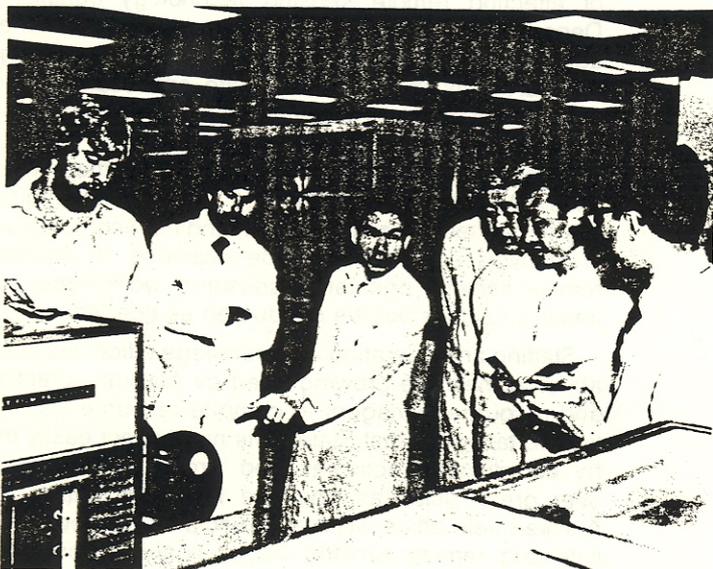


## COOPERATIVE PROJECT WITH CHINESE

A team of geologists and scientists specializing in remote sensing from the U.S. Geological Survey has been sent to the People's Republic of China to conduct training and exchange scientific information in connection with using Landsat data for petroleum exploration.

Initially, they plan to hold a workshop in Peking for approximately 30 Chinese geologists selected by the Chinese Institute for Petroleum Exploration and Development. Characteristics of the Landsat system will be covered, followed by a review of the principles behind using Landsat data for geologic applications.



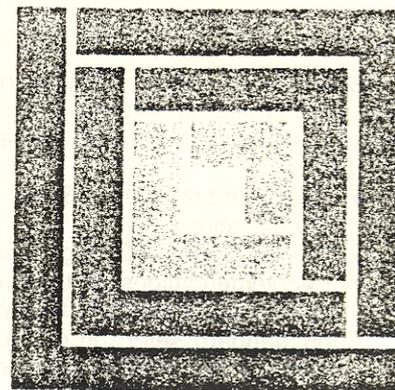
The Chinese Delegate Touring The Eros Data Center Laboratories.

After the workshop, U.S. and Chinese experts will spend several days consulting on interpretative results that have been obtained recently from the study of imagery over two sedimentary basins. These basins show promise of having oil and gas reserves. The discussions will be backed up by a field trip to check the interpretation of the Landsat data and generally learn more about the geology of the area.

This project was conceived last November when a delegation of Chinese scientists visited the EROS Data Center and expressed interest in Landsat data applications. They had the opportunity to examine some imagery of their area of interest, and discussions ensued which led to the joint work currently being done. The areas of digital image enhancement and analysis using computer-compatible tapes are also being investigated by Chinese geologists.

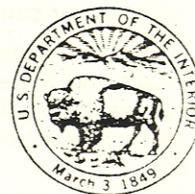
### INTERNATIONAL LANDSAT STATIONS

The 8th meeting of the Landsat Ground Stations Operations Working Group, hosted by NASA, took place at the Earth Resources Laboratory in Slidell, Louisiana, May 15-17, 1979.



# Landsat Data Users NOTES

ISSUE NO. 7  
JULY 1979



# NASA

U.S. GEOLOGICAL SURVEY  
EROS DATA CENTER  
Sioux Falls, S. Dak. 57198

## LANDSAT DATA USERS NOTES

Reports on several items were heard before the meeting turned to individual status reports on the various stations represented. Some of the general items regarded:

- The Landsat Data Base Interchange Tape Specification.
- The CCT Format Change Control Board.
- Recommendations of the Ground Control Point Standards Committee, a committee set up to work on standard selection criteria for ground control points in order to ensure common accuracies in geometric correction of data.
- Status of Landsats 2 and 3.
- Status of Landsat D and Landsat D follow-on concepts.
- Status of new Landsat ground stations which have recently been proposed.

The discussions then turned to the individual developments, plans, and recent applications associated with each station represented at the meeting. A summary of highlights follows:

**ARGENTINA** - A contract for construction of a receiving facility at Mar Chiquita and a processing facility at Buenos Aires has been signed. Installation of the station and commencement of tests are expected by the end of 1979.

**AUSTRALIA** - A reception/recording facility at Alice Springs is expected to begin operations in December 1979. A processing/dissemination facility at Canberra is expected to be operational by March 1980. Australia plans to produce single-band, quick-look imagery for all data acquired.

**BRAZIL** - The Brazilian station has been receiving data regularly. Several application projects are in progress, including monitoring of deforestation in the Amazon, identification of likely titanium deposits, mapping of sediment concentrations in a dam area, and inventorying of sugar cane acreage.

**CANADA** - Canada is receiving data at both the Prince Albert and Shoe Cove stations. Some applications of Landsat data currently underway in Canada include ice reconnaissance map updates and forest and fuel mapping.

**EUROPEAN SPACE AGENCY** - The European stations are acquiring and recording data which are processed at Fucino and then disseminated through National Points of Contact. They report that user demand for data has increased and is expected to continue to increase in the near future.

**INDIA** - The Indian station in Hyderabad is currently being installed and will be in operation by early summer. Several application projects are underway involving resource surveys, water, soil, and land use studies, as well as geologic surveys in various states.

**JAPAN** - Data reception began at the Japanese facility Ohashi shortly after the first of the year. An Earth Obser-

vation Center and Remote Sensing Technology Center are being established in downtown Tokyo for data dissemination and user assistance.

**ZAIRE** - Negotiations to arrange for financing to build a Landsat ground station are under way. Several application projects are in progress, including soils and forestry maps, and geologic studies.

The next meeting is scheduled to be held in Japan in November.

### EROS ALASKAN FIELD OFFICE

The EROS Data Center plans to augment its program of effecting remote sensing technology transfer to Department of Interior and cooperating government agencies by opening a field office in Anchorage, Alaska. At this office, Federal, State, and local agencies will be able to obtain assistance and training in the application of remote sensing data to a wide range of Alaskan resource inventory and management problems. Demonstrations of image analysis techniques, day-to-day technical assistance, and training in the use of analysis equipment will be available. In addition, remote sensing orientation sessions, workshops, and training courses will be conducted as needed.

Staffing and operating an Anchorage office has come about to meet the growing need by Alaskan scientists and resource managers to compile resource information pertaining to that State. This need is not easily met by coordinating activities and providing assistance over great distances from the lower 48 states. The Alaskan field office will make discipline-trained scientists and remote sensing image analysis equipment (both manual and digital) available to users in proximity to their base of operation.

Many users are finding Landsat data an extremely useful tool which can provide a cost-effective supplement to the more rigorous, time-consuming surveys performed with conventional sources of data. The Bureau of Land Management, for example, is aggressively applying Landsat technology in response to mandates to inventory Federal lands for areas of environmental concern, wilderness potential, and for general land use planning. The U.S. Fish and Wildlife Service is exploring the use of Landsat data for compiling an inventory of wetlands in Alaska as part of the National Wetlands Inventory. The vast expanse of Alaskan lands is well suited to the synoptic coverage provided by Landsat.

### USER SERVICES AND DATA MANAGEMENT WORKSHOP

The EROS Data Center hosted a 3-day gathering in May of senior User Services and Data Management personnel from Landsat ground stations around the world. The purpose of the workshop was to exchange

## LANDSAT DATA USERS NOTES

information on methods and techniques used, data availability, and communication requirements regarding the handling of Landsat data.

Workshop participants came to Sioux Falls, South Dakota from Australia, Canada, Italy, Brazil, and Japan. They discussed the operation of their facilities, or the status of any plans for a facility. Other discussion items included the interchange of Landsat data base tapes, the need for mutual assistance and cooperation among the national User Services and Data Management groups, and the Landsat microCATALOG and microIMAGE systems.

From this workshop an exchange program has been initiated covering such items as operating procedures, production specifications, newsletters, and bulletins, catalogs and image reference data, product samples, etc. It is hoped that an annual meeting will result from the activities of this first workshop.

### GROUND CONTROL POINT SELECTION

As a result of a NASA/EROS Working Group meeting held on March 30, 1979, priorities for selection and entry of ground control points for Landsat MSS imagery have been established.

This relates to the article on "Precision Corrections" carried in issue no. 5 of the Landsat NOTES last March. The priorities for incorporation of digitized ground control points into the Landsat systems are as follows:

<u>Country</u>	<u>Completion Date</u>
U.S. (paths 14 to 52)	Feb 1980
Alaska	Feb 1980
Canada	Feb 1980
Australia	Mar 1980
Soviet Union	Mar 1980
Brazil/Argentina	Aug 1980
India	Aug 1980

The above dates are contingent upon timely receipt of appropriate maps and other factors. Special priority requests will be considered by NASA but are not encouraged.

### STATUS OF LANDSAT 3 DATA AVAILABILITY

#### LANDSAT MSS PROBLEM

The MSS line-start problem noted in our last issue is still under study by NASA, as are designs for a ground fix. This error is caused by start pulse problems which result in scan line offset of about 25%. When failing, the error can cause from 5 to 40 percent of the total lines to be offset. Lately, however, few scenes appear to be affected, and to date, little evidence of the problem has

appeared in most of the data received and archived at the EROS Data Center. (Any such images are coded at EDC with degraded quality in the EDC data base and in Landsat catalogs.)

#### RBV DATA

Landsat 3 RBV data continue to be acquired. RBV data acquired prior to February 1, 1979, are available in 70-mm format. However, processing of RBV data acquired after February 1 has been suspended in anticipation of the start of digital processing through the Master Data Processor at NASA/Goddard and the EROS Digital Image Processing System (EDIPS) at EDC. Processing of these data by NASA/Goddard is scheduled to begin soon, at which time post-February 1 RBV data will be available both as computer-compatible tapes and as 241-mm enhanced film products.

#### RETROSPECTIVE ORDERS

Since February 1, 1979, all Landsat MSS data sent to the EROS Data Center from NASA/Goddard have been fully corrected (using "system" corrections, not ground control points), and resampled. Beginning in July, EDC will accept orders for MSS data in unresampled form or resampled to the Universal Transverse Mercator (UTM) image projection. Such orders at this time require a "retrospective" or back order to NASA/Goddard. They can be placed for any data acquired since November 1976; however, a special order price and longer delivery times will apply.

Regarding pre-November 1976 data, NASA/Goddard currently plans to continue CCT production at least through early 1980. These CCT's are provided in the pre-EDIPS "X" format only (band interleaved by pixel pairs). A final disposition on what will happen after the 1980 cutoff date has not yet been made.

In view of the uncertainty, EDC is in the process of evaluating all pre-November 1976 data to determine which geographic areas it would be advantageous to convert and archive in CCT format between now and 1980.

CCT users may be well advised to order CCT data of interest prior to the 1980 cutoff date. In addition, users are encouraged to submit suggestions regarding the selection of geographic areas by EDC. Comments should be directed to the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511.

#### LANDSAT PIPELINE PROCESSING

As of July this year, the standard pipeline processing steps performed on Landsat imagery by the EROS Digital Image Processing System (EDIPS) will no longer include automatic contrast stretch.

Automatic contrast stretch is being deleted from standard pipeline processing because of its potential effect on the analysis of temporal changes from scene to scene of the same area. For example, clouds present in

LANDSAT DATA USERS NOTES

one scene and not in another scene could create changes in ground features which do not exist. Instead of automatic contrast stretch, haze removal (compensation for atmospheric scattering) will be performed during all standard pipeline processing.

More detail on this subject will appear in the next issue of the NOTES in September.

**LANDSAT D**

The next satellite planned in the Landsat series will be the Landsat D (or, after successful launch, Landsat 4). It is currently under design and fabrication by NASA and its prime contractor, General Electric. It will serve as the platform for a multispectral scanner (MSS) similar to that currently in operation aboard Landsat 3, and a new thematic mapper. Launch is planned for the fourth quarter of 1981.

Landsat D will have a nominal orbital altitude of 705 km and a descending equatorial crossing at about 9:30-10:00 a.m., and it will maintain a 16-day cycle of repetitive coverage. The two on-board sensors will provide ground coverage of about 185 x 170 km per scene.

The MSS will sense data in the same 4 bands as the present MSS on Landsat 3, and will have the same instantaneous field of view (80 meters).

The thematic mapper, a line-scanning device also, will operate over 7 bands and have an instantaneous field of view of 30 meters.

A new ground processing system is being implemented at NASA/Goddard for Landsat D data. The system will receive sensor data via the new Tracking Data and Relay Satellite System (TDRSS) and will produce high-density tapes, computer-compatible tapes, and film of the data within 48 hours.

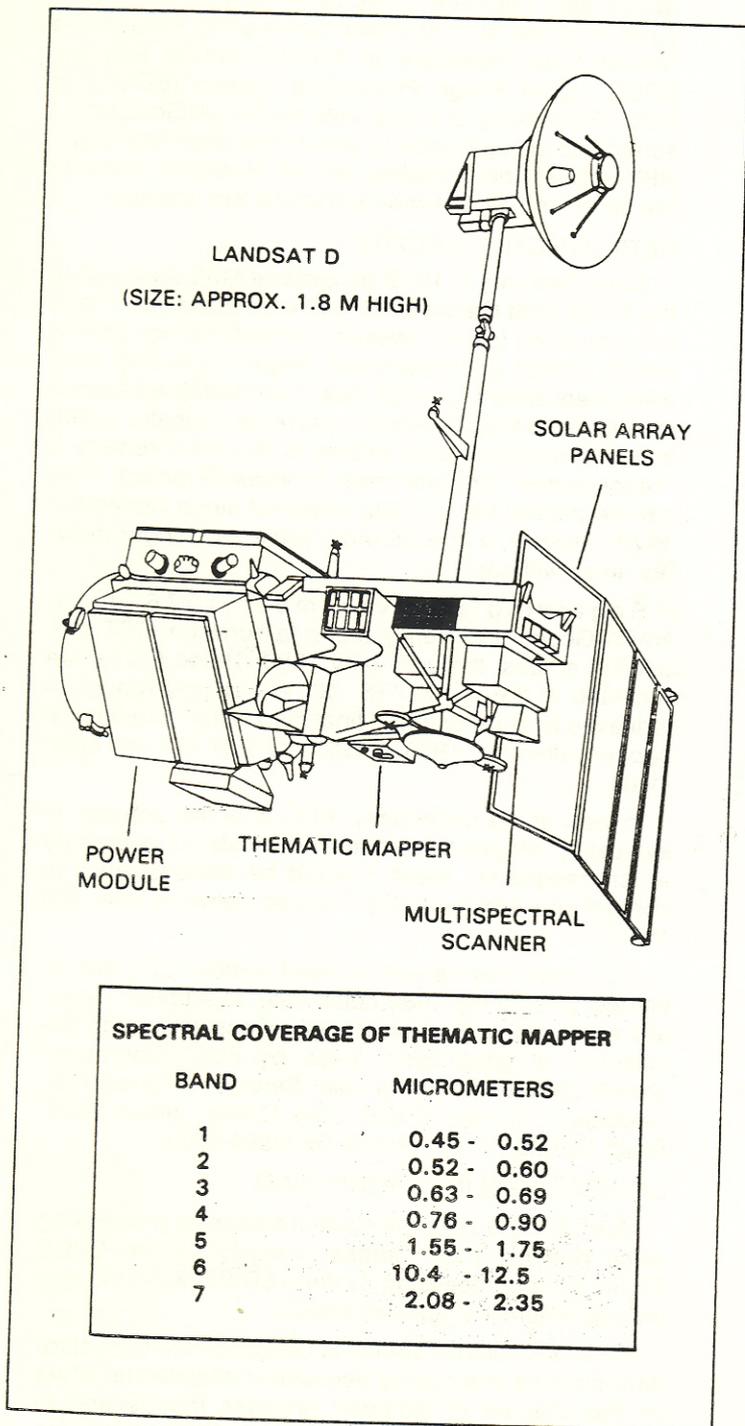
Approximately 200 MSS scenes per day will be converted to geometrically uncorrected high-density tapes in the same format as the HDT-AM of Landsat 3. These tapes will then be transmitted to EDC and will become the archival masters for product generation and dissemination. The geometrically corrected output pixel size will remain 57 meters square.

Approximately 50 scenes per day from the thematic mapper will be geometrically corrected and converted to high-density tapes. NASA/Goddard will then generate 241-mm film from these tapes and ship the film to EDC. This film will become the archival master for product generation and dissemination. The geometrically corrected output pixel size of thematic mapper data will be 28.5 meters square.

Both NASA and EROS agree that a film interface for thematic mapper data is technically unacceptable. The Department of the Interior is seeking funding in FY 1981 for a thematic mapper data processing system that would allow a digital data interface.

**EDIPS PRODUCTION STATUS**

The EROS Digital Image Processing System (EDIPS) continues to process MSS data received from NASA/Goddard via the Domsat communications link. Transmission of high-density digital data using this synchronous satellite link has proven reliable over the past



**SPECTRAL COVERAGE OF THEMATIC MAPPER**

BAND	MICROMETERS
1	0.45 - 0.52
2	0.52 - 0.60
3	0.63 - 0.69
4	0.76 - 0.90
5	1.55 - 1.75
6	10.4 - 12.5
7	2.08 - 2.35

several months and has been accomplished with few operational problems.

As of June 1, approximately 6,000 scenes had been processed through the all-digital EDIPS system and entered into the EROS Data Center archives. As the July NOTES went to press, RBV data were expected to be made available momentarily.

## AERIAL PHOTOGRAPHY MICROFICHE

A new microfiche reference system is available to users of aerial photography flown over the United States. Called the Aerial Photography micro(graphic)-INDEX, this system references several million frames of both NASA research and USGS mapping photography, maintained at the EROS Data Center.

The micro(graphic)INDEX is keyed to the U.S. Geological Survey's 1:1,000,000 scale map series, consisting of 4° x 6° quadrangles of the contiguous United States. Additional indexing based on photo scale, film type, and date of acquisition is provided. The smallest unit of fiche which can be purchased is that which references one entire 4° x 6° quad. A unit can reference small to large scale photography, and black-and-white, color, or color infrared film. Prices vary based on the amount of aerial coverage associated with a specific quad. They range from \$5 to \$65.

For additional information on this system, or to place orders for microfiche, contact the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, phone (605)594-6511.

## PECORA V

Approximately 300 people attended the Fifth Pecora Symposium in Sioux Falls last month. Entitled "Satellite Hydrology," the symposium was sponsored by the American Water Resources Association in cooperation with 16 other agencies and societies.

Dr. John M. DeNoyer, research scientist in the Geologic Division of the U.S. Geological Survey, and Virginia Norwood, of Hughes Aircraft Co., were named the 1979 Pecora Award recipients for outstanding contributions in the field of remote sensing during the Pecora V Symposium.

DeNoyer has been a pioneer in remote sensing and was a prime mover in the establishment of the EROS Program and the EROS Data Center. He served as first chief of the EROS Program. Norwood designed the multispectral scanner, a principal sensor on the Landsat satellites.

The Pecora Symposia and the Pecora Awards honor the late Dr. William T. Pecora, eighth Director of the Geological Survey and Under Secretary of the Interior. He was instrumental in the Nation's survey satellite program.

Among the highlights of Pecora V were two field trips on remote sensing of hydrology in eastern South Dakota sponsored by the Remote Sensing Institute of South Dakota State University and the Water Resources Division of the U.S. Geological Survey. Guided tours of the EROS Data Center were also featured.

Pecora VI will be sponsored by the Society of Exploration Geologists next April 13-17, 1980, in Sioux Falls.

## ASP-ACSM MEETING

Plans are being finalized for the 1979 Fall Meeting of the American Society of Photogrammetry and the American Congress on Surveying and Mapping to be held September 17-20 in the Sioux Falls, South Dakota, Convention Center.

Following opening ceremonies on Monday morning, the plenary session will cover the convention theme, "Observing and Measuring the Planet Earth." Specific topics will be "Applications of Space Technology to Nonrenewable Resource Problems of National Scope," "Measuring and Surveying Water Resources," "People, Resources, and Mapping Opportunities," and "Land Resource Information and Food Production."

Rupert B. Southard, Jr., Chief of the Topographic Division, U.S. Geological Survey, will give the keynote address on Wednesday morning, September 19. Mr. Southard, who joined the Survey in 1949 and has been on the Washington staff since 1955, received the Department of the Interior Meritorious Service Award in 1973 and the Interior Distinguished Service Award in 1976. His long experience as a topographic engineer has touched on almost every aspect of the discipline.

### General sessions on

- Data Acquisition and Information Extraction
- Surveying and Remote Sensing in Energy and Mineral Resource Production
- Surveying and Remote Sensing in the Management and Use of Water Resources
- Surveying and Remote Sensing in Food and Fiber Production and Management of Natural Vegetation
- Marine Surveying and Mapping
- Surveying and Remote Sensing in Land Use Planning and Change Detection, will be accompanied by panel discussions on:
  - Contracting of Federal Lands Surveys and Mapping
  - National High Altitude Photography Data Base.

Also, poster sessions will add a new dimension to the convention. More than 50 commercial exhibitors will display their products and technology, along with a number of educational exhibits by universities and government agencies.

## LANDSAT DATA USERS NOTES

**EDC TRAINING SCHEDULE**

The EROS Data Center's Applications Branch staff will conduct or participate in several training courses and workshops in the coming months.

- Aug 25 - Aug 29 *Introduction to Agricultural Remote Sensing* (Honolulu, Hawaii). Open to non-U.S. scientists: Contact: Dr. Saleem Ahmed, East-West Resource Systems Institute, The East-West Center, 1777 East-West Road, Honolulu, Hawaii 96848.
- Sept 10 - Oct 5 *International Remote Sensing Workshop* (Sioux Falls, South Dakota). Open to non-U.S. scientists. Contact Office of International Geology, U.S. Geological Survey, National Center (917), Reston, Virginia 22092.
- Sept 24 - Sept 28 *Vegetation and Landform Remote Sensing Workshop* (Coeur d'Alene, Idaho). Open enrollment. Contact: Joseph Ulliman, College of Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow, Idaho 83843, Phone: (208)885-7016.
- Oct 9 - Oct 13 *Terrain Analysis: Interpretation of Aerial Photographs and Images* (Sioux Falls, South Dakota). Contact: Lisa Underkoffler, Graduate School of Design, Gund Hall L-37, Harvard University, Cambridge, Massachusetts 02138, phone: (617)495-2578.
- Oct 15 - Oct 19 *Advanced Geology Workshop* (Sioux Falls, South Dakota). Open enrollment, preference given to U.S. Federal agency personnel. Contact: Branch of Applications, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114.
- Oct 22 - Oct 26 *Applications of Geological Remote Sensing to Mineral Exploration* (Rapid City, South Dakota). Contact: Director of Continuing Education, South Dakota School of Mines and Technology, Rapid City, South Dakota 57701, phone: (605)394-2480.
- Oct 23 - Oct 26 *Water Resources Remote Sensing Workshop* (Sioux Falls, South Dakota). Open enrollment, preference given to U.S. Federal agency personnel. Contact: Branch of Applications, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511.
- Jan 21 - Jan 25 1980 *Digital Analysis Workshop* (Sioux Falls, South Dakota). Open to Bureau of Land Management personnel only. Contact: William Bonner, BLM Scientific Systems Development, Denver Service Center, Bldg. 50, Code D-140, Denver, Colorado.
- Jun 9 - Jun 13 1980 *Basic Geology Workshop* (Sioux Falls, South Dakota). Open enrollment,

preference given to U.S. Federal agency personnel. Contact: Branch of Applications, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114.

**ADDITIONAL TRAINING IN REMOTE SENSING**

- Aug 19 - Aug 24 *Aerospace Technology and the Forest Environment -- An International Short Course and Conference* (Arcata, California). Contact: Donna B. Hankins, Remote Sensing Technology Transfer Project, Humboldt State University, Arcata, California 95521, phone: (707)826-3731.
- Oct 8 - Nov 9 *Advanced Training in Land Use Planning and Environmental Applications* (Flagstaff, Arizona). Contact: Office of International Geology, U.S. Geological Survey, National Center (917), Reston, Virginia 22092.
- Oct 15 - Oct 19 *Digital Image Processing of Earth Observation Sensor Data* (Washington, D.C.). Contact: Continuing Engineering Education, George Washington University, Washington, D.C. 20052, phone: (202) 676-6106.
- Oct 22 - Oct 26 *Remote Sensing and Digital Information Extraction* (Washington, D.C.). Contact: Continuing Engineering Education, George Washington University, Washington, D.C. 20052, phone: (202)676-6106.
- Oct 24 - Oct 26 *Remote Sensing and Photo-Interpretation Workshop for Environmental Studies* (Orono, Maine). Contact: Marshall D. Ashley, School of Forest Resources, University of Maine at Orono, Orono, Maine 04473, phone: (207)581-7313.
- Feb 11 - Mar 7 1980 *Advanced Training in Digital Image Processing* (Flagstaff, Arizona). Contact: Office of International Geology, U.S. Geological Survey, National Center (917), Reston, Virginia 22092.
- Feb 25 - Feb 29 1980 *Eighth Alberta Remote Sensing Course* (Edmonton, Alberta). Contact: Cal Bricker, Alberta Remote Sensing Centre, 11th Floor, 9820 - 106 St., Edmonton, Alberta T5K 2J6, phone: (403)427-2381.
- Continuing: *Training in Remote Sensing* (Brookings, South Dakota). Long-term (3-12 months) detailed training in technical and administrative techniques of Remote Sensing Technology. Contact: Dr. Donald G. Moore, Remote Sensing Institute, South Dakota State University, Brookings, South Dakota 57006.

NOTE: If you are planning a training course in remote sensing, please let us know *well in advance*. It will be

## LANDSAT DATA USERS NOTES

listed in the newsletter. Contact: William C. Draeger, Application Branch, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114.

### LANDSAT DATA USERS HANDBOOK

The *Landsat Data User's Handbook* (3rd edition) is available from the U.S. Geological Survey Branch of Distribution, 1200 South Eads Street, Arlington, Virginia 22202. The price is \$11.00 to users from the U.S., Canada, and Mexico. A 25% surcharge will apply to orders from other countries. Orders should be prepaid. Make checks payable to the U.S. Geological Survey.

### CCT's

The EROS Data Center Applications Branch has recently developed software for inputting EDIPS computer-compatible tapes to the interactive analysis systems in the Data Analysis Laboratory. As a result of this experience, they offer the following information to users who are contemplating development of tape read routines for the new EDIPS-format tapes.

1. The first tape directory contains the essential information: scene identification, sensor type (MSS or RBV), and the band organization -- band interleaved by line (BIL) or band sequential (BSQ).
2. The first header record indicates what corrections have been performed and which bands are present on the tape.
3. In reading the image, a quick way to ignore the "non-image" records and advance to the next image record is to test byte 6 in each record. If it contains 355<sub>8</sub>, it is an image record. Bytes 1 through 4 of the image record give a record number which may be checked to ensure that sequential records are being processed.

### INTERNATIONAL COURSES AT EDC

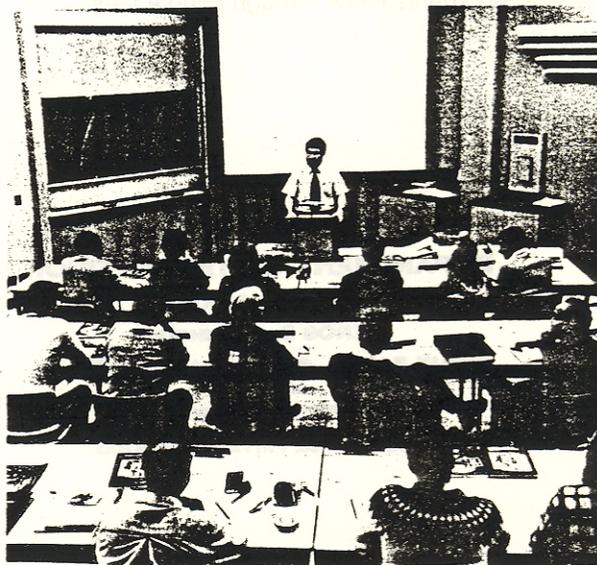
Since 1973, the EDC Branch of Applications has conducted 22 training courses for non-U.S. scientists in the use of remote sensing technology for natural resource inventory, evaluation, and management. These courses have totaled over 375 training days and have involved 637 students.

#### INTERNATIONAL WORKSHOP

Twice a year, in May and September, an International Remote Sensing Workshop is presented. The workshops are designed to give the participant familiarity with the general characteristics of a variety of remote sensing systems, i.e., image characteristics, advantages and limitations, and applications, as well as

experience in analyzing and interpreting imagery to produce products useful in natural resource management and planning. Emphasis is placed on the analysis of Landsat imagery, although attention is also given to other image types such as aerial photography, thermal infrared imagery, and radar. The workshops concentrate on the basic principles of manual analysis techniques, and do not include advanced theoretical work or computer-aided data analysis. Although specific discipline-oriented studies are discussed, emphasis is placed on the interdisciplinary uses of remote sensing data, because an understanding of the appearance and analysis of all resource features exhibited on remote sensing imagery (i.e., vegetation, soils, hydrologic phenomena, and geologic features) is essential to a thorough interpretation for any single discipline.

The intent of the workshops is not to make the participant an expert practitioner of remote sensing, but rather to equip him to acquire additional experience and practice upon return to his home country. The workshop is viewed as providing a foundation upon which he can build, and hopefully will allow him to proceed in the use of remote sensing with a basic understanding of techniques, uses, and possible difficulties that he may encounter.



A Training Course In Session.

The usual 4-week workshop program consists of a combination of classroom lectures, workshop exercises, homework, and field work in the analysis of Landsat images and aerial photos. In general, the first week is spent on an introduction to the fundamentals of remote sensing, including matter-energy relationships, sensors and their characteristics, the acquisition of Landsat data, and basic analysis techniques. The second week is devoted to a review of remote sensing applications in the various natural resource disciplines, and practice in image analysis and data interpretation

**LANDSAT DATA USERS NOTES**

by means of practical hands-on exercises. During the third week a field trip is taken during which many of the places viewed and analyzed on the imagery earlier are visited on the ground, thus incorporating the concept of the importance for field-familiarization and verification in the analysis process. The bulk of the fourth week is spent in the interpretation of Landsat imagery of an area selected by the attendee, usually in his own country in a region with which he is familiar and in which he has a particular interest. The attendee is asked to define a resource interpretation problem, analyze and interpret the imagery, and report on the results.

**SPECIAL COURSES**

In addition to the regularly scheduled workshops, EDC personnel have conducted courses sponsored by specific foreign governments or international organizations (United Nations, Food and Agriculture Organization, Inter-American Development Bank, etc.), often at sites outside the U.S. such as Saudi Arabia, Iran, Somalia, Mexico, and Argentina. Most of these courses have been similar to the regular International Workshops but have been modified somewhat to meet the particular sponsor's needs.

In all cases, the costs of the international training programs are borne by the individual participants or the sponsoring organizations through course fees.

**IMAGE ANALYSIS EQUIPMENT AND SERVICES**

The list of sources offering image analysis equipment and services that was printed in Issue No. 3 of the *Landsat Data Users Notes* is maintained at the EROS Data Center and is revised and expanded as new information is made available to EDC. Organizations requesting changes in their listings, or wishing to receive copies of the most current list, should direct their inquiries to:

User Services Section  
U.S. Geological Survey  
EROS Data Center  
Sioux Falls, South Dakota 57198  
(605)594-6511

\* \* \*

The Landsat Data Users NOTES is published bi-monthly in order to present information of interest to the user community regarding Landsat products, systems, and related remote sensing developments. There is no subscription charge; individuals and organizations wishing to receive the NOTES should contact the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, U.S.A., telephone: (605)594-6511.

Comments, corrections, and other inquiries should be directed:

Editor, Landsat NOTES  
U.S. Geological Survey  
EROS Data Center  
Sioux Falls, South Dakota 57198

**UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
EROS DATA CENTER  
SIOUX FALLS, SOUTH DAKOTA 57198**

**OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300**

POSTAGE AND FEES PAID  
U. S. DEPARTMENT OF THE INTERIOR  
INT-413



**AIR MAIL**