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T.D. No 29690

# THE FRENCH ATLANTIC LITTORAL AND THE MASSIF ARMORICAIN

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December 1975

Type I Report for period

September - December 1975

CENTRE NATIONAL D'ETUDES SPATIALES

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| 1. I.D. Number 29.690 | 2. Type of report 1 | 3. Recipient's catalog No. |
|---|---|---|
| 4. Title<br>THE FRENCH ATLANTIC LITTORAL | | 5. Report Date: December 1975<br>6. Period Covered: September-December 1975 |
| 7. Principal investigator<br>Prof. Fernand VERGER | | 8. No of pages: 5 |
| 9. Name and Address of Principal Investigator's Organization<br>ECOLE PRATIQUE DES HAUTES ETUDES<br>61, rue Buffon 75005 - PARIS.<br>France | | 10. Principal Investigat. Rept. No 1<br>11. GSFC Technical Monitor<br>CRUMP Edward W. |
| 12. Sponsoring Agency Name and Adress<br>CENTRE NATIONAL D'ETUDES SPATIALES<br>129, rue de l' Université<br>75007 - PARIS. France | | 13. Key Words (Selected by Principal Investigator)<br>Tidal marsh; littoral transport, estuary; beaches; wetlands; computer analysis |

14. Supplementary Notes

prepared in cooperation with J.M. MONGET

15. Abstract :

This first Type 1 Progress Report concerns the first look at imagery received from September to December 1975.
During this time period, 41 scenes were received and evaluated. A large part of this shipment unfortunately is displaying a dense cloud cover ranging from 70% to 40%.
Three of the best scenes have been asked for, in CCT tape format for further intensive study of:

- Mont-Saint-Michel bay and Charente coast and islands, with particular reference to diachronic variations observed by matching with LANDSAT 1 data.

- Bay of Biscay with particular reference to sea surface features in relation with wind and possible presence of internal waves.

A new data handling and image analysis computer system has also been devised with emphasis on interactive capabilities using a Tektronix display.

## I - INTRODUCTION

LANDSAT data will be used in conjunction with other remote sensors in order to study the coastal zone of the French Atlantic Littoral (FRALIT).Three types of applications have been identified in which remote sensing has a definite impact in our knowledge of this environment.

Channels MSS 4 and MSS 5 are of a great help in the phenomenology of coastal turbidity dynamics from which new relationships can be identified between sediment plumes and such factors as current patterns or coastal and submarine topography.Systematic correlation of those results with thermal and visible imagery from NOAA satellites gives an accurate mapping of the dynamic behaviour of our estuaries thus helping in the study of pollution spreading or dispersion and the planning of future nuclear plants.

The West Coast of France displays a vast complex of beaches and tidal flats due to a tide amplitude ranging from 3 to 15 meters. Water at low tides unveils large areas which can be mapped according to sediment nature and mineralogy.LANDSAT has helped and will help in the accurate delineation of silts in Mt-St Michel bay, in Anse de l'Aiguillon or sands at Pointe de la Coubre.Multitemporal statistics on tidalflats imagery also provide useful information on the frequency of tide flooding.Those parameters influence the patterns and productivity of aquicultural economic importance with a particular emphasis on oyster and mussel shells.

Coastal land use and vegetation study is also a promising field of application for remotely sensed data processing.Coastal sand dunes evolution, degradation and interaction with nearby vegetation is a typical target as well as salt marshes mapping and modifications in relation with sediment and waste discharges.
The evolution of these ecosystems is strongly influenced by recreation and industrial activities.Other areas of investigations are the coastal plains and reclaimed lands of the Atlantic coast where LANDSAT data will be able to study such aspects as water saturation and flooding.

## II - TECHNIQUES

MSS imagery is processed by photographic and densitometric techniques.
Computer CCT tapes are used in a pattern recognition system which is organized in two parts:a supervised system(TRGEØ) and an unsupervised system(FRACAM).

The TRGEØ system is based on detailed comparison between knowground truth and spectral signatures; it uses a decision table built around a quantization of the spectral band.

The FRACAM system uses an unsupervised classification method which is linked to an interactive computer display.

Ground truth is collected in several forms :

- type of land by visual observation .
- spectral signatures of objects, "on the spot" using an Exotech Ground truth Radiometer .
- airplane remote sensing missions using the DAEDALUS spectral scanner of CNES.

This type of integrated collection of ground truth is to be first tested on Mt St-Michel bay.
Comparison with IR imagery and computer tapes coming from the NOAA satellites is also used.

III - ACCOMPLISHMENTS

MSS imagery is processed by photographic enlargement and eye scanned for evaluation of potential interest with reference to :
- quality of cloud cover in the coastal zone which is considered to expand on each side of the coastal line, 30 kilometers seaward and landward .
- presence in the scene of test sites related to tidal flats, marshes, estuaries, and coastal industrial areas.
- recognition of oceanographic features such as sediment plumes, sea state, internal waves and occasional oil pollution.
- density of identified ships is also considered with particular emphasis on the English Channel.

This Type 1 Report N° 1 concerns the images listed in Table 1.
For the frame E 2-187-10111 only the bands 4, 5 and 6 have been received but not MSS spectral band 7.
Nor color nor tape product had been asked for during the first look phase of our investigation.

A member of the scientific team, Mr P. ROUX, from Ecole des Mines of PARIS, visited Dr R. PRICE at NASA.GSFC and personnaly reported to him regarding the progress of the investigation and the techniques used. Sample results and reports were also handed to him.

IV - SIGNIFICANT RESULTS

Practical applications of investigation results have been identified and several agencies have stated their interest and are starting to use them.
We will list essentially :
- EDF (Electricité de France)

This agency is in charge of the production of electricity for the entire country. Pressure is building up for the quick construction of nuclear plants. LANDSAT 2 data is to be used in order to plan the Cotentin and Loire estuary new developments.

- CNEXO (Centre d'Exploitation des Océans)
This agency with similar functions as NOAA in the USA is in charge of the management planning of the estuaries and is interested in our various studies.
On a global basis a large number of other research laboratories in the fields of geography, geology, sedimentology are interacting with our projects in the form of seminars or student exchanges.

V - PUBLICATIONS

Fernand VERGER : Le programme FRALIT de télédétection.
Bulletin du Comité français de Cartographie N° 64, 1975
p.196-199.

D.J. DAVID, J. DERIES et F. VERGER : Automatic Cartography of ERTS Remote Sensing Data.
Journal of the British Interplanetary Society vol.28, 1975
p. 624-628.

G. JOLY et F. VERGER : Cartographie diachronique à partir des données numériques de LANDSAT 1.
Photointerprétation.

F. VERGER : Une cartographie automatique des données de LANDSAT 1.
Photointerprétation.

F. VERGER : Les données LANDSAT et un exemple de leur utilisation.
Travaux et documents du CEGET , Talence, 1976.

J.M. MONGET : An unsupervised classification of multispectral scanner data using correspondence analysis (CLAMS)
Proceedings of the NASA Earth Ressources Survey Symposium,
Houston, June 1975.

J.M. MONGET : Classification automatique des données multispectrales utilisant l'analyse des correspondances (le système CLAMS).
Revue de Photogrammétrie N° 61

J.M. MONGET et M. ALBUISSON : FRACAM. Sous-ensemble temps partagé du système CLAMS - Manuel d'utilisation.
Laboratoire de Ressources Terrestres, Ecole des Mines, Paris
(Rapport interne LRT/75/R/17).

J.M. MONGET et D. SARRAT : Une méthode de classification automatique des données de la télédétection.
Laboratoire de Ressources Terrestres, Ecole des Mines, Paris
(Rapport interne LRT/R/75/19).

VI - DATA QUALITY AND DELIVERY

MSS imagery received from NOAA processing facility looks better for oceanographic phenomenas than LANDSAT 1 data previously received.
Unfortunately cloud coverage position relative to the coast line was poorly evaluated so that about a third of the received imagery is not very useful.
The first images were scheduled in August 1975 but effectively received in September 1975.

NASA - LANDSAT 2 — PROGRAMME-THEMA

| DATE | PRODUCT ID | BLACK AND WHITE PRODUCTS MSS (Quality) 4 | 5 | 6 | 7 | CLOUD COVER (%) | COLOR PRODUCT | TAPE PRODUCT | CODE OF FRAMES (L = Littoral) |
|---|---|---|---|---|---|---|---|---|---|
| 30 Avril 75 | E2 078-10055 | F | P | F | F | 30 | | | FLANDRES (L) |
| " | E2 078-10062 | F | F | F | F | 40 | | | PICARDIE (L) |
| " | E2 078-10064 | F | G | G | G | 70 | | | BEAUCE |
| " | E2 078-10071 | G | G | G | G | 60 | | | ANJOU |
| " | E2 078-10073 | G | G | G | G | 60 | | | CHARENTE-GIRONDE |
| " | E2 078-10080 | G | G | G | F | 50 | | | LANDES (L) |
| " | E2 078-10082 | G | G | F | G | 60 | | | GOLFE GASCOGNE (L) |
| 23 Juin 75 | E2 132-10070 | P | P | P | P | 80 | | | ANJOU-VENDEE |
| " | E2 132-10073 | G | G | G | G | 60 | | | GIRONDE |
| " | E2 132-10075 | F | G | G | F | 70 | | | LANDES (L) |
| " | E2 132-10082 | F | G | G | G | 60 | | | PYRENEES |
| 4 Juin 75 | E2 133-10113 | G | P | F | G | 40 | | | ARTOIS (L) |
| " | E2 133-10120 | F | P | F | G | 30 | | | BAIE DE SEINE (L) |
| " | E2 133-10122 | G | P | G | G | 60 | | | BAIE DE SEINE (L) |
| " | E2 133-10125 | G | F | G | G | 50 | | | VENDEE (L) |
| " | E2 133-10131 | G | F | F | G | 50 | | | GIRONDE (L) |
| " | E2 133-10134 | F | P | G | G | 40 | | | LANDES (L) |
| 6 Juin 75 | E2 135-10233 | F | P | P | F | 20 | | | JERSEY-COTENTIN (L) |
| " | E2 135-10235 | F | F | G | F | 30 | | | BAIE ST MICHEL (L) |
| " | E2 135-10242 | F | F | G | F | 60 | | | MORBIHAN (L) |
| 8 Juin 75 | E2 137-10352 | F | G | G | G | 50 | | | OUESSANT (L) |
| 9 Juil 75 | E2 168-10073 | G | G | G | G | 50 | | | SAINTONGE |
| " | E2 168-10080 | G | G | G | G | 50 | | | ARCACHON (L) |
| " | E2 168-10082 | F | G | G | G | 40 | | | GOLFE GASCOGNE (L) |
| 21 Juin 75 | E2 150-10060 | F | F | F | F | 40 | | | FLANDRES (L) |
| 22 Juin 75 | E2 151-10135 | F | F | F | G | 20 | | | ARCACHON (L) |
| 14 Juil 75 | E2 173-10352 | G | F | G | G | 30 | | | OUESSANT (L) |
| 28 Juil 75 | E2 187-10111 | F | P | G | X | 30 | | | PAS-DE-CALAIS (L) |
| " | E2 187-10114 | F | F | G | G | 30 | | | PICARDIE (L) |
| " | E2 187-10120 | G | F | G | G | 50 | | | Baie de SEINE (L) |
| " | E2 187-10123 | G | F | G | G | 20 | | | ANJOU |
| " | E2 187-10125 | G | G | G | G | 20 | | | CHARENTE (L) |
| " | E2 187-10132 | G | G | F | G | 10 | | | ARCACHON (L) |
| " | E2 187-10134 | F | G | G | F | 10 | | | GOLFE GASCOGNE (L) |
| 27 Juil 75 | E2 186-10071 | G | G | G | G | 0 | | | CHARENTE |
| " | E2 186-10073 | G | F | G | G | 10 | | | ARCACHON (L) |
| " | E2 186-10080 | G | G | G | G | 40 | | | COTE D'ARGENT (L) |
| 30 Juil 75 | E2 189-10230 | F | F | F | F | 10 | | | N COTENTIN (L) |
| 30 Juil 75 | E2 189-10233 | F | F | F | G | 10 | | | GOLFE ST MALO (L) |
| " | E2 189-10235 | F | F | F | G | 10 | | | Morbihan (L) |
| " | E2 189-10242 | F | F | F | F | 10 | | | Océan |

Table 1 : List of scenes received during the period September-December 1975.