linescan Image Processor) product line have been supplied to CCRS, Data Acquisition Division. Delivery of the fourth system is scheduled for early 1986. ALICE systems I-III have been designed for optical sensor application. ALICE IV will be integrated with the airborne SAR.

Enthusiastic about the prospects for the ALICE technology in airborne remote sensing, the company has identified several areas of possible market application including oil spill reconnaissance, agricultural remote sensing, forest fire control and search and rescue.

In addition to pursuing its airborne remote sensing activities, Knudsen Engineering is active in the underwater acoustics field and has recently been awarded a major contract to develop a prototype digital acoustic imaging system for the Atlantic Geoscience Centre at the Bedford Institute of Oceanography.

The two expanding fields of company expertise, airborne remote sensing and underwater acoustics, share a great deal of technology, particularly in the areas of digital signal processing, and image enhancement and display.

The company is located in the new West-Carleton Industrial Park in the Ottawa area. For further information, contact Donald Knudsen at:

Knudsen Engineering Limited
1 Westbrook Road, P.O. Box 929
Stittsville, Ontario
K0A 3G0

(613) 836-7344

Large-Format Camera Photography From Space

The large-format camera (LFC) is a high-altitude aerial mapping camera modified to operate from Earth-orbital altitudes. It is larger, more stable, more precise, and more technologically advanced in optics and electronics than its airborne predecessors.

The aspheric lens system of the LFC focuses an orthogonal image, free from spherical aberration, on a 9 x 18 inch (23 cm x 46 cm) focal plane. Photographs are made with the long axis of the film parallel to the ground track, thereby providing an opportunity for adequate image-motion compensation within the camera.

The camera body is pressurized by a nitrogen gas supply. This helps to stabilize the film and provides an atmosphere in which a relative vacuum can be created to momentarily press the film onto the platen during an exposure. During the exposure pulse, the platen moves the film at exactly the correct speed (electronically controlled) to cancel the image smear that would otherwise be caused by the movement of the shuttle over the Earth.

To acquire stereo pairs of photography, exposures may be timed to provide forward overlaps of 80, 70, 60, or 10 percent. In the 80 percent mode, each pair of photos would have a base/height ratio of 1.2, which should allow photogrammetric perception of heights as small as 30 metres (plus or minus 15 metres) at a map scale of 1:50 000.

On 5 October 1984, the LFC was carried into space on shuttle mission STS-41G. Requests for coverage had been received for 368 sites located on all continents except Antarctica. The orbit inclination was 57° and the shuttle operated at nominal altitudes of 352, 272, and 225 km. A total of 2160 frames were exposed--1520 on Kodak 3412 and 3414 panchromatic black/white, 320 on SO-242 natural colour, and 320 on SO-131 colour infrared films. Sixty percent of the frames have less than 0.36 cloud cover. Optically, mechanically, and electronically, the camera operated without flaw, and many exceptional scenes were acquired.

NASA specifies that the ground resolution of this type of photography is approximately 14 metres in black-and-white mode and 25 metres in colour infrared. It is, however, important to note that this is photographic resolution and not pixel dimension as normally given for electro-optical systems such as LANDSAT. In terms of detail visible in the images, 14 m photographic resolution is approximately equivalent to that of a 6 m pixel dimension.

LFC Parameters

Lens

- Focal length 30.5 cm, aperture ∫/6.0
- Resolution 80 line pairs/mm AWAR
- Maximum distortion less than 20 μm
- Interchangeable haze and minus blue filters
- Rotary capping and chopping shutter
- Automatic exposure control, 1/250 to 1/30 seconds

Magazine

- Format 23 x 46 cm, long dimension in direction of flight
- 12 illuminated fiducials
- Back illuminated 5 x 5 cm reseau
- Forward overlap 10, 60, or 80 percent
- Adjustable forward motion compensation
- Film capacity 2400 frames
- Automatic data recording

A number of photographs were acquired over Canadian territory, notably of the Montreal area, Hudson Bay, the Prairies and the Rockies. The complete list of photographs acquired worldwide is available on microfiche. These can be consulted at CCRS, 717 Belfast Road, Ottawa by contacting Jean Heffernan. Photographs are available at the EROS Data Center, the price of each 23 cm x 46 cm negative varying between $15 U.S. and $50 U.S. depending on the type of the original film (black-and-white, colour, colour infrared) and the photographic medium (film or paper). The U.S. government requires that every image request be accompanied by a declaration stating that data will be used for non-commercial purposes only.

Portions of this text have been extracted from articles by F.J. Doyle appearing in Photogrammetric Engineering and Remote Sensing, (February 1985 and January 1979). For more information, contact Christian Prévost or Jean Heffernan, CCRS, (613) 993-9900.

Progress with the Fluorescence Line Imager (FLI)

Since delivery of the Fluorescence Line Imager by Moniteq to the Department of Fisheries and Oceans (DFO) in 1984, test and operational flights over lakes and ocean areas have been carried out, some arranged by DFO and some arranged commercially by Moniteq.

The FLI was designed to provide high spectral and spatial resolution images of low radiance targets such as water, but with provision for imaging land targets with a lower sensitivity iris setting. The instrument has full software flexibility for spectral band definition in its push-broom imaging mode, and can also gather high resolution spectra in a "rake" spectrometer mode.

Figure 1: FLI image showing the Chesapeake Bay Bridge/Tunnel (crossing the lower part of the scene), ships and their wakes, and suspended sediment patterns in the water from an altitude of 23,000 ft (7,000 m).

Most of the original goals of the instrument design have now been met. As well as producing spatial imagery similar to that produced by other devices currently in use, the FLI has admirably demonstrated its flexibility by being reprogrammed several times to change the position and width of the spectral bands. It has a wide dynamic range and has produced high spectral resolution data over water and land targets. These data have been used to create 'spectral images' of narrow spectral features that are not available from any other sensor now in use.

As well, the instrument has been used to collect data for forestry, agriculture, bathymetry and mariculture, as well as for the phytoplankton studies for which it was originally designed.

Fluorescence from the phytoplankton pigment chlorophyll a has been detected on water radiance spectra, despite interference from atmospheric absorption in the vicinity of the fluorescence line. By normalizing FLI radiance spectra to the spectrum of the incident light, it has been possible to calculate pseudo-reflectance spectra identical to the reflectance spectra obtained in past work with the IOS spectrometer. These FLI 'reflectance' spectra show the fluorescence line as a narrow peak in the vicinity of 685 nm. The FLI has also detected a previously undescribed spectral feature near 700 nm that may be usable for mapping benthic water plants.

The high spectral resolution and the great flexibility of the FLI give it a significant advantage over other instruments available today. Work on the FLI since delivery has improved its performance considerably and collective experience with the instrument and the data it produces has shown that further improvement can be expected. Proposals have been made to start work on a space version of the instrument, possibly with international cooperation.

Jim Gower
Institute of Ocean Sciences

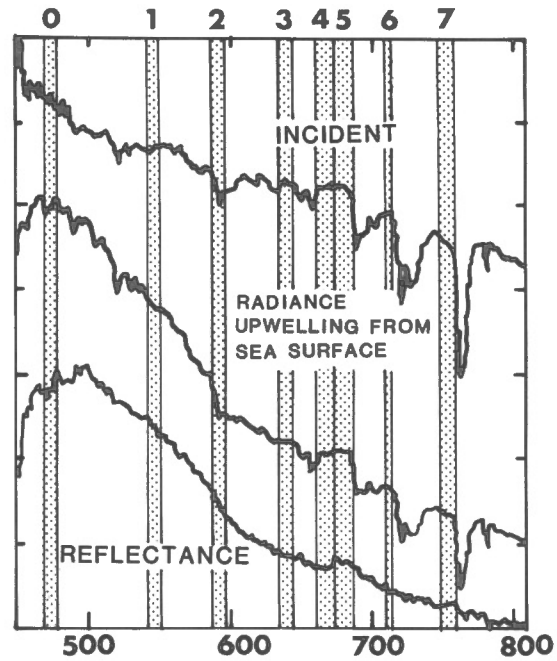

Figure 2: Spectra recorded with the FLI imaging spectrometer, from an altitude of 150 m over the Atlantic Ocean, 100 km east of the mouth of Chesapeake Bay. These illustrate compensation of the effects of atmospheric absorption, to show the chlorophyll fluorescence line centred at 685 nm.

Update on the Coastal and Marine Studies Laboratory

Organization and work

The Coastal and Marine Studies Laboratory, a component of the University of Sherbrooke's Department of Geography (which is associated with the centre for remote sensing applications and research [CARTEL]), has been in operation for over two years. The laboratory obtained $53,485 in research grants and fellowships in 1983, $73,700 in 1984, and anticipates more than $50,000 for 1985-86. Currently, it is developing four major remote-sensing applications:

1) marine algae
2) surface currents
3) coastal geomorphology
4) salmonids.

Marine algae

The marine algae remote-sensing project began in 1983 with a grant from Agriculture, Fisheries and Food Quebec (MAPAQ). This project consists of two parts:

1) Infralittoral algae (1983-87) financed by the MAPAQ, Fisheries and Oceans Canada (and probably IFREMER, France);

2) Intertidal algae (1985-87), financed by the MAPAQ.

The study zone for infralittoral algae is located on the north shore of Chaleur Bay; the study zone for intertidal algae is in the Saint-Fabien area near Rimouski.

The prospects for development of marine algae resources in Quebec lie in the capability to inventory and monitor available stocks. The laboratory intends to pursue this major line of research because it is certain that remote sensing can become the ideal aid in developing this resource, which has numerous uses in industry.

Surface currents

The remote sensing of surface currents project was begun jointly with the University of Quebec at Rimouski (UQAR) in 1983.

The first phase, conducted by André Lavoie and financed by the Natural Sciences and Engineering Research Council of Canada (NSERC), dealt with the thermal structure and variability of currents in the St. Lawrence estuary. Using multitemporal images from the HCMM satellite, an overall view of water circulation characteristics in the estuary was estuary was obtained. Analysis of the images also established the presence of counterclockwise and clockwise eddies, which had previously only been suspected. Moreover, it is now possible to interrelate various phenomena observed in the images (resurgences, density fronts) and to deduce possible movements occurring in that body of water by interpreting the distribution patterns of its surface temperatures.

The second phase, conducted by Jacinthe Lacroix and financed by the UQAR, concerns the currents in the western Gulf of St Lawrence. For this phase, NOAA-7 multitemporal data are being used, with many ground control points.

Coastal geomorphology

The coastal geomorphology remote-sensing project has been financed by the NSERC and the University of Sherbrooke for nearly four years. It began by examining changes in the North Shore coastline, as evidenced by multitemporal aerial photographs. The project is now focused on the use of digitized multitemporal aerial photographs in the study of coastal change, as well as the optimization of a Daedalus-1260 overflight to distinguish coastal deposits and forms of Anticosti Island.

Salmonids

The salmonid remote-sensing project is nearly ten years old. Its purpose was to prove the usefulness of aerial photographs and promote their use in detecting pools, spawning grounds and the biophysical environment particular to the Atlantic salmon in Quebec rivers and the St. Lawrence estuary. This project has already resulted in a transfer of technology to the Quebec Department of Recreation, Fish and Game, various Quebec firms, and the Woods Hole Oceanographic Institution.

At the present time, a Department of Recreation, Fish and Game contract involves the development of control software applicable to remotely sensed data for Quebec salmon rivers. The objective is to furnish a product that can be processed by digital methods. As part of this project, trial digitization of aerial photographs to a scale of 1:10,000 is planned, to enhance the range of products of use to biologists.

CCRS Satellite Imagery Price List

MSS, RBV, NOAA

	Effective October 1/85 (Cdn. dollars)
Photographic	
Black and White	
70 mm Film Positive	83.
70 mm Film Negative	125.
185 mm Paper	36.
185 mm Film Positive	38.
371 mm Paper	68.
371 mm Film Positive	96.
742 mm Paper	109.
Colour	
185 mm Paper	65.
185 mm Film Positive	83.
371 mm Paper	114.
371 mm Film Positive	174.
742 mm Paper	203.
Digital	
MSS — Bulk Full Scene	750.
DICS	
Precision Geocoded Subscene	650.
From Previously Corrected Data	350.
NOAA — AVHRR	117.
Facsimile Transmission	
Per Image	31.50
Per Day (up to 4 images)	117.00
Per Month (up to 130 images)	3,390.00
Per Year (up to 1,500 images)	38,587.00
Microfiche Catalogue Subscription - Per Satellite/Per Year	
1 Track	66.
Up to 10 Tracks	563.
Up to 20 Tracks	940.
Up to 40 Tracks	1,510.
Full PASS Coverage	1,825.
Special Services	
Colour Enhancement (Surcharge)	33.
Master Negative from User Supplied Data	35.
Rush Orders	Unit Price x2
Other Charges	
Handling Per Order	5.85
Postage Extra to Customers Outside Canada	
Courier Services (Registered Mail or Special Delivery)	
Charged Directly to Customer	

CCRS Satellite Imagery Price List

THEMATIC MAPPER

	Quadrant	Full Scene
Photographic		
Black and White		
Quicklook Paper		42.
185 mm Paper	63.	84.
185 mm Film Positive	79.	105.
371 mm Paper	95.	126.
371 mm Film Positive	110.	147.
742 mm Paper	126.	168.
Colour		
Quicklook Paper		105.
185 mm Paper	126.	168.
185 mm Film Positive	158.	210.
371 mm Paper	189.	252.
371 mm Film Positive	221.	294.
742 mm Paper	252.	336.
Digital		
Bulk Corrected	1,050.	3,465.
Other Charges		
Colour Enhancement	63.	
TM Sample Package	160.	
Handling Per Order	5.85	
Postage Extra to Customers Outside Canada		
Courier Services, Registered Mail or		
Special Delivery Charged Directly to Customer		

Development of the MK IV Airborne Laser Fluorosensor for Operational Use in the Canadian Offshore and Arctic

A CCRS contract to develop a laser fluorosensor system for airborne operations has been awarded by DSS to Barringer Research Limited in Toronto. The laser fluorosensor, the Mk IV, is to be used for the detection and classification of marine discharges in the Canadian offshore and Arctic. Its design emphasizes the requirements for operational monitoring, which include real-time on-board data processing, annotated display and copy, capability to operate in daylight as well as at night, ease of operation and installation, and compact size.

The fluorosensor system uses a pulsed ultraviolet laser to induce fluorescence in the target, and detect and classify the target by signature recognition of the characteristic fluoroscence emission spectrum. The system principle has been well demonstrated; the earlier prototype, Mk III, which was developed at CCRS, participated successfully in the Arctic Marine Oilspill Program and in other trials in the offshore regions. The new system will be based on these same design principles, but will make use of the improved technology now available.

The laser fluorosensor offers several advantages for the monitoring of marine discharges offshore and in the Arctic. It is able to monitor fluorescent targets, such as oil, that are on the water surface or within the upper few metres of the water column. It is the only demonstrated sensor able to classify marine pollutants, and it has the potential to identify the presence of oil on, or mixed with, sea ice.

Development of the Mk IV system is currently in the design phase, and is expected to be a multi-year project, with system testing planned for 1987-1988. For more information about the project, please contact S.M. Till, CCRS, the scientific authority.

LANDSAT-4 CANADIAN TIMETABLE FOR 1986

TRACKS	10	1	8	15	6	13	4	11	2	9	16	7	14	5	12	3
	26	17	24	31	22	29	20	27	18	25	32	23	30	21	28	19
	42	33	40	47	38	45	36	43	34	41	48	39	46	37	44	35
	58	49	56	63	54	61	52	59	50	57	64	55	62	53	60	51
	74	65	72	79	70	77	68	75	66	73	80	71	78	69	76	67
	90	81	88		86		84		82	89		87		85		83
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	31															
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	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
JUNE															1	2
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JULY													1	2	3	4
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	26	27	28	29	30											
DECEMBER						1	2	3	4	5	6	7	8	9	10	11
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	28	29	30	31												

LANDSAT-5 CANADIAN TIMETABLE FOR 1986

TRACKS	10	1	8	15	6	13	4	11	2	9	16	7	14	5	12	3
	26	17	24	31	22	29	20	27	18	25	32	23	30	21	28	19
	42	33	40	47	38	45	36	43	34	41	48	39	46	37	44	35
	58	49	56	63	54	61	52	59	50	57	64	55	62	53	60	51
	74	65	72	79	70	77	68	75	66	73	80	71	78	69	76	67
	90	81	88		86		84		82	89		87		85		83
JANUARY																1
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MAY								1	2	3	4	5	6	7	8	9
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	26	27	28	29	30	31										
JUNE							1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
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JULY					1	2	3	4	5	6	7	8	9	10	11	12
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	29	30	31													
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OCTOBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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NOVEMBER																1
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	20	21	22	23	24	25	26	27	28	29	30	31				

MEETINGS/CONFERENCES/COURSES

JANUARY - MARCH 1986

Course: Optical Science and Engineering
January 6-17, 1986
Tucson, Arizona

Course: Remote Sensing Applications for Land Resource Surveys
January 6 - February 22, 1986
ITC
Enschede, The Netherlands

Workshop: Remote Sensing Applications in Geomorphology and Hydrology
January 8-9, 1986
University of Reading
Reading, UK

O-E Lase '86: Symposium on Laser Applications in Science and Engineering
January 19-24, 1986
SPIE
Los Angeles, CA

Practical Short Course on Remote Sensing
January 20-23, 1986
OCRS
Toronto, Ontario

Course: SITEL: Introductory Course on Remote Sensing
January 20 - February 14, 1986
May 26 - June 20, 1986
September 29 - October 24, 1986
November 17 - December 2, 1986
GDTA
Toulouse, France

Symposium on Geotechnical Applications of Remote Sensing and Remote Data Transmission
January 31, 1986
American Society for Testing and Materials
Cocoa Beach, Florida

Course: Introduction to Digital Image Processing
February 24 - May 16, 1986
ITC
Enschede, The Netherlands

ACSM-ASPRS Annual Convention
March 16-21, 1986
Washington, DC

Symposium on Optics and Optoelectronics
March 31 - April 4, 1986
SPIE
Orlando, Florida

APRIL - JUNE 1986

Workshop on Geographic Information Systems
April 1-4, 1986
USDA Forest Service
Atlanta, Georgia

Third International Conference on Optical and Electro-Optical Applied Science and Engineering
April 14-24, 1986
SPIE
Innsbruck, Austria

Course: The SPOT System
English: April 14-25, 1986
November 3-14, 1986
French: January 6-17, 1986
September 15-26, 1986
GDTA
Toulouse, France

Second Image Symposium: Image Processing Synthesis and Applications
April 21-25, 1986
CESTA
Nice, France

10th Canadian Symposium on Remote Sensing
May 5-8, 1986
Edmonton, Alberta

Second Conference on Satellite Meteorology/Remote Sensing and Applications
May 1986
AMS

Symposium on Photogrammetric and Remote Sensing Systems for Data Processing and Analysis
May 26-30, 1986
ISPRS Commission II
Baltimore, MD

1986 ACM-SIGMOD Conference on Management of Data
May 28-30, 1986
Washington, DC

FIG Congress '86: International Federation of Surveyors
June 1-11, 1986
Toronto, Ontario

Course: Remote Sensing Applications in Agriculture and Forestry
June 2-27, 1986
University of New Mexico
Albuquerque, New Mexico

SPIE's 1986 Québec International Symposium on Optical and Optoelectronic Applied Sciences and Engineering
June 2-6, 1986
Québec City, Québec

13th International Symposium on Computer Architecture
June 3-5, 1986
IEEE
Tokyo, Japan

ITC '86: International Conference on Ice Technology
June 10-12, 1986
MIT
Cambridge, Mass.

CLEO '86, OSA/IEEE Conference on Lasers and Electro-Optics
June 10-13, 1986
San Francisco, CA

Third Canadian Conference on Marine Geotechnical Engineering
June 11-13, 1986
Memorial University
St. John's, Newfoundland

Other Non-Cartographic Applications of Photogrammetry and Remote Sensing
June 16-19, 1986
ISPRS Commission V
Ottawa, Ontario

ESA/EARSeL Symposium on Europe from Space
June 25-29, 1986
Technical University of Denmark
Lyngby, Denmark

Course: Image Processing of Satellite Data for Natural Resource Applications
June 30 - July 18, 1986
University of New Mexico
Albuquerque, New Mexico

XXVI COSPAR General Meeting
June 30 - July 12, 1986
Toulouse, France

JULY - SEPTEMBER 1986

ESPACE '86: Exhibition of Scientific Space Technologies
July 3-9, 1986
CNES
Toulouse, France

10th International CODATA Conference: The Computer Handling and Dissemination of Data
July 14-17, 1986
International Council of Scientific Unions
Ottawa, Ontario

Course: Remote Sensing Applications in Meteorology and Climatology
August 17 - September 6, 1986
University of Dundee
Dundee, Scotland

ACM SIGGRAPH '86: 13th Annual Conference on Computer Graphics and Interactive Techniques
August 18-22, 1986
Dallas, Texas

International Symposium on Remote Sensing for Resources Development and Environmental Management
August 25-29, 1986
ISPRS
Enschede, The Netherlands

International Symposium on Progress in Imaging Sensors
September 1-5, 1986
ISPRS
Stuttgart, FRG

Symposium on Remote Sensing in Glaciology
September 6-12, 1986
International Glaciological Society
Cambridge, England

International Symposium on Mapping from Modern Imagery
September 8-12, 1986
ISPRS
Edinburgh, Scotland

Course: CETEL: Remote Sensing Training Cycle
September 8, 1986 - June 19, 1987
GDTA
Toulouse, France

IGARSS '86, International Geoscience and Remote Sensing Symposium
September 8-11, 1986
Zurich, Switzerland

ASP Fall Technical Meeting - Special Session: Remote Sensing Solutions to Engineering Problems in New Frontier Areas
Fall 1986
Anchorage, Alaska

Auto-Carto London 1986
September 14-19, 1986
London, England

Economic, Professional and Educational Aspects of Photogrammetry and Remote Sensing
September 22-26, 1986
ISPRS Commission VI
Badagry, Lagos State, Nigeria

ASPRS-ACSM Fall Convention
September 28 - October 3, 1986
Anchorage, Alaska

OCTOBER - DECEMBER 1986

Course: Remote Sensing Applications for Earth Sciences
November 10 - December 20, 1986
ITC
Enschede, The Netherlands

JANUARY 1987 -

Course: Remote Sensing Applications for Land Resource Surveys
January 5 - February 21, 1987
ITC
Enschede, The Netherlands

Course: Introduction to Digital Image Processing
February 23 - May 15, 1987
ITC
Enschede, The Netherlands

If there are subject areas which you would like to see covered, conferences which have been missed or upcoming conferences which you are aware of or for further information contact:

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