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MANAGEMENT OF NATURAL RESOURCES THROUGH AUTOMATIC CARTOGRAPHIC INVENTORY

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TYPE I PROGRESS REPORT
for Period Avril - December 1973
(n° 3)

January 1974

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CONTENTS :

ABSTRACT

The following significant results were obtained :

- Accurate recognition of previously known ground features from ERTS imagery has been confirmed and a probable detection range for the major signatures can be given.

- Unidentified elements, however, must be decoded by means of the equal densitometric value zone method.

- Determining these zonings involves an analogical treatment of images using the color equidensity methods (pseudo-color), color composite and especially TEMPORAL COLOR COMPOSITE (repetitive superposition).

- After this analogical preparation, the digital equidensities can be processed by computer in the 4 MSS bands, according to a series of transfer operations from imagery and automatic cartography.

MAJOR PROBLEMS

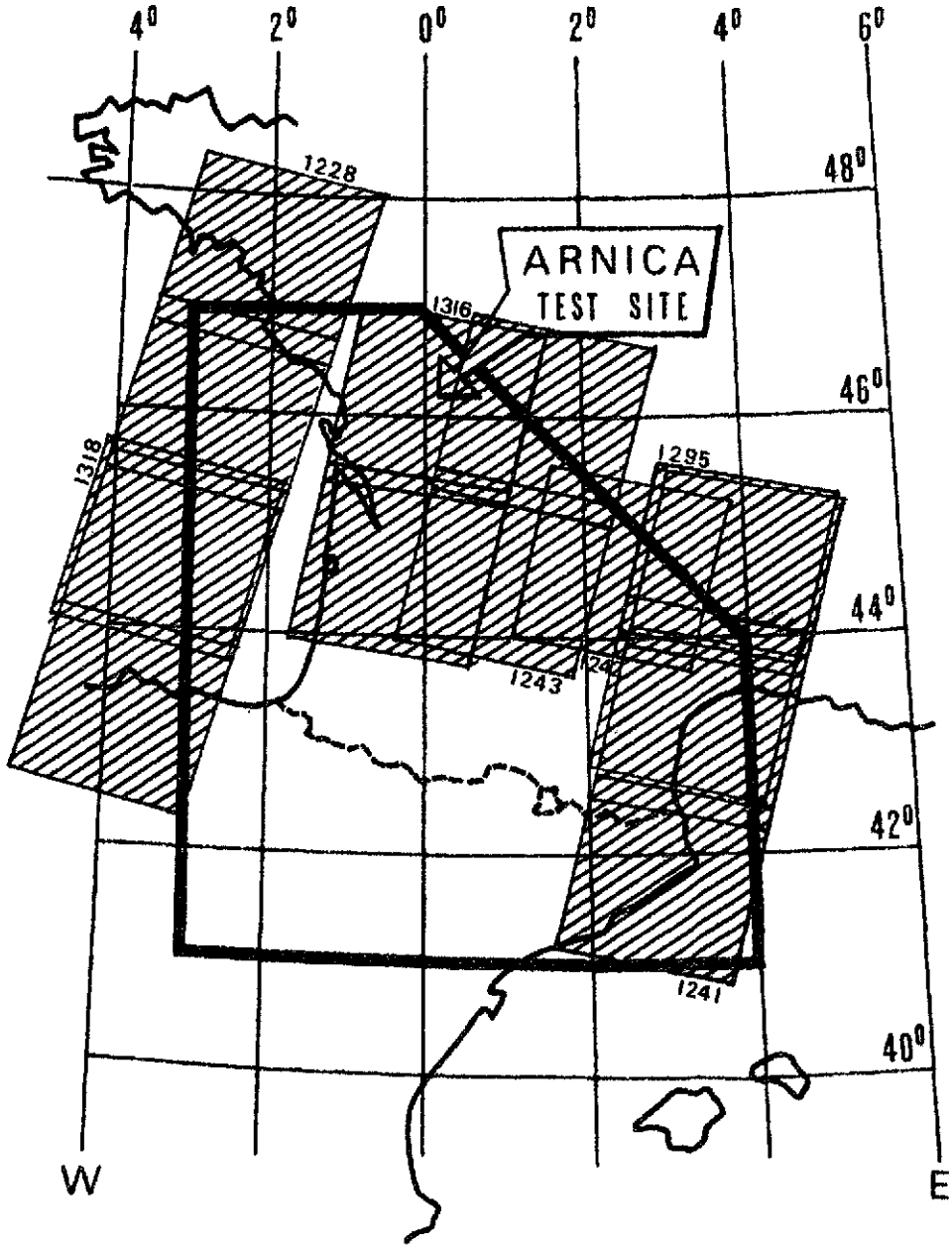
The latest imagery from the ARNICA program for the period March - July, 1973 was not received until November, 1973.

The quality of the imagery varies considerably from region to region, due to frequent cloud cover, and repetitive information is available only for limited sections.

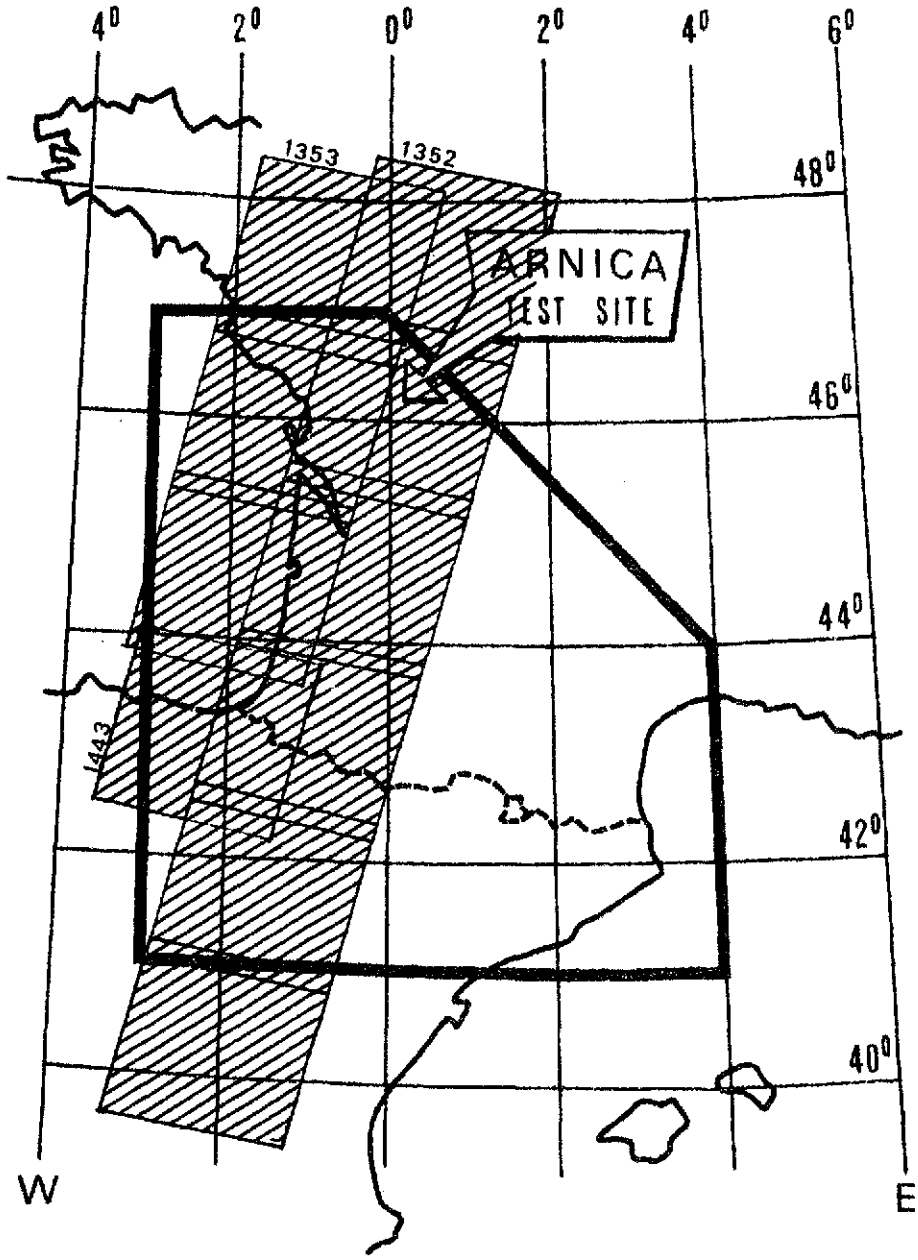
For the central part of the test-site (the Garonne Valley) which has a rather extensive experimental ground based network, there was no usable imagery throughout the entire program.

Research has therefore been directed towards the study of regions in which good repetitive information was obtained rather than on the sections and on the themes originally planned in which the ground truth information could not be treated because the corresponding simultaneous imagery was not provided.

Plot of data
received on June - August 1973



Plot of data
received on August - November 1973



LIST OF DATA RECEIVED
on June - August 1973

F M T M S S	Date of observation	M 4 5 6 7	T 7	P 7
1228.10305	03 - 08 - 73	1 1 1 1	1	2
1228.10311	-	1 - - 1	1	2
1228.10314	-	1 1 1 1	1	2
1228.10320	-	1 1 1 1	1	2
1229.10363	03 - 09 - 73	1 1 1 -	-	-
1229.10370	-	1 1 1 -	-	-
1241.10030	03 - 21 - 73	1 1 1 1	1	1
1241.10033	-	1 1 1 1	1	2
1241.10035	-	1 1 1 1	1	2
1242.10085	03 - 22 - 73	1 1 1 1	1	2
1243.10141	03 - 23 - 73	1 1 1 1	1	2
1243.10143	-	1 1 1 1	1	2
1295.10025	05 - 14 - 73	1 1 1 1	1	2
1295.10031	-	1 1 1 1	1	2
1316.10192	06 - 04 - 73	1 1 1 1	1	2
1316.10195	-	1 1 1 1	1	2
1318.10311	06 - 06 - 73	1 1 1 1	1	2

LIST OF DATA RECEIVED
on August - November 1973

F M T M S S	Date of observation	M 4 5 6 7	T 7	P 7
1352.10183	07 - 10 - 73	1 1 1 1	1	2
1352.10190	-	1 1 1 1	1	2
1352.10192	-	1 1 1 1	1	2
1352.10195	-	1 1 1 1	1	2
1352.10201	-	1 1 1 1	1	2
1352.10204	-	1 1 1 1	1	2
1353.10242	07 - 11 - 73	1 - - -	1	2
1353.10244	-	1 1 1 1	1	2
1353.10251	-	1 1 1 1	1	2
1443.10235	10 - 09 - 73	1 1 1 1	1	2

ACCOMPLISHMENTS DURING THE REPORTING PERIOD

A. Qualitative Studies

Research was carried out in two complementary directions :

- inventory of elementary signatures
  - biological (vegetation, agriculture, urbanization)
  - geographical (geology, hydrography, soils)
  - linked with event (meteorology, nivology, hydrology)
- geographical organization of signatures and determination of zones of equal densitometric value necessary for eventual computer processing.

This work has been written up in two publications. Cf. Type II Progress Report n° 2, Study by B. DONVILLE (Part II, Chapter 1, pp. 11 - 24) and Study by P. GOUAUX and D. LOUBET (Part II, Chapter 2, pp. 25 - 39).

B. Quantitative Studies

Since an example of complete integrated cartography has already been done (cf. automatic cartography of Fir forests in the Aran Valley, in the Type II Progress Report n° 1), this study concentrates on defining the exact methodological conditions of the various operations required in the chain of operations from ERTS imagery to the automatic mapping of natural resources.

Three stages have been completed :

- printout of the imagery after densitometric processing

- definition of rules for precise referencing of the selection of samples on the imagery
- definition of techniques for selecting representative samples based on successive levels of digital equidensity approaching ground truth with increasing accuracy.

A review of these methods can be found in the Type II Progress Report n° 2 : a study by T. LE TOAN, M. MONCHANT (Part II, Chapter 3, pp. 40-54) ; T. LE TOAN, J.C. GUYADER, P.GOUAUX (Part II, Chapter 4, pp. 55-70) ; T. LE TOAN, J.C. GUYADER, M. MONCHANT (Part II Chapter 5, pp. 71-82).

C. Ground Experiments

Reflectance measurement experiments on healthy and chlorotic deciduous samples as well as the study of experimental apparatus on articulated porticoes were carried out, but as there is not enough corresponding satellite imagery, this part of the ARNICA program has been basically organized for use in future ERTS B programs.

ACCOMPLISHMENTS PLANNED FOR NEXT PERIOD

The final phase of the ARNICA program will consist of developing the last experiments in order to make up the complete chain of operations leading from ERTS documents to their automatic cartographical processing.

In this perspective, and taking into account only the documents actually available, the final program includes 3 successive complementary aspects :

1 - Establishing a detection range for the principal elementary signatures and organizing "equal value zoning".

2 - Establishing analogical correspondence codes, using chromatic coding methods on a systematic basis

- color equidensities (pseudo-color)
- color-composite (very promising and economical results in the form of TEMPORAL COLOR COMPOSITES).

3 - Final development of the stages in the chain of operations for digital computer processing, using the analogical processing described above as a guide.

DISCUSSION OF SIGNIFICANT RESULTS

1. AGRICULTURE / FORESTRY

A. Crop survey :

(Data 1241-10033)

In the alluvial zone of the Rhone, rice cultures under water can be distinguished from vine cultivation.

(Data 1243-10143
1352-10192)

The comparison of two successive states of agriculture in the Garonne Valley help distinguish major cultures by means of the temporal color composite, by associating the following three components into one document :

1243-10143 MSS 7
1352-10192 MSS 5
1352-10192 MSS 7

B. Timber survey :

(Data 1352-10183
1352-10192
1353-10244)

Deciduous and conifer can be distinguished clearly from other land use types when MSS 5 and MSS 7 are combined.

F. Water utilization :

(Data 1352-10201)

A very fine illustration of the irrigated zones of Aragon and Catalonia.

DISCUSSION OF SIGNIFICANT RESULTS

2. LAND USE SURVEY and MAPPING

A. Land use classification

(Data 1228-10305 1352-10183
1241-10030 1352-10192
1242-10085 1352-10201
1242-10141 1353-10244
1243-10143 1443-10235)

All of the documents analyzed demonstrate that the land use elements are grouped together in homogeneous units, translated by a characte - ristic densitometric zoning of the elementary combinations defining each regional landscape.

Thus the treatment of data from unknown ground must be based on the analysis of these zones. An example of zoning is given in the Type II Pro gress Report n°2, Part II, Chapter 2 : Study by P. GOUAUX and D. LOUBET, pp. 25 - 39.

B. Thematic mapping

(Data 1241-10030 1243-10143
1241-10035 1295-10025
1242-10085 1352-10183
1242-10141 1352-10193)

Especially clear results of thematic mapping of major land use types could be easily obtained from such documents.

E. Population density

(Data 1128-10305 1352-10183
1242-10141 1352-10193)

It has already been shown that the inventory of urban zones was directly obtainable from ERTS data. The references provided here show that this urban zoning can be interpreted in detail as follows : old city, recent urbanization, suburb, etc...

DISCUSSION OF SIGNIFICANT RESULTS

3. GEOLOGICAL STRUCTURE and LANDFORM SURVEY

I. Geomorphic and Landform surveys

(Data 1241-10030
1242-10085
1243-10143)

These three images provide the expression of zones of equal geomorphological value, corres ponding to characteristic landscape types having significant elementary land use combinations.

J. Lithologic surveys

(Data 1241-10030
1241-10033
1243-10143)

These same landscapes faithfully show up the distribution of various lithologic components of the lands : calcareous, molasse, siliceous, granitic.

K. Structural surveys

(Data 1228-10305
1241-10035
1352-10195
1443-10235)

ERTS documents have proven extremely useful in the interpretation of structures, especially in arid zones. One of the images (1241-10035) served as a basis for the study published in the Type II Progress Report n°2, Part II, Chapter 1 : Study by B. DONVILLE, pp. 11 - 24).

DISCUSSION
OF SIGNIFICANT RESULTS

4. WATER RESOURCES

C. Estuary and wetlands

(Data 1228-10305
1352-10192
1353-10244)

These three images of the French Atlantic coast (Estuaries of the Loire and the Gironde) illustrate the wealth of information available (cf. FRALIT program).

D. Limnology

(Data 1241-10033
1352-10192
1353-10251)

Vegetation zonings are always very apparent in the littoral pools of the Atlantic and the Mediterranean.

G. Snow survey

(Data 1241-10030 1241-10035
1295-10025 1242-10085)

The good repetitive cover conditions made it possible to form a very significant temporal color composite by superimposing successive MSS 7 imagery :

January, 1973 : 1187-10023 CYAN
March, 1973 : 1241-10030 MAGENTA
May , 1973 : 1295-10025 YELLOW

which leads to the decoding of 8 situations of temporal variation in snow conditions and proof that the ERTS imagery taken at different times can be easily superimposed.

DISCUSSION OF SIGNIFICANT RESULTS

5. MARINE RESOURCES

A. Locating biologically rich areas

(Data 1352-10192
1353-10244
1353-10251)

Very valuable complementary information on the sedimentation conditions of the estuaries (Loire and Gironde) and of the Arcachon Basin at high and low tide.

F. Estuary dynamics

(Data 1228-10305)

New state of coastal dynamics of the estuary of the Loire (cf. F. VERGER's reports).

6. METEOROLOGY

B. Air surface

(Data 1295-10031)

A very noteworthy illustration of the cyclonic conditions of the "MARINE WIND" and the geographical limits of its influence.

(This document is exceptionally valuable).

LIST OF PAPERS

13. REY, P.A., 1973. Présentation du Programme ARNICA (Satellite ERTS / 1).
XXX° Salon International de l'Aéronautique et de l'Espace. Paris Le Bourget. May 1973.

14. DONVILLE, B., 1973. ERTS 1 Satellite documents and geological structures of northeast of Catalonia.
In ARNICA, Type II Progress Report n° 2, pp. 11 - 24.

15. GOUAUX, P., LOUBET, D. 1973. Identification of landscapes types from ERTS 1 Imagery (Landes de Gascogne, France).
In ARNICA, Type II Progress Report n° 2, pp. 25 - 39.

16. LE TOAN, T., MONCHANT M., 1973.
Display problems.
In ARNICA, Type II Progress Report n° 2, pp. 40 - 54.

17. LE TOAN, T., GUYADER, J.C., GOUAUX, P. 1973. Method for locating samples on ERTS Imagery.
In ARNICA, Type II Progress Report n° 2, pp. 55 - 70.

18. LE TOAN, T., GUYADER, J.C., MONCHANT, M., 1973. Responses of different types of soil occupation defined from homogeneous samples.
In ARNICA, Type II Progress Report n° 2, pp. 71 - 82.

19. REY, P., CAMBOU, F., GOURINARD, Y., 1973. Management of National Resources through Automatic Cartographic Inventory, Type II Progress Report for period February - December 1973, n° 2. 1 vol., 84 p., 39 fig. Toulouse. Dec. 1973.

CONCLUSIONS

The following definitive perspectives, which will appear in the TYPE III FINAL REPORT, can now be formulated using the processing of the latest imagery concerning the ARNICA program.

1. Previously known land features can be recognized very accurately on the ERTS imagery (often even for objects smaller than 1 hectare, whenever contrast can replace resolution). Degrees of detection of the major signatures can be established.

2. The reverse procedure interpretation of imagery in order to determine elements not identified on the ground, requires a preliminary treatment of the information in zones equal interpretation of densitometric value.

3. Such zoning involves an analogical use of the using chromatic methods (pseudo-color, color composite), especially the TEMPORAL COLOR COMPOSITE, which is particularly effective in assuring the best data compression formula because it gives the minimum number of repetitive combinations likely to guarantee the required determinations.

4. The computer processing of the imagery must be carried out using this analogical exploration by means of the treatment of digital equidensities most likely to assure the automatic charting of natural resource from the ERTS imagery furnished under conditions of minimal repetitiveness.

E R T S - IMAGE DESCRIPTOR

Cf. ATTACHMENT C

(18 sheets)

ATTACHMENT C

ERTS IMAGE DESCRIPTOR FORM

USER NAME BEY Paul - Augustin DATE 12.20.73

USER ID FO 433

AGENCY CNRS Service Carte Vegetation BP 4009 31 TOULOUSE FRANCE

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COAST	FOREST	LAKE	MARSH	
1228 10305 4	✓	✓	✓	✓	ESTUARY ISLAND OCEANOGRAPHY SEA VEGETATION
1228 10305 5	✓	✓	✓	✓	AGRICULTURE BAY CAPE CONIFER ESTUARY HARDWOOD FOREST ISLAND MEADOWLAND OCEANOGRAPHY PLUMES SALT FLAT SEA GRASS VEGETATION
1228 10305 6	✓	✓	✓	✓	BAY CAPE CITY CONIFER ESTUARY FAULT HYDROGRAPHY ISLAND ISTHMUS OCEANOGRAPHY PLUMES RIVER SEA STREAM VEGETATION

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

MAIL TO ERTS User Services
Code 563
Bldg 23 Room E203
NASA GSFC

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COAST	SEA	SALT FLAT	MARSH	
1228 10305 7	✓	✓	✓	✓	BAY CAPE CARTOGRAPHY CITY COASTAL DUNE CONIFER ESTUARY FAULT FOREST GEOLOGY GULF HYDROGRAPHY ISLAND ISTHMUS LAKE LITTORAL DRIFT MARSH OCEANOGRAPHY RIVER SEA GRASS STREAM VEGETATION
1228 10311 7	✓	✓	✓	✓	BAY CAPE COASTAL DUNE CONIFER ISLAND SEA GRASS VEGETATION

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COAST	CROPLAND	METEOR.	SEA	
1228 10320 4	✓	✓	✓	✓	CAP CLOUDSTREET MOUNTAIN
1228 10320 5	✓	✓	✓	✓	AGRICULTURE BASIN AND RANGE CAP COULDSTREET CONIFER FOREST GEOGRAPHY PASTURE SIERRA VEGETATION
1228 10320 6.7	✓	✓	✓	✓	BASIN AND RANGE BAY CAP CITY CLOUDSTREET CONIFER DAM ESTUARY FOREST GEOGRAPHY MEANDER PASTURE RIVER SIERRA STREAM VALLEY VEGETATION

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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USER ID FQ 433

AGENCY CNRS Service Carte Vegetation BP 4009 31 TOULOUSE FRANCE

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	FOREST	MOUNTAIN	SNOW	STREAM	
1241 10030 4	✓	✓	✓	✓	CANAL DECIDUOUS QUARRY SYNCLINE VEGETATION
1241 10030 5	✓	✓	✓	✓	AGRICULTURE CANAL CONIFER CROPLAND DAM DECIDUOUS HYDROLOGY HIGHWAY LAKE QUARRY SYNCLINE TRIBUTARY VALLEY VEGETATION
1241 10030 6.7	✓	✓	✓	✓	CANAL CITY CONIFER CROPLAND DAM FAULT GEOGRAPHY HYDROLOGY HIGHWAY KARST SYNCLINE TRIBUTARY VALLEY VEGETATION

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COASTAL DUNE	LAGOON	METEOR.	SEA	
1241 10033 4	✓	✓	✓	✓	GULF MOUNTAIN SEA GRASS SNOW
1241 10033 5	✓	✓	✓	✓	ALLUVIAL PLAIN CROPLAND CONIFER DECIDUOUS DELTAIC COASTAL PLAIN GULF MOUNTAIN SEA GRASS SNOW STREAM TRIBUTARY VEGETATION
1241 10033 6.7	✓	✓	✓	✓	ALLUVIAL PLAIN COASTAL MARSH CROPLAND DAM DELTAIC COASTAL PLAIN EROSION FAULT FOLD GULF HYDROLOGY KARST LITTORAL DRIFT MOUNTAIN RIVER SEA GRASS STREAM TRIBUTARY

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	DELTA	METEOR.	SEA	SNOW	
1241 10035 4	✓	✓	✓	✓	ALLUVIAL PLAIN BASSIN AND RANGE COAST LINE FAULT FOLD GEOLOGY HARBOR
1241 10035 5	✓	✓	✓	✓	AGRICULTURE ALLUVIAL PLAIN BASIN AND RANGE CITY COAST LINE CONIFER CROPLAND DECIDUOUS FAULT FOLD FOREST HARBOR HARDWOOD FOREST INDUSTRIAL AREA IRRIGATION VEGETATION
1241 10035 6.7	✓	✓	✓	✓	AGRICULTURE ALLUVIAL PLAIN BASIN AND RANGE CAP CITY COAST LINE DAM FOREST GEOLOGY HARBOR VEGETATION

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	HYDROL.	PLATEAU	SNOW	FAULT	
1242 10085 4	✓	✓	✓	✓	CONIFER FOREST PASTURE RIVER
1242 10085 5	✓	✓	✓	✓	AGRICULTURE CITY CONIFER CROPLAND DAM HARDWOOD FOREST PASTURE RIVER VEGETATION VINEYARD
1242 10085 6.7	✓	✓	✓	✓	CITY CONIFER CROPLAND DAM GEOGRAPHY GEOLOGY HARDWOOD FOREST MEANDER MOUNTAIN PASTURE RIVER VEGETATION VINEYARDS

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM ON FOR THE DESCRIPTORS COLUMN).

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	CITY	FOREST	PLATEAU	HYDROLOGY	
1243 10141 4	✓	✓	✓		MOUNTAIN SNOW
1243 10141 5	✓	✓	✓	✓	AGRICULTURE CONIFER CROPLAND DAM HARDWOOD FOREST GRASSLAND MOUNTAIN RIVER SNOW VALLEY VEGETATION
1243 10141 6.7	✓	✓	✓	✓	DAM GRASSLAND SNOW VALLEY VEGETATION
1243 10143 4		✓	✓	✓	CONIFER CROPLAND FAULT MEANDER RIVER VALLEY VEGETATION
1243 10143 5		✓	✓	✓	AGRICULTURE CONIFER CROPLAND DAM FAULT HARDWOOD FOREST MEANDER RIVER VALLEY VEGETATION

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	CROPLAND	DAM	FOREST	RIVER	
1243 10143 6.7	✓	✓	✓	✓	AGRICULTURE CARTOGRAPHY CITY CONIFER FAULT HARWOOD FOREST HYDROLOGY MEANDER VALLEY VEGETATION
1295 10025 5	✓	✓	✓	✓	AGRICULTURE CANAL CONIFER HARDWOOD FOREST HIGHWAY QUARRY RICE SNOW VEGETATION VINEYARD
1295 10025 7	✓	✓	✓	✓	AGRICULTURE CANAL CITY FAULT GEOGRAPHY GEOLOGY HARDWOOD FOREST HYDROLOGY MOUNTAIN PASTURE RICE STREAM

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USER NAME REY Paul - Augustin DATE 12.20.73

USER ID F0 433

AGENCY CNRS Service Carte Vegetation BP 4009 31 TOULOUSE FRANCE

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	SEA	RIVER	METEOR.	COAST	
1295 10031 7	✓	✓	✓	✓	CYCLONE DAM HYDROLOGY MOUNTAIN RICE STREAM VINEYARD
1316 10192 7	✓	✓	✓	✓	CLOUDS ESTUARY
1316 10195 7	✓		✓	✓	COASTAL DUNE CLOUDS CONSEQUENT LAKE DUNE OCEANOGRAPHY
1318 10311 7	✓		✓		CLOUDS

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	FOREST	PLAIN	METEOR.	AGRIC.	
1352 10183 4	✓	✓	✓		
1352 10183 5	✓	✓	✓	✓	CARTOGRAPHY CROPLAND GEOGRAPHY GRASS LAND HARWOOD FOREST HIGHWAY HYDROGRAPHY STREAM TRIBUTARY VALLEY VEGETATION VINEYARD
1352 10183 6.7	✓	✓	✓	✓	CITY CONIFER CROPLAND GRASS LAND HIGHWAY HYDROGRAPHY LAKE STREAM SUBURBAN AREA VALLEY
1352 10190 7	✓	✓	✓		CAP CLOUDS COAST LINE COASTAL DUNE DUNE ESTUARY RIVER SEA

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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ATTACHMENT C

ERTS IMAGE DESCRIPTOR FORM

USER NAME REY Paul - Augustin DATE 12.20.73

USER ID FQ 433

AGENCY CNRS Service Carte Vegetation BP 4009 31 TOULOUSE FRANCE

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COAST LINE	FIRE BREAK	CITY	VEGETAT.	
1352 10192 4	✓	✓	✓	✓	BAY CONSEQUENT LAKE CONIFER DUNE HARDWOOD FOREST SEA SUBURBAN AREA
1352 10192 5	✓	✓	✓	✓	AGRICULTURE BAY COASTAL DUNE CONIFER CONSEQUENT LAKE CROPLAND DUNE FOREST GRASS LAND HARDWOOD FOREST ISLAND MARSH METEOROLOGY SEA STREAM SUBURBAN AREA VINEYARD
1352 10192 6.7	✓	✓	✓	✓	AGRICULTURE BAY CONSEQUENT LAKE DUNE ESTUARY FOREST HYDROLOGY

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COASTAL DUNE	CONIFER	METEOR.	SEA	
1352 10192 6.7	✓	✓	✓	✓	ISLAND MARSH MEANDER RIVER STREAM URBAN AREA
1352 10195 4	✓	✓	✓	✓	COASTAL LINE FOREST MOUNTAIN SIERRA SYNCLINORIUM VALLEY VEGETATION
1352 10195 5	✓	✓	✓	✓	COASTAL LINE CROPLAND DAM GEOLOGY HARDWOOD FOREST MOUNTAIN RIVER SIERRA SYNCLINORIUM VALLEY VEGETATION
1352 10195 6.7	✓	✓	✓	✓	CITY COASTAL LINE DAM DUNE FOREST METEOROLOGY MOUNTAIN RIVER

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	AGRICULT.	DIVIDE	FAULT	FOREST	
1352 10201 4.5	✓	✓	✓	✓	ALLUVIAL PLAIN BASIN AND RANGE CARTOGRAPHY CHAPERRAL CONIFER CROPLAND DECIDUOUS DROUGHT CONDITIONS GEOGRAPHY GEOLOGY HARDWOOD FOREST IRRIGATION SALINE SOIL SYNCLINAL VALLEY TRIBUTARY VALLEY VEGETATION
1352 10201 6.7	✓	✓	✓	✓	ALLUVIAL PLAIN BASIN AND RANGE CHAPERRAL CITY CONIFER CROPLAND DAM DROUGHT CONDITIONS HYDROLOGY LAGOON SALINE SOIL SYNCLINAL VALLEY TRIBUTARY VALLEY

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COAST	FOREST	ALLUVIAL PLAIN	SEA	
1353 10242 7	✓	✓	✓	✓	CITY CONIFER DECIDUOUS HYDROLOGY LAKE MARSH MEADOW LAND STREAM SUBURBAN AREA TRIBUTARY VALLEY VINEYARD
1353 10244 4.5	✓	✓	✓	✓	AGRICULTURE COASTAL DUNE CONIFER CROPLAND ESTUARY HARWOOD FOREST ISLAND LITTORAL DRIFT MARSH MEADOW LAND OCEANOGRAPHY RIVER VEGETATION
1353 10244 6.7	✓	✓	✓	✓	CITY DAM DUNE ESTUARY HYDROLOGY ISLAND LITTORAL DRIFT MARSH

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	COAST LINE	FOREST	BAY	SEA	
1353 10244 6.7	✓	✓	✓	✓	MEADOW LAND RIVER SALT MARSH SEA GRASS VEGETATION
1353 10251 4.5	✓	✓	✓	✓	AGRICULTURE CITY COASTAL DUNE CONIFER CROPLAND ESTUARY FIREBREAK OCEANOGRAPHY STREAM SUBURBAN AREA VINEYARD
1353 10251 6.7	✓	✓	✓	✓	AGRICULTURE CITY COASTAL DUNE CONIFER CONSEQUENT LAKE CROPLAND DAM DECIDUOUS DUNE ESTUARY FIREBREAK IRRIGATION ISLAND LITTORAL DRIFT MARSH OCEANOGRAPHY STREAM VINEYARD

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	GULF	METEOR.	SEA	VEGETAT.	
1443 10235 4	✓	✓	✓	✓	BASIN AND RANGE COAST LINE CUESTA FAULT FOG FOREST GEOGRAPHY GEOLOGY HARDWOOD FOREST MEANDER VEGETATION
1443 10235 5	✓	✓	✓	✓	AGRICULTURE ANTICLINE BARBED TRIBUTARY BASIN AND RANGE CITY COAST CUESTA DECIDUOUS DIVIDE FAULT FOG FOREST GEOGRAPHY GEOLOGY HARDWOOD FOREST MEANDER STREAM SYNCLINE VEGETATION

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
	GULF	METEOR.	SEA	VEGETAT.	
1443 10235 6.7	✓	✓	✓	✓	AGRICULTURE ANTICLINE BASIN AND RANGE CAPE CARTOGRAPHY CITY COAST CONIFER CUESTA DAM DIVIDE ESTUARY FAULT FOG GEOGRAPHY GEOLOGY GULF HYDROLOGY INLET IRRIGATION LAKE MEANDER METEOROLOGY RIVER SYNCLINE VEGETATION

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