LANDSAT USER NEEDS AND ADMINISTRATIVE RESPONSES: DENSITY SCALES, DATA CATALOGUES, IMAGE ANNOTATION

by

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ABSTRACT

The present procedure of system interrogation and the consequent response to users which is necessary in order to identify a Landsat image, order and receive it can, apparently be simplified by the use of an illustrated image catalog. The illustrated catalog can be rapidly compiled using existing system procedures based on the Canadian ISISFICHE model and using off-set litho printing. The consequent ease of consultation of the catalog and the flexibility in forming weekly, monthly or annual catalogues alongside the daily catalogue system appear as major advantages. The illustrated catalog provides the user with a ready reference to the position of cloud cover within the scene and the major locational detail is visible also. An improved method of annotating the grey scale on individual bands and thus making colour composites easier to analyse is also described. In total a system of receiving stations providing quicklook imagery and a catalogue service backed by a central processing facility creating images as required by user demand, appears to offer an efficient use of regional resources. It may be a useful model for future planning of facilities amongst nations receiving Landsat data.

1. INTRODUCTION

The user of Landsat data requires, in a timely manner, copies of data tapes or images in forms which are easy to use and free of obvious problems. For many users the end product is a photograph or photo-image-map which may or may not require the expense of substantial computer processing in its creation. Common to all users is the desire for high quality cloud free scenes of appropriate date and location. Many users are also concerned that the images should not prove to be an expensive source of embarrassment by providing views of clouds when detail of the land area is required. Images which provide views of areas adjacent to those desired are a similar source of embarrassment. Feature identification is often best achieved in a particular season, and user interest in the passage of fires, rainstorms, snowstorms, or the 'green wave' can often only be sustained by the appropriate temporal selection of images.

The current system of image selection offered to the potential user is efficiently operated but is not in itself ideal for its purpose. The typical system of requests and responses is given in figure 1. An initial enquiry receives the response of an introduction to the system; a request for an geographical computer search can then be completed. The completion and return of the form results in a listing of scenes for the requested area. This listing provides a vast amount of coded information which requires an additional sheet of explanation to facilitate its interpretation. On receipt of such a print-out the potential user seeks for a scene which has zero cloud cover, excellent quality in all four bands, is available in color composite, and was compiled from data gathered at a desired season in an appropriate year.

Searching such output is a difficult task especially when the number of pages of computer output is large. There is the further complication that several images may meet the user's criteria and a full evaluation requires either travel to a browse file, or the purchase of the cassettes of images for use on microfilm readers. The further possibilities, namely purchase of all the suitable images or the purchase of a randomly selected image lead to expense, frustration or delay unless the random selection by chance provides an ideally suited image.

It is only on receipt of the images ordered from the system that most first-time users become fully aware of the image quality and scene content. This awareness occurs only after the ordering decisions and payment have been completed and is particularly important in cases where there is some cloud cover in the images. In such cases the location of the cloud may be of critical importance in determining the further use of the image.

Figure 1 illustrates the linkages between events in the obtaining of suitable data for a given project. The most desirable link would be the direct satisfaction of user needs in reply to the initial enquiry. This however, can rarely be achieved when the user is enquiring with the purpose of obtaining data. Thus, in figure 1, link A and link B are desirable but not realistically obtainable, as the definition of scene, season, year, band, cloud cover, and image quality are important in determining the product to be supplied. Link C reduces the time between the expressed need for imagery and the delivery of it but requires a tedious search of catalogues to define the image required and a particularly perplexing search if a series of images are required for mosaicing.

Links 1 and 2 represent the interaction of a user with the system in a manner which is almost inevitable unless an illustrated catalogue is used. Data ordered either from existing catalogues or from a requested computer print-out cannot be evaluated until received. The elapsed time in dealing with the system plus the necessary pre-payment for images which may be of little value mean that several circuits around links i and ii may be required before the desired goal is achieved. Within the user's subsystem there is often a need for ready reference catalogues to identify data at short notice so that an existing project may be extended. Searching through existing computer-printed "stock inventories" for these purposes is often a severe problem.

Many of these initial problems can be solved by integrating the catalogue system with the production of "quick-look" imagery and the system of path and row identifiers for Landsat scenes. Path, row and date uniquely identify each Landsat scene at a given nominal centre. Thus images for a certain scene centre can be requested and the existing system of geographical search yields a listing of scenes for that centre. However, scenes for adjacent centres are difficult to identify and it becomes a painstaking task to search for images at a given season to use in the construction of a mosaic. The problem of determining the location of cloud within the image remains.

2. INTEGRATION OF SYSTEMS FOR CATALOGUE PRODUCTION

Existing systems of image production provide the raw materials for an illustrated image catalogue and by amending the system-flow a low-cost highly efficient catalogue system can be developed. The Canadian system which produces "quick-look" data processes the data tapes within a short-time of the satellite pass, makes the images available either in individual prints at 1:1,000,000 scale or in 70mm format. In addition all the imagery collected on a given day is formatted into a microfiche and mailed to subscribers. This product of Integrated Satellite Information Systems (ISIS) Ltd., is known as ISISFICHE.

The 70mm format band 5 images which are the raw material for the daily microfiche are a resource which can be used for a further catalogue system. Because the data from one day of orbits over a nation consist of images along widely separated paths, the coverage is contiguous only along the paths. Searching these fiche by date is more convenient than searching the computer print out ordinarily supplied to the user. The fiche have the added advantage that the location and type of cloud cover can be readily observed.

If the band 5 images used in the creation of the microfiche of the image received each day are then reassembled in a series of standard frames a larger area of contiguous coverage can be achieved. Thus a microfiche of images for seven adjacent paths and five rows gives a set of 35 images or one weeks production of imagery over a standard area of some 1,197,875 kms of the earth's surface (not allowing for overlap). This system then permits the use of a standard frame using the international path and row identifiers and the dates of image collection. Figure 2 illustrates such a standard frame for images around Brisbane Australia (095-079). Such a frame can be easily created and used for each seven day cycle.

If each frame is then filled with the correct 70mm quicklook image of band 5 over the seven days the frames can be photographed using a 125 mm x 100 mm format which gives a conventional microfiche product. Higher resolution can be achieved by using appropriate microfilm equipment. By rephotographing the same original in a standard off-set litho platemaker a conventional A4 size off-set litho printing plate can be produced. This can be used to create a page of a visual catalogue of Landsat data. Figure 3 is a specimen page in which a selection of scenes has been used to evaluate the technique. In figure 3 the images in each path (column) and row location are not correct except for Brisbane (095-079). Column 100 contains test images which were originally in colour except for row 080 which is entirely a selection from the many dollars work of cloud covered imagery purchased by one of the authors. All of figure 3 excluding row 080 and column 100 consists of six columns and four rows. Row 076 contains band 4 images, row 077 contains band 5 images row 078 band 6 images and row 079 band 7 images.

Row 077 offers particularly useful detail because it shows band 5 images which would be the standard item for inclusion in such a system. Figure 4 illustrates a standard page from the non U.S. data catalogue and Figure 5 an extract from the typical computer print out in response to a geographic computer search request. The value of the illustrated catalogue system is its flexibility and its direct communication with the user. From the miniature scenes ready identification of cloud location is possible. Major location features are also readily identifiable in band 5 images (row 077).

The value of this identification of cloud extent and location, and major feature identification can be appreciated by comparing figure 3 with figures 4 and 5. The initial catalogue page printed by the offset litho process shows only computer digits (figure 4) and contains information about 35 scenes. The information requires explanatory detail provided on another (offset litho) printed sheet. Figure 3 provides information for 35 scenes and requires little or no further coding information. Figure 5 is a specimen response to a request for a geographical data search. The quantity of output for a 35 scene area is large, and requires explanation to permit the data to be decoded. Although the user possess an invaluable fund of information about sun angle and azimuth, image centre and corners, and other detail the critical factors remain cloud cover date and location. Thus a catalogue of the type shown in figure 3 provides more information of immediate value to the potential user (see figure 6).

Costs have not been fully evaluated but the cost of preparing an offset litho printing plate does not differ greatly in the case of the two types of information illustrated in figures 3 and 4. As each catalogue page becomes available it is a resource which can easily be reprinted, or distributed, and provides a permanent, easy reference. For the duration of the Landsat program so far, any 35 scene area within the United States will have had a total of approximately 200 overpasses by Landsat sensors by the end of 1978. Because of cloud cover, not all these scenes will be of value to users. In consequence the 200 page illustrated catalogue for a chosen 35 scene area would represent the maximum catalogue and cycles for which no usable data were gathered would provide for a reduction in the total page count.

For a catalogue operation by subscription, persons interested in a specific area could receive, by mail, a catalogue page for each 7 day cycle over the requested area. The advantage of mailing one sheet of low cost off-set litho material which can be easily read by the recipient contrasts with the present packaging of computer print out or the expense of microfiche production and the need for the recipient to have access to a microfiche viewer.

Catalogue pages can be accumulated into annual catalogues (20 pages p.a. for each Landsat satellite over each 35 scene area) for distribution to subscribers and users in each area. The interest of individual states or nations and of researchers in specific areas should be satisfied through the detail readily available in an illustrated catalogue. Further embellishment is possible as the NASA scene identification code can be written under each scene but the simplicity of the path, row and date as a unique definition of the scene appears to offer many advantages.

A consequence of such a system is the flexibility of organisation which it permits. It becomes possible to establish one major image production centre to serve the needs of several receiving stations. Each receiving station, equipped with its "quicklook" facility and the consequent catalogue operation serves as a user oriented prime contact in the system. Scenes which are partially obscured by cloud do not have to be processed beyond the "quicklook" or catalogue stage until a user requests them and so a large component of enquires to the main image production centre is reduced. The existing computerized system of cataloguing becomes primarily an internal "stock control system". It is no longer in such great demand for user search requests and the illustrated catalogues of Landsat data are readily available for consultation on an area basis. Thus the catalogue would become fully oriented to user needs rather than organised by a computerized stock-control system as at the present time.

3. GREY SCALES AND ANNOTATION

Once the user receives the image in photographic form further problems are innate in the system. Although the image carries a standard grey-scale the units of reflectance recorded on the Landsat tape are not directly and clearly associated with the image. To offset this problem it is proposed that a sequence of automatic annotation of the grey scale be added so that the units of energy recorded by each step are indicated numerically at each step of the grey-scale. Some of the present difficulties with the interpretation of colour composite images in photographic form can be solved by the relocation of the grey scales for each of the images so that band 4 has the grey scale located to the left of the image band 5 in the conventional position, band 6 to the right of the image and band 7 above it. The location of grey scales for all bands other than that of the image itself should be masked. This then results in a colour positive which shows at a glance the bands used and permits the intensity of the bands to be measured by densitometer measurement of the "grey" scale associated with each separate colour used in the print. The annotation of the grey scale also permits the quantitative contribution of each band to the colour composite to be assessed.

4. CONCLUSION

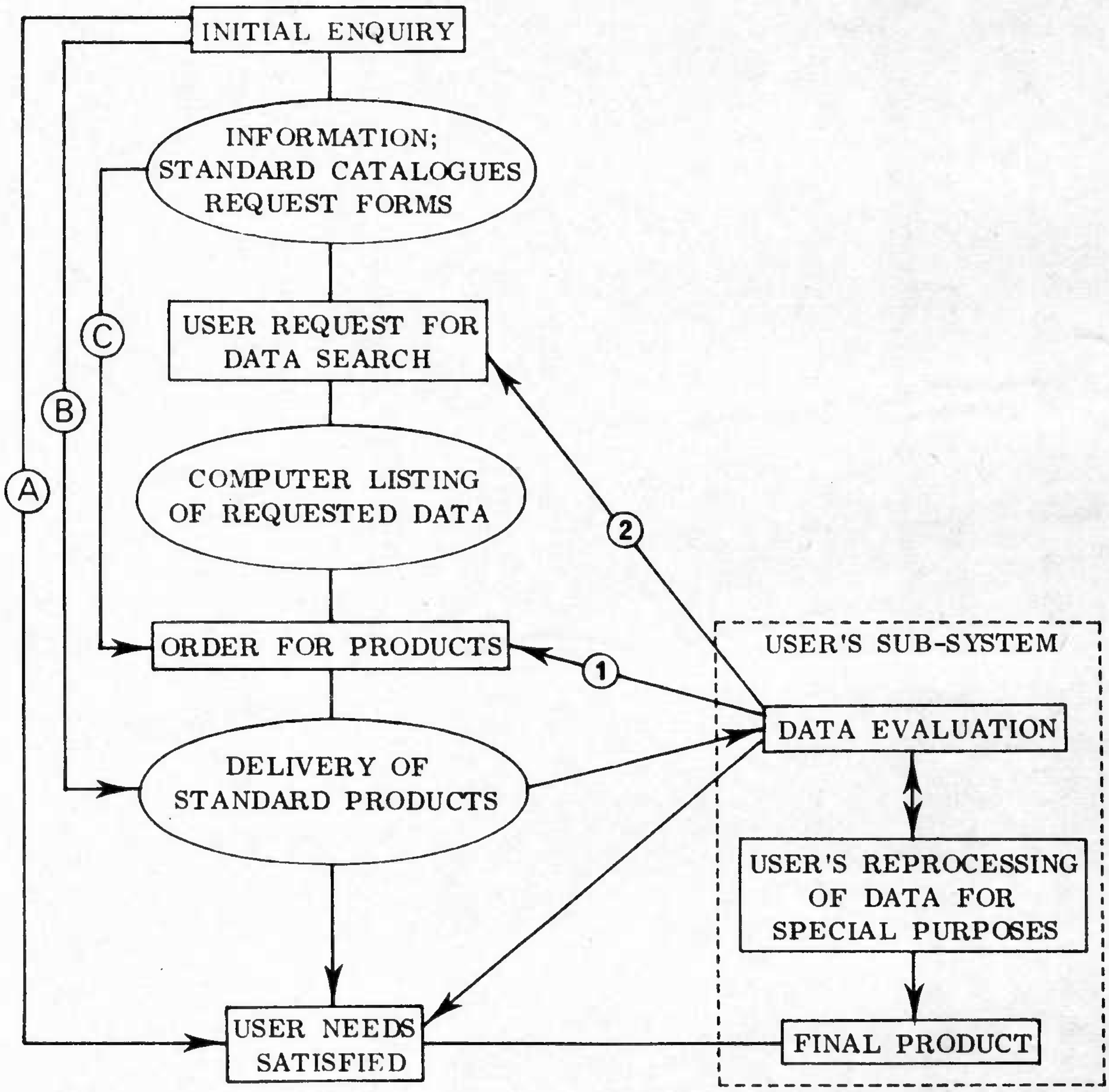
The integration of an existing image production system at present used in creating "quicklook" imagery and a cataloguing procedure using offset lithography and miniature images can result in a flexible and comparatively low cost catalogue system. The system proposed permits the use of microfiche, or offset litho prints of data for a specific area on a regular basis.

A subscription service mailing the product of each 7 day cycle of imagery over an area is also possible thus a subscriber requiring immediate knowledge of the content of Landsat imagery can use the existing technology of the facsimile transmission of quicklook data. The existing service of the ISISFICHE type where a daily mailing of the days imagery conveys the quiclook information to a user (at the discretion of the postal service) remains available.

The new possibility is for a standard area of 35 scenes to be documented on a seven day cycle and mailed to subscribers. Each cycle then is recorded for the subscriber who receives either a microfiche or offset-print of the images. The delivery time is subject to the mail service but dispatch should be about a day after the receipt of the last image in the sequence and eight days after the reception of the first. It becomes in effect an 18 day subscriber service.

Accumulation of these sheets into annual groups permits the issuing of an illustrated annual catalogue of images at low cost for subscribers. The receiving stations operating a quicklook system and catalogue service can therefore be independent of the central processing centre. A central processing centre can create imagery on demand annotating the grey scale as outlined above. One central processing centre may be able to handle the data for several receiving stations particularly if the administrative demands on the system are reduced by the catalog system outlined here (see figure 6).

The concept can easily be given a further dimension; for example certain areas of interest can be catalogued by miniature prints which illustrate all available imagery over a small area or a single standard scene. The use of images arranged on a page in temporal sequence may be a further useful elaboration of the proposal. In total the flexibility, low cost, and speed of the proposed system seem to offer great advantages. The fact that it can be operated using conventional equipment, low cost materials and the standard product of a "quick-look" system seems to enhance the potential value to users.



Flow chart of User / data-center interaction.

AUSTRALIAN LANDSAT IMAGE CATALOGUE

AUG. 16 – 22 1977 University of Queensland

100 AUG. 22	099 AUG. 21	098 AUG 20	097 AUG. 19	096 AUG. 18	095 AUG. 17	094 AUG. 16	ROW
							076
							077
							078
							079
							080

COLUMN

Order by column & row number, and date.

EXPERIMENTAL FORMAT

DEPT OF GEOGRAPHY, UNIVERSITY OF QUEENSLAND

OBSERVATION ID	MICROFILM ROLL NO./ POSITION IN ROLL REV	MSS	DATE ACQUIRED	CLOUD COVER	ORBIT NUMBER	PRINCIPAL POINT OF IMAGE LAT	LONG	SUN ELEV.	SUN AZIM.	IMAGE QUALITY RBV 123	MSS 45678
1301-07204	00000/0000	20022/0364	05/20/73	20	4191	10-5N	03704E	57.9	68.6		GGGG
1301-07210	00000/0000	20022/0365	05/20/73	20	4191	0848N	03643E	57.1	66.6		GGGG
1301-07213	00000/0000	20022/0366	05/20/73	20	4191	0721N	03623E	56.3	64.7		GGGG
1301-07215	00000/0000	20022/0367	05/20/73	30	4191	0554N	03602E	55.4	62.9		GGGG
1301-07222	00000/0000	20022/0368	05/20/73	30	4191	0428N	03542E	54.6	61.2		GGGG
1301-07224	00000/0000	20022/0369	05/20/73	20	4191	0301N	03522E	53.6	59.6		GGGG
1301-07231	00000/0000	20022/0370	05/20/73	10	4191	0134N	03501E	52.7	58.1		GGGG
1301-07233	00000/0000	20022/0371	05/20/73	10	4191	0007N	03441E	51.7	56.7		GGGG
1301-10314	00000/0000	20022/0372	05/20/73	100	419[illegible]	6255N	00537E	45.8	159.1		GGGG
1301-10321	00000/0000	20022/0373	05/20/73	100	4193	6133N	00428E	46.9	157.1		GGGG
1301-10414	00000/0000	20022/0374	05/20/73	10	4193	2858N	00951W	62.7	102.7		GGGG
1301-10421	00000/0000	20022/0375	05/20/73	0	193	2732N	01015W	62.8	99.8		GGGG
1301-10423	00000/0000	20022/0376	05/20/73	0	4193	2606N	01038W	62.7	96.8		GGGG
1301-10430	00000/0000	20022/0377	05/20/73	0	4193	2439N	01101W	62.6	93.9		GGGG
1301-10432	00000/0000	20022/0378	05/20/73	0	4193	2313N	01123W	62.4	91.0		GGGG
1301-10435	00000/0000	20022/0379	05/20/73	0	41-3	2147N	01145W	62.1	88.1		GGGG
1301-10441	00000/0000	20022/0380	05/20/73	0	4193	2020N	01207W	61.8	85.3		GGGP
1301-14011	00000/0000	20022/0381	05/20/73	100	4195	5312N	05232W	53.1	145.6		GGPG
1301-14014	00000/0000	20022/0382	05/20/73	70	4195	5147N	05316W	54.0	143.6		GGGG
1301-14020	00000/0000	20022/0383	05/20/73	60	4195	5023N	05357W	54.9	141.5		GGGG
1301-14023	00000/0000	20022/0384	05/20/73	90	4195	4858N	05435W	55.7	139.4		GGGG
1301-14025	00000/0000	20022/0385	05/20/73	100	[illegible]	4733N	05513W	56.6	137.3		GGGG
1301-14032	00000/0000	20022/0386	05/20/73	60	4195	4608N	05548W	57.4	135.0		GGGG
1301-14034	00000/0000	20022/0387	05/20/73	30	4195	4442N	05622W	58.1	132.7		GGGG
1301-14041	00000/0000	20022/0388	05/20/73	20	4195	4317N	05654W	58.8	130.3		GGGG
1301-14043	00000/0000	20022/0389	05/20/73	1[illegible]	4195	4152N	05725W	59.5	127.9		GGGG
1301-14050	00000/0000	20022/0390	05/20/73	0	4195	4026N	05755W	60.1	125.3		GGGG
1301-14125	00000/0000	20022/0391	05/20/73	10	4195	1306N	06532W	59.2	72.7		GGGG
1301-15411	00000/0000	20022/0392	05/20/73	100	4196	6417N	07039W	44.8	161.0		GGGG
1301-15413	00000/0000	20022/0393	05/20/73	80	.196	6255N	07154W	45.9	159.0		GGGG
1301-15420	00000/0000	20022/0394	05/20/73	80	4196	6133N	07302W	47.0	157.1		GGGG
1301-15422	00000/0000	20022/0395	05/20/73	60	4196	6010N	07406W	48.0	155.2		GGGG
1301-15425	00000/0000	20022/0396	05/20/7-	10	4196	5847N	07505W	49.1	153.3		GGGG
1301-15431	00000/0000	20022/0397	05/20/73	10	4196	5723N	07600W	50.1	151.4		GGGG
1301-15434	00000/0000	20022/0398	05/20/73	20	-196	5600N	07651W	51.1	149.5		GGGG
1301-15440	00000/0000	20022/0399	05/20/73	50	4196	5435N	07738W	52.1	147.5		GGGG
1301-15443	00000/0000	20022/0400	05/20/73	50	4196	5311N	07823W	53.1	145.6		GGGG
1301-15445	00000/0000	20022/0401	05/20/73	60	4196	5148N	07906W	54.0	143.6		GGGG
1301-15452	00000/0000	20022/0402	05/20/73	70	4196	5023N	07947W	54.9	141.5		GGGG

KEYS: CLOUD COVER % .... 0 TO 100 = % CLOUD COVER. ** = NO CLOUD DATA AVAILABLE.
IMAGE QUALITY .... BLANKS=BAND NOT PRESENT/REQUESTED. R=RECYCLED. G=GOOD. F=FAIR BUT USABLE. P=POOR.

PRINCIPAL POINT OF IMAGE LONG	LAT	OBSERVATION ID	MICROFILM ROLL NO./ POSITION IN ROLL RBV	MSS	DATE ACQUIRED	CLOUD COVER %	ORBIT NUMBER	SUN ELEV.	SUN AZIM.	IMAGE QUALITY RBV 123	MSS 45678	PRODUCTS B C	P	P C	B D	P D
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04646E	3013N	1172-06571	00000/0000	20012/0672	01/11/73	40	2392	30.1	146.6		GGGG					
04645E	5835N	1360-07343	00000/0000	20025/0978	07/18/73	70	5014	49.6	149.1		GGGG					
04645E	2142S	1127-06210	00000/0000	20008/1179	11/27/72	30	1764	57.7	95.6		GGGG					
04644E	3017N	1010-06563	20001/1027	00000/0000	08/02/72	90	133	59.5	107.2	GGG						
04644E	0843N	1330-06403	00000/0000	20024/0713	06/18/73	10	4595	55.0	61.2		GGGG					
04644E	2131S	1361-06202	00000/0000	20026/0586	07/19/73	60	5027	32.6	45.0		GGPP					
04644E	7725S	1185-03341	00000/0000	20013/1370	01/24/73	100	2571	20.4	87.3		GGGG					
04643E	2559N	1351-06523	00000/0000	20025/0727	07/09/73	0	4888	61.3	90.4		GGGG					
04643E	0126N	1167-06365	00000/0000	20012/0078	01/06/73	80	2322	48.0	126.8		GGGG					
04642E	1548S	1290-06251	00000/0000	20021/0185	05/09/73	0	4037	41.4	48.4		PGPG					
04641E	1432N	1313-06445	00000/0000	20022/1392	06/01/73	10	4358	59.3	71.1		GGGG					
04641E	1428N	1349-06443	00000/0000	20025/0825	07/07/73	0	4860	57.5	70.5		GGGG					
04639E	7528N	1233-09073	00000/0000	20017/0203	03/13/73	60	3244	11.6	181.2		GGGG					
04639E	3019N	1208-06574	00000/0000	20015/0898	02/16/73	20	2894	37.2	138.9		GGGG					
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04639E	2016N	1350-06483	00000/0000	20025/0679	07/08/73	50	4874	59.9	79.8		GGGG	M				
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04636E	0131N	1203-06372	00000/0000	20015/0655	02/11/73	20	2824	49.7	113.9		GGGG					
04636E	0104N	1041-06363	00000/0000	20002/1426	09/02/72	10	551	55.4	77.6		GFFF					
04636E	1714S	1074-06244	00000/0000	20005/0535	10/05/72	10	1025	54.3	73.6		GGG					
04635E	3859N	1156-07062	00000/0000	20011/0843	12/26/72	0	2169	22.8	153.2		GGGG					
04635E	3437N	1011-07010	20001/1215	00000/0000	08/03/72	10	147	58.5	115.4	GGG						
04634E	5559N	1323-07300	00000/0000	20024/0327	06/11/73	20	4498	53.8	146.7		GGGG					
04634E	3439N	1191-07015	00000/0000	20014/0288	01/30/73	10	2657	29.9	145.3		GGGG					
04634E	1259N	1169-06450	00000/0000	20012/0321	01/08/73	20	2350	41.7	136.5		GGGG					
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04633E	2434N	1153-06532	00000/0000	20011/0563	12/23/72	60	2127	34.0	146.6		GGGG					
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PRODUCTS ALREADY MADE .... R=MADE FROM RBV. M=MADE FROM MSS. B=MADE FROM RBV AND MSS.

EROS DATA CENTER
SIOUX FALLS, SOUTH DAKOTA 57198
PHONE 605-594-6511 FEDERAL TELECOMMUNICATIONS SYSTEM PHONES USE 784-7151

REPORT NO. D102C-1
DATE 09/28/77
TIME 12:08
PAGE 1

CONTACT NUMBER 0007129005 TERMINAL 0096
KMW

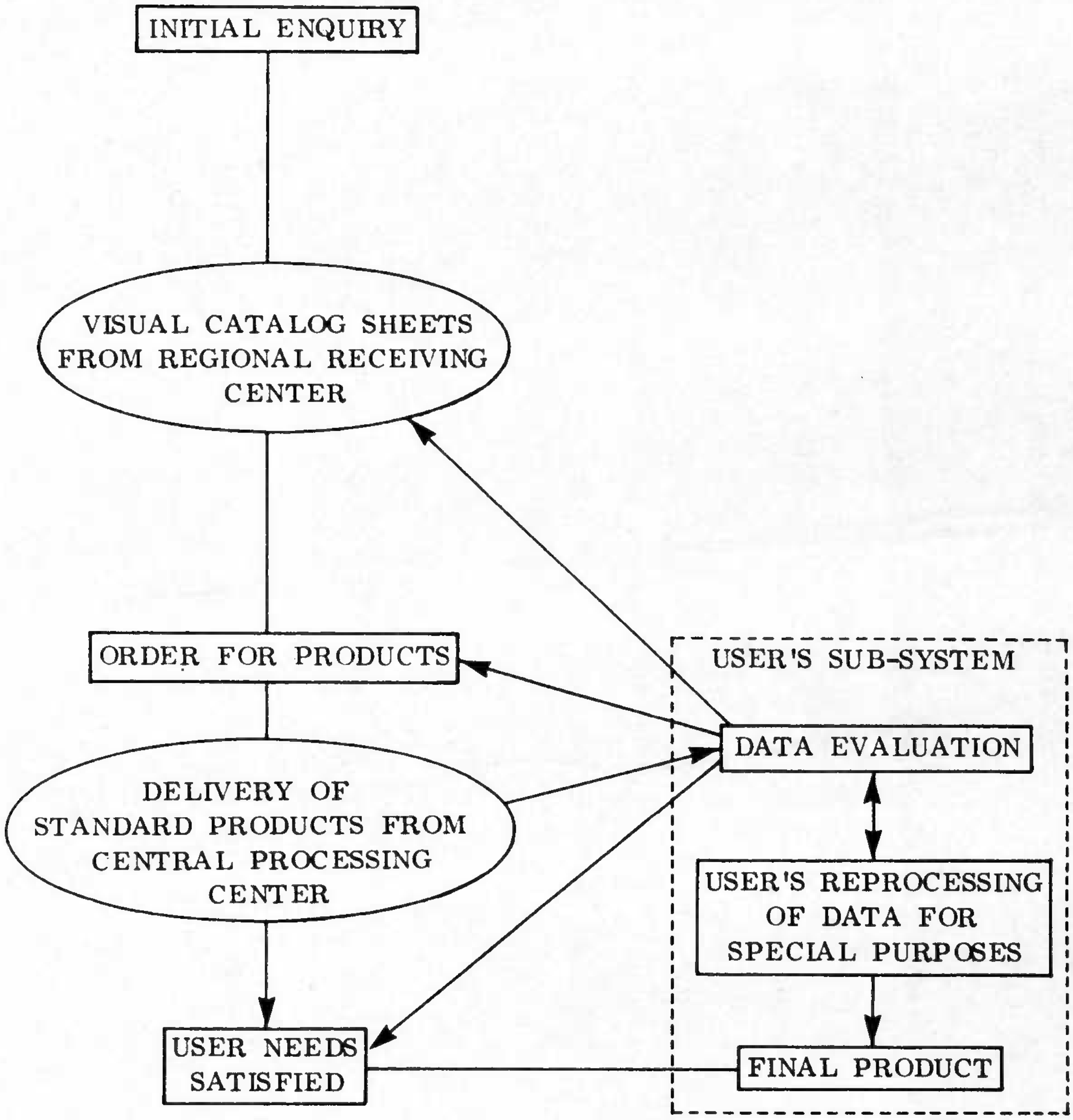
15 ACCESSIONS

POINT REFERENCE RETRIEVAL

PATH	ROW	PATH	ROW	PATH	ROW	PATH	ROW	QUALITY	CLOUD COVER
105	066	105	067	105	068	106	066	5	30%
106	067	106	068						

DATA TYPE MULTISPECTRAL

IMAGERY TYPE	SCENE ID	PATH,ROW	FILM SOURCE	QUALITY	CLOUD	EXPO DATE	SCENE CENTER POINT	SCENE SCALE	MICROFILM	CCT	CCP
LANDSAT-1 (MSS)	81026000325N0	105,066	B&W 2.2"	8,8,8,8	30%	08/18/72	S08D43M13S E143D19M40S	1:3,369,000	1200020155	P	Y
CORNER POINT COORDINATES=#1:S08D05M24S E144D20M32S ,#2:S07D50M16S E142D44M14S ,#3:S09D36M06S E143D55M17S ,#4:S09D20M53S E142D18M36S											
LANDSAT-1 (MSS)	81026000325N2	105,066	FCC 7.3"	5	30%	08/18/72	S08D43M13S E143D19M40S	1:1,000,000	1200020155	P	
CORNER POINT COORDINATES=#1:S08D05M24S E144D20M32S ,#2:S07D50M16S E142D44M14S ,#3:S09D36M06S E143D55M17S ,#4:S09D20M53S E142D18M36S											
LANDSAT-1 (MSS)	81422000305N0	105,067	B&W 2.2"	8,8,8,8	30%	09/18/73	S10D11M22S E142D51M11S	1:3,369,000	1200290899	P	P
CORNER POINT COORDINATES=#1:S09D32M44S E143D51M44S ,#2:S09D18M56S E142D14M51S ,#3:S11D03M44S E143D27M45S ,#4:S10D49M51S E141D50M25S											
LANDSAT-1 (MSS)	81386000345N0	105,067	B&W 2.2"	8,8,0,8	30%	08/13/73	S10D03M46S E142D50M34S	1:3,369,000	1200290148	P	P
CORNER POINT COORDINATES=#1:S09D25M02S E143D51M50S ,#2:S09D10M38S E142D14M07S ,#3:S10D56M49S E143D27M13S ,#4:S10D42M19S E141D49M03S											
LANDSAT-1 (MSS)	81026000355N0	105,067	B&W 2.2"	8,8,8,8	10%	08/18/72	S10D10M24S E142D59M26S	1:3,369,000	1200020156	N	P
CORNER POINT COORDINATES=#1:S09D32M37S E144D03M33S ,#2:S09D17M22S E142D23M51S ,#3:S11D03M22S E143D35M15S ,#4:S10D48M01S E141D56M07S											
LANDSAT-2 (MSS)	8212923530500	105,068	B&W 2.2"	5,5,5,5	30%	05/31/75	S11D34M52S E142D16M59S	1:3,369,000	2200071812	P	P
CORNER POINT COORDINATES=#1:S10D56M41S E143D41M13S ,#2:S10D41M12S E142D02M45S ,#3:S12D28M42S E143D15M23S ,#4:S12D13M05S E141D36M30S											
LANDSAT-1 (MSS)	81386000415N0	105,068	B&W 2.2"	8,8,8,8	30%	08/13/73	S11D30M35S E142D30M12S	1:3,369,000	1200290149	P	P
CORNER POINT COORDINATES=#1:S10D51M54S E143D31M46S ,#2:S10D37M24S E141D53M37S ,#3:S12D23M42S E143D07M02S ,#4:S12D09M04S E141D28M22S											
LANDSAT-1 (MSS)	81170000445N0	105,068	B&W 2.2"	5,5,8,8	20%	01/09/73	S11D45M01S E142D35M17S	1:3,369,000	1200120375	P	P
CORNER POINT COORDINATES=#1:S11D06M22S E143D36M14S ,#2:S10D52M26S E141D58M44S ,#3:S12D37M31S E143D12M05S ,#4:S12D23M27S E141D34M04S											
LANDSAT-1 (MSS)	81026000415N0	105,068	B&W 2.2"	8,8,8,8	0%	08/18/72	S11D37M02S E142D38M56S	1:3,369,000	1200020157	N	P
CORNER POINT COORDINATES=#1:S10D59M17S E143D40M23S ,#2:S10D43M57S E142D03M14S ,#3:S12D30M03S E143D14M52S ,#4:S12D16M35S E141D37M13S											
LANDSAT-1 (MSS)	81027000905A0	106,066	B&W 2.2"	8,8,8,8	30%	08/19/72	S08D31M52S E141D52M25S	1:3,369,000	1200020255	P	P
CORNER POINT COORDINATES=#1:S07D53M31S E142D52M53S ,#2:S07D39M16S E141D16M31S ,#3:S09D24M24S E142D28M30S ,#4:S09D10M04S E140D51M45S											
LANDSAT-2 (MSS)	8223823574500	106,068	B&W 2.2"	5,5,0,5	20%	09/17/75	S11D30M00S E141D15M59S	1:3,369,000	2200140401	P	P
CORNER POINT COORDINATES=#1:S10D51M11S E142D18M13S ,#2:S10D36M12S E140D39M17S ,#3:S12D23M42S E141D52M58S ,#4:S12D08M36S E140D13M30S											
LANDSAT-1 (MSS)	81405000935N0	106,068	B&W 2.2"	8,8,8,2	20%	09/01/73	S11D31M21S E141D05M46S	1:3,369,000	1200290491	P	P
CORNER POINT COORDINATES=#1:S10D52M53S E142D06M55S ,#2:S10D38M32S E140D29M25S ,#3:S12D24M05S E141D42M21S ,#4:S12D09M37S E140D04M20S											
LANDSAT-1 (MSS)	81207001105A0	106,068	B&W 2.2"	8,8,8,8	10%	02/15/73	S11D27M08S E141D05M39S	1:3,369,000	1200150295	P	P
CORNER POINT COORDINATES=#1:S10D48M05S E142D07M16S ,#2:S10D33M55S E140D28M45S ,#3:S12D20M16S E141D42M49S ,#4:S12D05M59S E140D03M46S											
LANDSAT-1 (MSS)	81171001035N0	106,068	B&W 2.2"	8,8,0,0	30%	01/10/73	S11D48M06S E141D09M32S	1:3,369,000	1200120500	P	P
CORNER POINT COORDINATES=#1:S11D09M34S E142D10M35S ,#2:S10D55M26S E140D33M04S ,#3:S12D40M41S E141D46M14S ,#4:S12D26M27S E140D08M12S											
LANDSAT-1 (MSS)	81063001005N0	106,068	B&W 2.2"	8,8,8,5	10%	09/24/72	S11D37M35S E141D12M07S	1:3,369,000	1200041322	P	P
CORNER POINT COORDINATES=#1:S10D58M48S E142D13M32S ,#2:S10D44M34S E140D35M26S ,#3:S12D30M12S E141D49M04S ,#4:S12D16M11S E140D10M26S											



Proposed user / system interaction.

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COVERAGE IS FOR PICTURES TAKEN BETWEEN 24/07/72 AND 19/04/75
COUVERTURE: IMAGES PRISES ENTRE ET

PICTURE CENTRE NUMBER / NUMERO CENTRE D"IMAGE	CLOUD COVER %AGE / NEBULOSITE %AGE	DATE OF RECORDING DD MM YY / DATE D"EN REGISTRMT JJ MM AA	ORBIT TRACK ID. / TRAJ. ORB. ID.	ORBIT NUMBER / NUMERO DE L" ORBITE	CENTRE POINT OF IMAGE LAT. / POINT CENTRE DE L"IMAGE LAT.	LONG.	IMAGE QUALITY / QUALITE DE L"IMAGE RBV 1	RBV 2	RBV 3	MSS 4	MSS 5	MSS 6	MSS 7	COL 8	COL 9	FRAME ID. ORBIT GMT DAY HHMMS / ID CADRE ORB. T.U. JOUR HHMMS
25-15 (20)	100	17/07/73	15-B	5005	63/54	76/41				G	F	G	F			1359-16033
(21)	0	04/08/73	15-B	5256	64/00	76/18				P	F	P	F			1377-16031
(22)	20	22/08/73	15-B	5507	63/59	76/17					G	F	G			1395-16025
(23)	5	09/09/73	15-B	5758	63/58	76/17				F	E	G	E			1413-16024
(25)	40	15/10/73	15-B	6260	63/56	76/13				F	G	G	G			1449-16014
(34)	98	26/03/74	15-B	8519	64/01	76/30				F	F	F	F			1611-15584
(35)	25	13/04/74	15-B	8770	64/00	76/33				F	F	F	F	P	P	1629-15581
(36)	98	01/05/74	15-B	9021	64/01	76/33							F			1647-15574
(37)	35	19/05/74	15-B	9272	64/04	76/31				P	G	G	G			1665-15571
(38)	100	06/06/74	15-B	9523	64/02	76/33						F				1683-15564
(39)	20	24/06/74	15-B	9774	64/00	76/35				F	G	G	G	G	G	1701-15561
(40)	90	12/07/74	15-B	10025	63/59	76/35				F	G	G	G			1719-15553
(41)	40	30/07/74	15-B	10276	63/59	76/33				F	G	G	P			1737-15545
(42)	100	17/08/74	15-B	10527	64/00	76/32							P			1755-15541
(43)	100	04/09/74	15-B	10778	64/00	76/30							G			1773-15533
(44)	70	22/09/74	15-B	11029	63/51	76/36				G	G	G	G			1791-15524
(45)	100	10/10/74	15-B	11280	64/01	76/33							G			1809-15523
(46)	90	28/10/74	15-B	11531	64/01	76/39				G	G	G	G			1827-15521
16 (06)	30	07/11/72	15-B	1491	62/38	77/22				G	G	G	G			1107-16042
(15)	40	18/04/73	15-B	3750	62/37	77/36							G			1269-16045
(16)	30	06/05/73	15-B	4001	62/38	77/36				G	G	G	G			1287-16044
(17)	20	24/05/73	15-B	4252	62/36	77/38				G	G	G	G	F	G	1305-16043
(20)	85	17/07/73	15-B	5005	62/32	77/54				G	F	G	F			1359-16035
(21)	60	04/08/73	15-B	5256	62/39	77/31				F	G	F	G			1377-16034
(22)	25	22/08/73	15-B	5507	62/37	77/31				P	E	E	E	P	G	1395-16032
(23)	5	09/09/73	15-B	5758	62/37	77/30					E	G	E			1413-16030
(24)	100	27/09/73	15-B	6009	62/37	77/28							E			1431-16024
(25)	40	15/10/73	15-B	6260	62/35	77/27				G	G	G	G			1449-16021
(34)	65	26/03/74	15-B	8519	62/38	77/45				F	F	F	F			1611-15590
(35)	30	13/04/74	15-B	8770	62/38	77/46				F	F	F	F			1629-15584
(37)	50	19/05/74	15-B	9272	62/42	77/44				F	G	G	E			1665-15574
(38)	100	06/06/74	15-B	9523	62/40	77/46						P				1683-15571
(39)	50	24/06/74	15-B	9774	62/38	77/48				F	G	G	G	P	P	1701-15564
(40)	55	12/07/74	15-B	10025	62/37	77/48				F	F	G	G			1719-15560
(41)	3	30/07/74	15-B	10276	62/37	77/47				G	G	G	P	P	P	1737-15552

AUSTRALIAN LANDSAT IMAGE CATALOGUE

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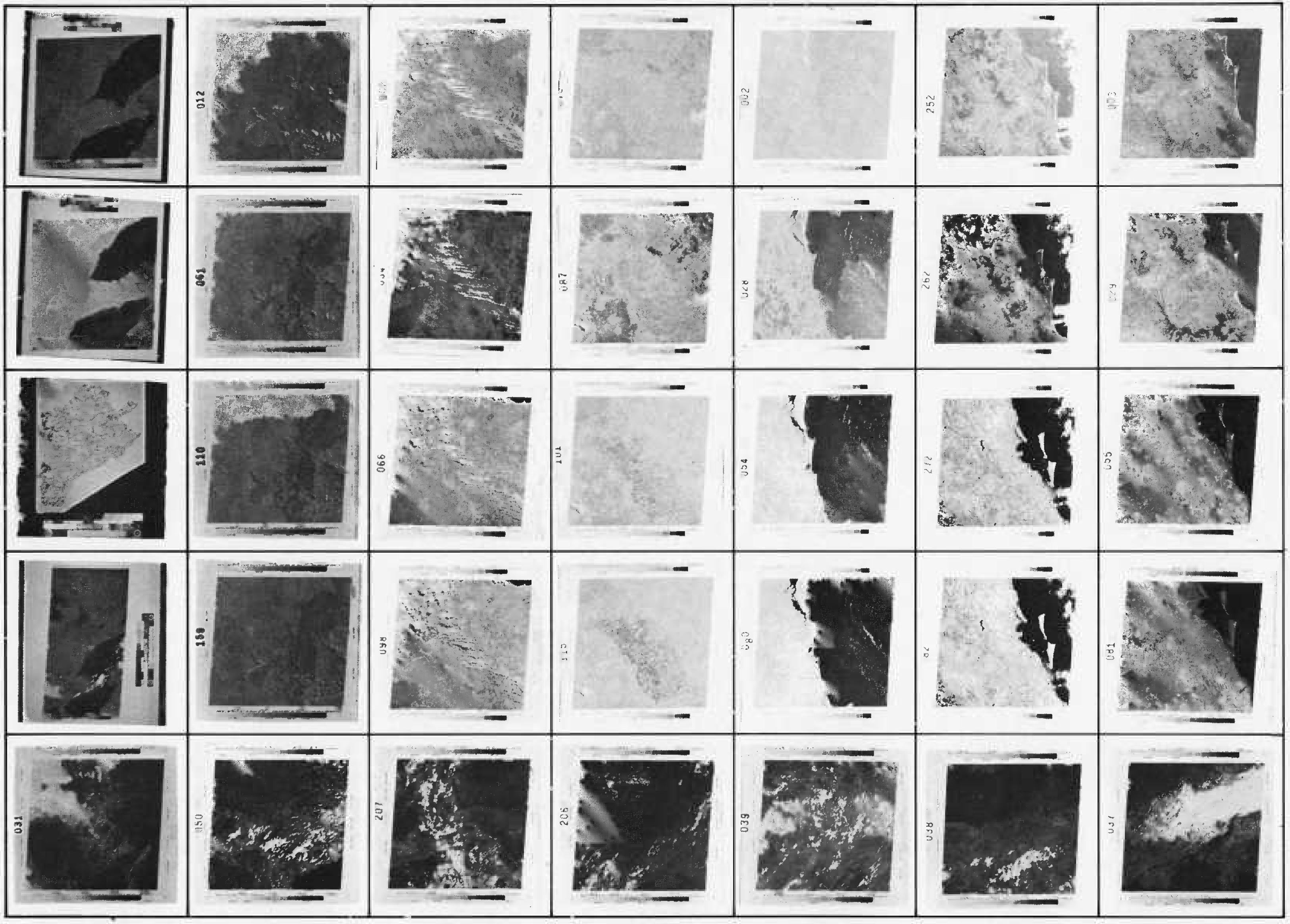

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