Landsat Data Users NOTES

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NASA

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

PECORA VII

The ever increasing use of remotely sensed data will be addressed at the 7th Pecora Symposium entitled "Remote Sensing: An Input to Geographic Information Systems in the 1980's." Cosponsoring the event, which will take place in Sioux Falls, S.Dak., October 18-21, 1981, are the Association of American Geographers, the National Council for Geographic Education, and the American Society of Photogrammetry, in cooperation with the U.S. Geological Survey and the National Aeronautics and Space Administration (NASA).

The combined use of remotely sensed data and ancillary information has aided in developing an effective method of evaluating and managing earth resources. The symposium is designed to explore the advancements in the information systems that have resulted from this unified approach, with special emphasis on the role of remote sensing. Specific topics addressed will include land use classification and mapping, monitoring environmental changes, the role of remote sensing in predictive modeling, future developments in earth resources satellites, and cartographic and geographic information systems for the 1980's. Digital analysis demonstrations and tours of the U.S. Geological Survey's Earth Resources Observation Systems (EROS) Data Center will be conducted throughout the conference.

The Pecora symposia, which were established in 1975, honor the memory of William T. Pecora. As a Director of the U.S. Geological Survey from 1965-71, Dr. Pecora played a leading role in the establishment of the EROS program and of the EROS Data Center itself.

LANDSAT D SIMULATION DATA AVAILABLE

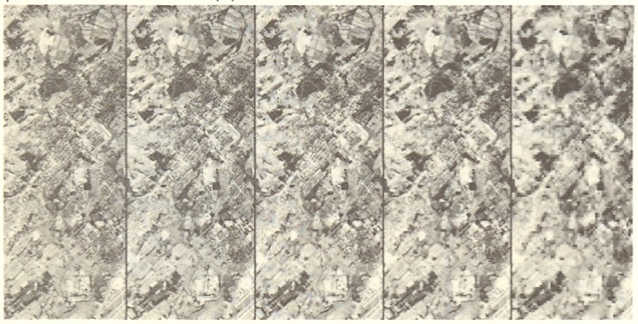
EDC has received a set of image data generated by Geospectra Corporation in connection with a project to simulate various spatial resolutions of multispectral data. The data were acquired by aircraft using a Daedalus DS-1260 multispectral scanner and a thematic mapper simulator. They give an indication of the effects of pixel size on image usability. In particular, some of the data demonstrate the expected ground resolution of imagery from Landsat D.

Resolutions of 10, 20, 30, 40, and 80 meters were simulated for each of four test areas that represented four distinct categories of interest to users: urban, agriculture, forestry, and geology. The first three test areas were imaged with the multispectral scanner, whereas the geology test area was imaged with the thematic mapper simulator. Radiometric and geometric corrections, including resampling to the universal transverse mercator projection, were subsequently performed on the raw image data.

EDC has generated a series of products from these simulation data. These products are available to any interested user and consist of the following:

	Ref. No.	Price
Uncorrected Digital Tapes (9 track, 1600 bpi):		
Urban-Agriculture	A0391	$100
Geology-Forestry	A0533	$100
Resampled Digital Tapes (9 track, 1600 bpi):		
Geology	J0670	$100
Urban-Agriculture-Forestry	A0256	$100
Photographic imagery (color film or paper prints, various scales):		
Agriculture	E-1211-99CT	$15 to $50
Urban	E-1212-99CT	
Forestry	E-1213-99CT	
Geology	E-1214-99CT	

To obtain any of the above image data, call or write the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6151. Documentation on tape format will be provided where applicable.



10 m 80 m

Example of how various resolutions are mosaicked together on the MSS simulation data photographic products.

HISTORICAL CCT SELECTION CONTINUES

In March of 1979, the Landsat Data Users NOTES carried an article on the computer compatible tape (CCT) formats that were available after conversion to new digital image processing systems at the EROS Data Center (EDC) and the NASA Goddard Space Flight Center. A concern at that time was whether pre-November 1976 Landsat data would continue to be available in the old CCT format, since this format was incompatible with the new systems and operation of the old system could not go on indefinitely.

EDC and NASA therefore initiated a project to identify and archive (in CCT form) as many of these historical data as possible before the Goddard Space Flight Center ceased production of the old-format tapes altogether. This project has reached a point where selection of CCT's for certain scenes acquired during 1972-75 has been completed, and selections for 1976 are now in progress.

Although the conversion of pre-November 1976 Landsat data to CCT form will eventually be stopped by the Goddard Space Flight Center, the exact time is not known. Users with special needs requiring the conversion of historical scene data to CCT form are therefore encouraged to make their requirements known to EDC. If the scenes have not already been identified and placed on order with the Goddard Space Flight Center, a concerted effort will be made to do so. Requests should be submitted to the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6151.

MAPSAT FEASIBILITY STUDIED

The following article describes the results of a feasibility study contracted for by the U.S. Geological Survey to look at a concept for a land remote sensing satellite system. It is one of several conceptual satellite system configurations being looked at by the Federal Government.

In January of this year, the U.S. Geological Survey received a feasibility study on the conceptual design for an automated mapping satellite (Mapsat) system. Performed by Itek Corporation, the study had been solicited by the Survey in April 1980 to define a candidate for an operational land remote sensing system that could emerge after the experimental Landsat era.

Itek's report summarizes a study of the Mapsat concept and indicates that if the U.S. Government decided to move immediately on such a project a satellite could be launched in the 1986-88 time frame.

Mapsat is based on the Landsat mission, including the original Landsat orbit and data communication concept, but goes further in meeting the needs of some parts of the user community. A 10-m instantaneous field of view (IFOV), for example, in either stereoscopic or monoscopic mode, would be available on demand in any of three spectral ranges of interest. A high degree of automation in the extraction of topographic information would also be achieved as a result of platform stability, attitude determination, and advances in sensor technology.

Briefly, the Mapsat concept incorporates the following capabilities:

- Global coverage on a continuous basis over a very long life.
- Variable resolution and swath-width coverage.
- Stereoscopic and multispectral capabilities.
- Capability of 1:50,000-scale image mapping with a 20-m contour interval.
- Unidimensional data processing.

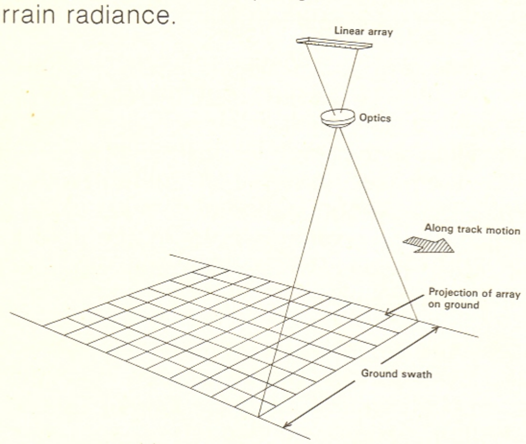
The primary features of the Mapsat system are discussed briefly below.

MAPPING GEOMETRY

Although the name Mapsat implies a mapping system, this does not mean it would serve only the mapmaker. Geometric precision, essential to the cartographer is also the key to an operational Earth-sensing system. Disciplines such as geology, hydrology, agriculture, and geography, for example, have a proven need for multispectral data in accurate mappable form.

Mapsat would achieve high geometric fidelity by defining a spacecraft and sensor system which would have virtually no moving parts and very precise position and attitude determination. The sensor system would be based on solid-state linear arrays. Moreover, the antennas would be rigid and the solar panels defined so that they would remain rigid during data acquisition.

Solid-state linear arrays, while not unique to the Mapsat concept, are suited to satellite imaging of the Earth. Imaging would be achieved by optically projecting the array to the ground so that the vehicle's velocity would cause the array to scan the Earth's surface and, by repeated sampling, to obtain a record of the terrain radiance.



Pushbroom scan for a one-dimensional array.

This method of imaging, termed "pushbroom" scanning, has striking advantages over mechanical scanning. Because there are no mechanical devices needed for the imaging process, there is opportunity for eliminating all mechanical disturbances, an advantageous situation for high resolution imaging. In addition, the precision geometry of the photo arrays, inherent in the photolithographic process by which they are made as well as in the stability of their silicon structure, provides the basis for registration from one spectral band to another and for the accurate location or mapping of terrain features. Greater signal-gathering power is also achieved as a result of the larger area of the focal plane from which the signal is continuously gathered (increasing the "dwell" time available to record the signal). This improved instrument sensitivity could be used to increase radiometric accuracy, improve geometric resolution, or provide narrower spectral bands, thus increasing the precision of the information gathered.

These concepts of precision in both platform positioning and sensor response would enable Mapsat to acquire data with a geometric accuracy far greater than that achieved by Landsat or any alternative electo-optical system currently proposed.

RESOLUTION AND DATA RATES

At full resolution, Mapsat would be able to image a given area with an effective resolution element as small as 10 m. This resolution would have to be balanced, however, with the type of spectral coverage, topographic mode, and swath width deemed appropriate for the area to be covered. Although each of these acquisition parameters will be commandable from the ground, not all combinations will be possible.

Flexibility in choosing combinations of resolution level, swath width, spectral coverage, and stereo-vs-mono acquisition mode would thus be limited to the following:

Defined Mode	Spectral Region	Topographic Mode	Resolution	Swath Width
a	Pan	Stereo	Full	Reduced
b	Pan	Stereo	Reduced	Full
c	MS	Stereo	Full	Reduced
d	MS	Stereo	Reduced	Full
e	Pan	Mono	Full	Full
f	MS	Mono	Full	Reduced

Fortunately, areas requiring full 10-m resolution are generally of limited extent. It should also be remembered that earth resources data can be correlated across spectral bands so that only one band need be recorded at high resolution, with the others at reduced resolution. Additional flexibility in the system would be achieved by using data compression techniques and onboard data storage.

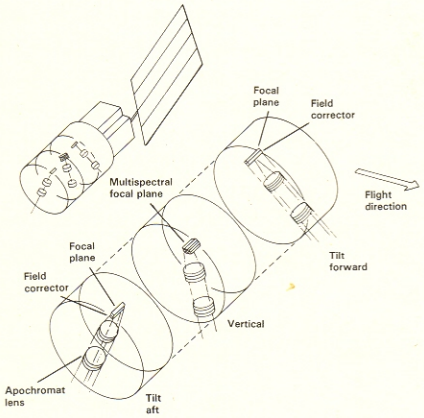
SPECTRAL BANDS

The Landsat multispectral scanner (MSS) uses four basic spectral bands. Of the four MSS bands, two are in the near infrared. In order to simplify data acquisition, the two near-infrared bands would be consolidated into one on Mapsat. The three bands sensed would be a blue-green band (0.47 to 0.57 μm), a green-red band (0.57 to 0.70 μm), and a near-infrared band (0.76 to 1.05 μm). A thermal band, although important, is not considered suitable for Mapsat, which would record reflected solar energy.

STEREOSCOPIC CAPABILITY

The delineation of the Earth's surface in three dimensions is useful for many applications. Landsat was not designed to acquire stereo data, but Mapsat would do this with two separate base-to-height ratios depending on the type of topography involved.

The requirement that Mapsat provide stereoscopic coverage on a demand basis would be accommodated by multiple imaging systems, one looking vertically (which provides the basic multispectral capability), and two looking forward and aft of the vertical by 23°. The fore and aft pair would provide a base-to-height ratio of 1.0, giving strong heighting capability. For moderate to rough terrain, a base-to-height ratio of 0.5 would be available through use of the vertical sensor in conjunction with either the fore or aft sensor. Such a sensor configuration would enable the acquisition of precise stereoscopic data and, thus, more efficient production of topographic maps.



Mapsat sensor configuration enabling fore, aft, and vertical imaging.

The value of stereoscopic sensing need not end with applications to topographic mapping. The Mapsat stereoscopic mode would provide for the automated production of digital elevation data, which represent a relatively new and powerful tool for depicting and analyzing the Earth's terrain. Using such data, a computer could depict topography based on any simulated conditions of illumination, and this would be useful for geologic interpretation and related applications. Moreover, derivative products such as slope maps and simulations of radar images could also be generated by the computer. For those who need precise radiometry, digital elevation data can be used to provide an appropriate slope and aspect correction to the recorded response.

UNIDIMENSIONAL DATA PROCESSING

Mapsat would be designed to acquire a one-dimensional flow of data from each detector in the linear array. The data from each of the several thousand detectors could thus be processed by relatively simple computer programs in a unidimensional mode.

This situation would be enabled by the pushbroom method of imaging in which the single (X) dimension is defined by the spacecraft heading and measured in terms of time.

Precise control of the spacecraft attitude will be essential in this processing mode because two arrays of detectors are involved in stereoscopic imaging, and corresponding detectors from each array both must trace the same ground path. When they do, they satisfy what is known as the "epipolar" condition by which data from the two arrays can be correlated by a unidimensional search and made to provide elevation data as well as planimetric position. Some ground control is needed, but with the stability and positional accuracy expected of Mapsat, such control need be much less than that required for conventional photogrammetry. Since correlated data could be processed by automated means, a basis would be provided for automated mapping systems. Significantly, the proper implementation of this concept would greatly reduce data processing time and cost in both the monoscopic and stereoscopic modes.

RBV/MSS COMPOSITE AVAILABLE

A color composite of combined Landsat RBV and MSS bands 4, 5, and 7 of the Washington, D.C., beltway area has been produced by EDC. It is a result of some of the work that has been in progress to assess the utility of combining the best features of each sensor in a single image.

RBV data have a spatial resolution about three times better than MSS data, but the MSS provides for spectral separation which the RBV does not. When both qualities are combined in the same image, the result is increased information content with a high level of detail. Discrimination of detail is aided by the technique of compositing a color image from the different MSS bands while incorporating the RBV brightness component.

Users who are interested in obtaining this test print should contact the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6151. A normal black-and-white RBV image of the same area is available for comparison. The order numbers for the color composite and the black-and-white RBV image are, respectively, E-1207-99CT and E-593-99BN. Enlargements of both prints can also be obtained.

EROS FIELD OFFICE ONE YEAR IN ALASKA

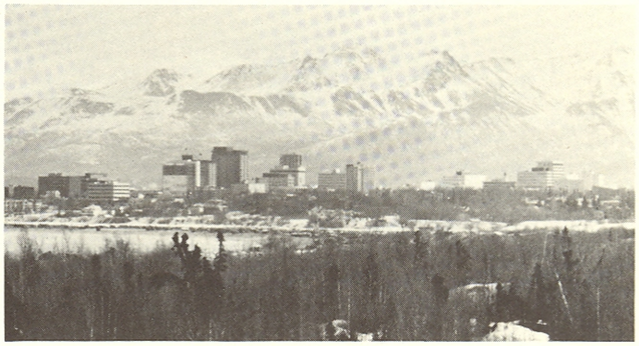
This March, the EROS Field Office located in Anchorage, Alaska, completed its first year of operation. During that time, the Field Office conducted:

- Forty demonstrations of its Interactive Digital Image Manipulation System's (IDIMS) capabilities for processing and analyzing digital Landsat data.
- Three training courses, consisting of introductory remote sensing courses for the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game, and a digital analysis course with the Bureau of Land Management.
- Three cooperative projects, one each with the National Park Service, the U.S. Forest Service, and the Bureau of Land Management.

In addition, the Field Office has hosted several remote sensing courses and orientation sessions conducted by other Federal agencies. Personnel from four State and Federal Government agencies have used IDIMS operationally to conduct their own resource assessment studies. In all, over 400 resource managers representing Federal, State, and local government agencies, as well as private industry, have visited or used the EROS Field Office for assistance in remote sensing applications.

In December 1980, President Carter signed into law the Alaska National Interest Land Conservation Act (frequently referred to as the D-2 legislation). This act places approximately 100 million acres of Alaska's pristine wild land into the national conservation system. The bill creates 43.6 million acres of new national park land to be managed by the National Park Service, adds 53.7 million acres of national wildlife refuge areas to be managed by the U.S. Fish and Wildlife Service, and puts 3.4 million additional acres into the national forest system to be managed by the U.S. Forest Service. The bill gives wilderness protection to 56.6 million acres of national park, refuge, and forest lands. The act also speeds conveyance of approximately 105 million acres to the State of Alaska and approximately 44 million acres to native groups under the 1958 Alaska Statehood Act and the 1971 Alaska Claims Settlement Act.

The D-2 legislation specifies that, within 5 to 7 years after enactment, a comprehensive management plan will be required for all units of a national park system including wildlife refuges, national parks, national forests, and national conservation and recreation units. Specifically, within 5 years, a conservation and management plan will be required for each unit of the system. A comprehensive conservation plan is required within 5 years for not less than 10 wildlife refuges, and plans for all refuges are required



A view of Anchorage.

within 7 years. A joint State-Federal plan is also required for the Bristol Bay Cooperative Region. The legislation additionally calls for North Slope land studies, particularly in the Arctic National Wildlife Range, as well as studies for oil and gas leasing programs and mineral assessment.

Several State and Federal agencies have already begun discussions with the EROS Field Office about the feasibility of using remote sensing techniques and the analysis capabilities of the Field Office for meeting many of the informational requirements of the comprehensive management plans.

For example, the Alaskan State Department of Natural Resources is exploring the possibility of developing land cover maps for 30 million acres in the Bristol Bay subregion by digital analysis of Landsat data. Elsewhere, the U.S. Fish and Wildlife Service is investigating the use of both manual analysis of high-altitude color-infrared aerial photographs and digital analysis of Landsat data to produce land cover maps for the comprehensive plans they must prepare for all the new and expanded wildlife refuges.

The Bureau of Land Management already is using the Field Office's image processing system to merge digital topographic data with digital land cover maps produced from Landsat for the Alaskan National Petroleum Reserve. This information will be used by BLM in preparing environmental assessments associated with oil and gas leasing activities soon to begin in the reserve. The National Park Service will almost certainly use Landsat and high-altitude aircraft data to gather information for the comprehensive plans for the new national parks.

The availability of Landsat data over all of Alaska, and high-altitude aerial photographs and radar imagery for much of the State, offer a variety of possibilities for using remote sensing techniques to collect much of the needed resource base data. The digital analysis capabilities and remote sensing assistance programs offered by the EROS Field Office complement the remote sensing activities already going on in Alaska and promise to contribute significantly to the massive resource inventory challenges of the Alaska National Interest Lands Conservation Act.

Landsat Production Statistics

	Aug. '80 MSS	Aug. '80 RBV	Sept. '80 MSS	Sept. '80 RBV	Oct. '80 MSS	Oct. '80 RBV	Nov. '80 MSS	Nov. '80 RBV	Dec. '80 MSS	Dec. '80 RBV	Jan. '81 MSS	Jan. '81 RBV	6-Month Total MSS	6-Month Total RBV
Landsat scenes acquired (satellite acquisitions)	2,145	1,433	3,394	1,676	3,759	1,958	2,576	1,007	2,298	1,775	1,061	702	15,233	8,551
Landsat scenes received at EDC[1]	1,166	--	2,667	--	1,440	2,258	1,620	6,876	3,017	3,825	3,467	3,712	13,377	16,671
Average time in days from EDC acquisition to EDC receipt (by month of EDC receipt)	41.2	--	19.7	--	20.7	--	37.8	--	28.6	--	[2]71.9	--	--	--
Average time in days from EDC receipt to archive availability	2.0	--	2.4	--	4.2	--	3.1	--	3.8	--	5.6	--	--	--
Average delivery time in days from receipt of order at EDC to shipment:														
Standard photographic products	13		16		20		19		15		18		--	
Standard digital products	9		8		13		9		8		11		--	
Landsat photographic frames sold	8,302		7,817		19,470		7,741		8,930		9,298		61,558	
Landsat digital scenes sold	333		295		404		364		356		358		2,110	
TOTAL LANDSAT DOLLAR VOLUME	$172,730		$156,987		$294,194		$175,305		$183,639		$206,238		$1,189,093	

[1]September, October, and November include some MSS reprocessed data.

[2]Increased time in January is a result of substantial progress with data that had been backlogged.

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.

Apr. 28 - May 29 *International Remote Sensing Workshop: Applications in Geologic and Hydrologic Exploration and Planning* (Sioux Falls, S. Dak.) Open to non-U.S. scientists. Contact: Office of International Geology, U.S. Geological Survey, National Center, Mail Stop 917, Reston, VA 22092, telephone: (703)860-6418.

June 1 - 5 *Digital Remote Sensing Techniques in Geology* (Sioux Falls, S. Dak.) Open enrollment. Contact: Branch of Applications, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6114.

June 15 - 19 *Terrain Analysis: Interpretation of Aerial Photographs and Images* (Sioux Falls, S. Dak.) Contact: Coordinator, Continuing Education Program, Harvard Graduate School of Design, Gund Hall L-37, Harvard University, Cambridge, MA 02138, telephone: (617)495-2578.

Aug. 31 - Oct. 21 *International Remote Sensing Workshop: Applications in Vegetation Assessment and Land-Use Planning* (Sioux Falls, S. Dak.) Open to non-U.S. scientists. Contact: Office of International Geology, U.S. Geological Survey, National Center, Mail Stop 917, Reston, VA 22092, telephone: (703)860-6418.

Oct. 26 - 30 *Applications of Remote Sensing in Geology/Hydrology* (Sioux Falls, S. Dak.) Open enrollment. Contact: Branch of Applications, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6114.

Nov. 16 - 20 *Advanced Geological Workshop* (Sioux Falls, S.Dak.) Open enrollment. Contact: Branch of Applications, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6114.

ADDITIONAL TRAINING IN REMOTE SENSING

Mar. 31 *Remote Sensing: An Overview* (Kansas City, Kans.) Also to be held April 2 in Topeka, Kans., April 7 in Salina, Kans., and April 8 in Pratt, Kans. Contact: Ms. Anne Kahle, KARS Program, University of Kansas, Space Technology Center, Lawrence, KS 66045, telephone: (913)864-4775.

Apr. 6 - 10 *Digital Image Processing of Earth Observation Sensor Data* (Washington, D.C.) Contact: Continuing Engineering Education, George Washington University, Washington, DC 20052, telephone: (202)676-6106 or (800)424-9773.

Apr. 18 - 19 *Remote Sensing Workshop* (Los Angeles, Calif.) Held in conjunction with 71st Annual Meeting of Association of American Geographers. Contact: Ronald A. Weinkauf, Department of Geography and Earth Science, University of Wisconsin, La Crosse, WI 54601, telephone: (608)785-8340.

May 11 - 12 *Digital Image Processing/Data Base Management for Geographic Information Systems* (Cambridge, Mass.) Contact: Ms. Smolens, Laboratory for Computer Graphics, Harvard University, 48 Quincy Street, Cambridge, MA 02138, telephone: (617)738-5020.

June 1 - 5 *Fundamentals of Applied Remote Sensing* (Lawrence, Kans.) Also held July 13-17. Contact: Anne Kahle, KARS Program, University of Kansas Space Technology Center, Lawrence, KS 66045, phone: (913)864-4775.

June 2 - 3 *Geographic Information Analysis Workshop* (New Haven, Conn.) Contact: Joseph K. Berry, School of Forestry, Yale University, New Haven, CT 06511, telephone: (203)436-0440.

June 2 - July 3 *Advanced Training in Geologic Interpretation* (Flagstaff, Ariz.) Open to non-U.S. scientists. Contact: Office of International Geology, U.S. Geological Survey, National Center, Mail Stop 917, Reston, VA 22092, telephone: (703)860-6418.

June 9 - 11 *Remote Sensing for Decisionmakers* (Ithaca, N.Y.) Contact: Dr. Warren R. Philipson, 464 Hollister Hall, Cornell University, Ithaca, NY 14853, telephone: (607)256-4330.

June 18 - 19 *Geographic Information Analysis Workshop* (Corvallis, Oreg.) Contact: Michael J. Manfredo, Department of Resource Recreation Management, Oregon State University, Corvallis, OR 97331, telephone: (503)754-2043.

June 23 - 24 *Geographic Information Analysis Workshop* (Fort Collins, Colo.) Contact: James A. Smith, College of Forestry, Colorado State University, Fort Collins, CO 80523, telephone: (303)491-5420.

August *Remote Sensing and Resource Management* (Taipei, Taiwan, Republic of China) Contact: Dr. Shin Wang, Department of Geography, National Taiwan University, Taipei, Taiwan. Address until May 1981: ITC, Box 6 (Private Box 112), Ensched, The Netherlands. This course will be followed by two others: "Agricultural and Forestry Applications" conducted by Dr. K. S. Hsu, and "Computer Processing of Imagery" conducted by Dr. T. C. Chen.

Aug. 25 *Postgraduate Diploma Programme in Remote Sensing* (Tamil Nadu, India) Duration: 1 year. Contact: Prof. R. Palanivelu, Head, Division of Photogrammetry and Remote Sensing, Pararignar Anna University of Technology, Madras, India.

Sept. 14 - Dec. 11 *Remote Sensing of Coastal Environment and Marine Resources* (Newark, Del.) Contact: Dr. V. Klemas, Center for Remote Sensing, College of Marine Studies, University of Delaware, Newark, DE 19711, telephone: (302)738-2336.

Oct. 5 - Nov. 6 *Advanced Training in Land Use Planning and Environmental Applications* (Flagstaff, Ariz.) Open to non-U.S. scientists. Contact: Office of International Geology, U.S. Geological Survey, National Center, Mail Stop 917, Reston, VA 22092, telephone: (703)860-6418.

Oct. 13 - 24 *International Geologic Correlation Programme (IGCP) Workshop on Remote Sensing and Mineral Exploration* (Nairobi, Kenya) Contact: W. D. Carter or L. C. Rowan, U.S. Geological Survey, National Center, Mail Stop 730, Reston, VA 22092.

Monthly: *Short Course on Numerical Analysis of Remote Sensing Data* (Emphasis varies from month to month.) (West Lafayette, Ind.) Contact: Douglas B. Morrison, Purdue/LARS, 1220 Potter Drive, West Lafayette, IN 47906, telephone: (317)749-2052.

Continuing: *Training in Remote Sensing* (Brookings, S. Dak.) 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, SD 57006.

Graduate and Postgraduate Training in Remote Sensing of Coastal Environment and Marine Resources (Newark, Del.) Long-term (3-12 months) training in data acquisition and analysis, including laboratory and field work. Contact: Dr. V. Klemas, Center for Remote Sensing, College of Marine Studies, University of Delaware, Newark, DE 19711, telephone: (302)738-2336.

NOTE:
If you are planning a training course in remote sensing, please let us know well in advance so that we can list it in this newsletter. Contact the Chief, Training and Assistance, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6114, concerning all training-related activities.

SYMPOSIUM

The *15th International Symposium on Remote Sensing of Environment* will take place in Ann Arbor, Mich., May 11-15, 1981. The symposium, sponsored principally by the Environmental Research Institute of Michigan, is open to anyone who has an interest in remote sensing.

Interested persons should contact Dr. Jerald J. Cook, Environmental Research Institute of Michigan, P.O. Box 8618, Ann Arbor, MI 48107, telephone: (313)994-1200.

LANDSAT DATA USERS NOTES

NEW JOURNAL

A new periodical, the *Journal of the Chilean Society of Photogrammetry and Remote Sensing (Revista de la Sociedad Chilena de Fotogrametria y Percepcion Remota)* is being published quarterly in Spanish. Its objectives are to present information in the areas of research, methods, and applications of photogrammetry and remote sensing.

Those wishing to receive the journal or to submit articles for publication should contact:

Oficina de Sensores Remotos
Instituto Geografico
Nueva Santa Isabel 1640
Santiago, CHILE

BRIEF . . . .

Seasat data users are reminded that both digital and film products of the data acquired by this satellite are available from the Satellite Data Services Division, National Oceanic and Atmospheric Administration, Room 606, World Weather Building, Washington, DC 20233. Seasat acquired data for 4 months and ceased operation on October 10, 1978.

The Landsat Data Users NOTES is published bimonthly 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: 605-594-6151.

Comments, corrections, and other inquiries should be directed to:

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