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Remote Sensing in Argentina Today

1. OBJECTIVE **REMOTE SENSING IN ARGENTINA TODAY**

This work has been prepared by the *Sociedad de Especialistas Latino Americanos en Percepción Remota (SELPER)* with the purpose of listing the Official Institutions and Private Enterprises related in one way or another or simply interested in applications of Remote Sensing (RS) and Geographical Information Systems (GIS).

2. BACKGROUND

Since the seventies the National Commission of Space Research of Argentina has pioneered in training of personnel and establishment of applications of Remote Sensing technology.

Several national and international organizations have trained over 1000 professionals in Remote Sensing technology.

Image Processing was established in 1975 at the National Center for Remote Sensing.

This station was not brought up to date with the needs of the country.

At the end of 1983, 75% of the personnel moved to other institutions.

Some of them have formed their own small companies in the same area.

In spite of all the promoted use of this type of technology, the activity in this area has not been relevant because of reduced budgets at the official level and at the private level.

Prepared by
SELPER

Buenos Aires, October 1991

Ing. MIGUEL SANCHEZ PERA
PRESIDENTE
S.E.L.P.E.R.

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Min. des Affaires extérieures
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2 BACKGROUND

Since the seventies the *National Commission of Space Research (CNIE)* of Argentina has pioneered in training of personnel and establishing programs for applications of Remote Sensing technology.

Several national and latinoamerican short and regular courses have trained over 1000 professionals in this area. In 1980 a receiver Station was installed which could receive LANDSAT information and a Center of Satellite Digital Image Processing was established, as well as users distribution of data.

This station was not brought up to date with the use of new sensors, as the Thematic mapper (TM), or the SPOT satellite and after 1986 it closed. At the end of 1982, only in the area of remote sensing there were more than 75 people involved in several active programs, but after some time it decayed and part of that personnel moved to other Institutions or to the University. Some of them have formed their own small companies or work for bigger ones in the same area.

In spite of all the promoted use of this type of technology and its applications, the activity in this area has not been relevant in the past years, mainly because of reduced budgets at the official level and at provinces.

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3 FUTURE PERSPECTIVES

Nevertheless, there has been an increasing interest in the last year, mainly in general training and specially in Digital Image Processing Systems, use of software and applications of Geographic Information Systems. This is due to several factors:

- Cheaper software and hardware due to the use of PC's.
- Personnel that used to work at CNIE, or that participated in courses, from different parts of the country, is still interested in the subject.
- The intense promotion of this activity realized by SELPER in the last years.

We are convinced that there exists a big potential market in which to apply Remote sensing technology, specially in the areas of agriculture, forests, geology, soil usage, urban planification, etc. It will be necessary to continue promoting at different levels of city halls, provinces and national government, producers Associations and others, so that they would invest in research and applications of remote sensing technology, as well as the possibility of offering *soft credits*.

This propaganda could also be implemented in the form of courses and seminars for decision makers at Official or private levels. In this task, SELPER could collaborate efficiently.

A subject which deserves special attention is the study and planification for updating the satellite receiver Station of Mar Chiquita, with capacity to process LANDSAT, SPOT and ERS-1 data. For this it is necessary to perform some *lobby* work to produce a project of this magnitude.

In the next two sections we list, very briefly, the different groups which are working in this area, starting from the official ones and ending with private companies.

4 OFFICIAL ORGANIZATIONS

Servicio Meteorológico Nacional

25 de Mayo 650, (1002) Buenos Aires

Ph. 44-1481/42-2518

Since 1970 the Servicio Meteorológico Nacional has included the remote sensing information obtained from satellites for the diagnosis of meteorological phenomena. At this time it has three receivers: one in Antarctica, the Vicecomodoro Marambio station; one in Ezeiza (Buenos Aires) and the High Resolution Satellite Information Receiving Station (HRPT) at Villa Ortúzar, also in Buenos Aires. Both stations in Buenos Aires are capable of receiving information from an area covering the South Pole to the Equator and from 10 to 40 meridian degrees. Both receive satellites from polar orbits from the series TIROS-NOAA and from the satellite GOES-E.

The HRPT station is equipped with a Hewlett-Packard 1000 computer with peripherals, an image processor I-S, a processor which transmits low resolution information via Telex and FAX (Laser System) to a graphic output of the system, in low and high resolutions, producing images similar to a photograph.

With the use of this equipment, research has been oriented to evaluate pastures and farming using the Green Index and estimate rains derived from the convective systems of clouds, with data from GOES.

Instituto Nacional de Tecnología Industrial (INTI)

Parque Tecnológico Miguelete, Av. Gral. Paz between Albarelos and Av. de los Constituyentes, Buenos Aires.

C.C. 157, (1658), Buenos Aires.

Ph. 755-6161/6112/6314/ 752-5101/5151/5201, FAX: (541) 755-2102.

The groups in INTI that work in teledetection applied to resource information for the national industry are: The Center of Research on Celulose

and Paper and the Center of Research for Mining Industry.

The activities of INTI in the area of teledetection applications are oriented to solve specific problems of their clients using:

- Technical Services.
- Training (courses requested by Companies and Institutions).

The main objective is to support the national industrial sector through the offer of modern technology which will allow the evaluation and study of natural resources.

The Institute, by means of its Centers CICELPA, CIIM and the Computation area is self equipped and uses programs for the digital processing of satellite information which have been developed in the Institute, as well as professionals specialized in computations and teledetection.

The main thematic areas are:

- Prospection and Mineral Exploration.
- Geological Mapping.
- Forest and Agricultural resources.
- Adequate use of the soil.

Centro Oceanográfico Buenos Aires (COBA)

Av. Eduardo Madero 399, (1106), Buenos Aires

Ph. 34-4676/7748/7601/30-7778, FAX: (541) 331-0270

The areas of research of this Center cover physical oceanography, geology and geophysics, hydrography, instrument development and coastal management.

The R&D projects are the following:

- **MOTOR.** Adjustment of a numerical model for the calculation of the heights of the tides produced by the storm waves in the Río de la Plata.

- PLACON. Evolution of the continental platform next to the Río de la Plata from the quaternary to the present.
- SEDI Marine sediments from Río de la Plata and the Delta of the Paraná river.
- CATER Thermal characteristics in the area of Río de la Plata.
- BACO Elaboration of the base data which covers the physical, biological, legal and socio-economical aspects of the coastal management of the Río de la Plata.
- PROTEL Design and construction of a prototype of a telemetry station for oceanographic and meteorological data acquisition for its further digital processing.
- DICO Research on coastal dynamics in Atalaya, Punta Piedras and San Antonio.
- OTOR Research concerning the storm wave in Mar del Plata.
- SECOR Coastal currents in the area of Mar del Plata.

This organization has a 40 Mb. computer, printer, plotter, water and air temperature sensors and anemometer. Also a station for real time processing of oceanographic and meteorological variables is under development.

Universidad Nacional de Luján

Rutas 5 & 7, (5700) Luján, Buenos Aires.

Ph. 0323-24385/21030, FAX: (54323) 25795

The University has a Program for Research and Development in Remote Sensing, connected with the academic curricula.

Taking into account that this subject is directly related with the area of System Information, the University has added Remote Sensing at the Masters level, as well as programs in Artificial Intelligence and System Analysis.

The Master level which covers the last two years of the career can be divided into:

1. Basics.
2. Specialization area.

The Program of Research & Development in Remote Sensing has been implemented in the Department of Basic Sciences and has as its objectives, the following:

- Use of the NOAA-AVHRR to evaluate the vegetation of the Pampa prairie.
- Correlation between the productivity of the pastures and the vegetation indexes, obtained from the multispectral data.
- Dynamic study of urban areas obtained from satellite and aerial photography data.

Centro de Aplicaciones en Teledetección (CATEL)

Rutas 5 & 7, (5700) Luján, Buenos Aires.

Ph. & FAX: (54323) 23064

The main objective of this Center is to strengthen the Teledetection activities at the University of Luján by establishing a group with an adequate academic level and the necessary equipment to perform applied research and decision making concerning the evaluation of natural resources and other connected applications.

It works in the main areas of National interest of applied research in Teledetection, this is: Agriculture, Silviculture, Geology, Oceanography, Marine Resources, Hydrology, Soil applications, Environment and others.

It stresses the support to other Programs, therefore it established the following subprograms:

1. Training.
2. Supports the following Programs:

- Environmental problems.

- Agroindustry.
 - Medium and Small Enterprises.
 - Water.
 - Others.
3. Technical Assistance to third parties. Official and private organizations at the national, provincial or municipal levels; coöperatives, etc.

The activities of the Center evolve in the following priority areas:

1. Visual and digital image processing with data obtained from satellite, aerotransported sensors and others.
2. Training program which includes: short courses, long range professional education and work training for scientists and professionals from Argentina as well as visitors.
3. Design and implementation of software, systems of geographic information and expert systems in the area.
4. Obtain and distribute satellite data and aerial photography to facilitate the creation of a data base in the area.
5. Promote the development of low cost Receiver stations and integrated information stations with environmental data for the productivity improvement.

Centro Argentino de Estudios de Radiopropagación y Compatibilidad Electromagnética (CAERCEM)

Julián Alvarez 1218, (1414) Buenos Aires

Ph. 771-7649/772-1471

The objectives of the Center is to set a laboratory for the evaluation of natural resources and determination of the environmental, oceanic and terrestrial factors, by the use of satellite information integrated with data coming from aerial photography, maps, campaign data, etc. Promote the

use of the data we have just mentioned, as well as training of professionals and researchers in the area, as well as the interaction with other private or national Institutions, which may need of the existing capacity or the one which may be developed by the Satellite Radiometry Group.

The main research areas are directed to the following:

- Determination of the applicability of the NOAA-AVHRR systems for the monitoring of the areas covered by vegetation, water masses, coastal water and snow covered areas.
- Determination of the applicability of the data from Landsat TM and SPOT/HRV in the coast environment of Argentina.
- Computation of oceanic environmental parameters.
- Organization of a satellite or georeferenced data base for regional and global environmental studies.

The Satellite Radiometry Group is equipped with the following: COMPAQ DESKPRO 386/20 microcomputer with ERDAS image processing software and the Geographic Information System, high resolution monitor, Tape units, digitizer, Tektronix color printer and a microprocessor IBM PC 386/12 with the Geographic Information System IRDISI.

CAERCEM has a Cooperation Agreement with the National Meteorological Service to advice and collaborate with the performance of the reception antenna of Villa Ortúzar.

Instituto de Investigaciones Aplicadas en Ciencias Espaciales (IIACE)

C.C. 131, CRICYT, (5500) Mendoza.

Ph. (5461) 241654 .

This Institute has been created under an Agreement of the *Comisión Nacional de Investigaciones Espaciales* and the *Consejo Nacional de Investigaciones Científicas y Técnicas* in 1979. It started operating in the *Centro Regional de Investigaciones Científicas y Tecnológicas* in Mendoza in 1981. The main objectives are based in promoting the use of satellite data.

For image processing it has a COMTAL processor, VISION One/20, based on a μ processor LSI 11/23 installed on a VAX 11/780. They work mainly in the census of abandoned farms and vineyards, in areas and systems of irrigation, in vegetation and soil administration in arid zones and research on saline soils.

Dirección de Aplicaciones Satelitales

The CNIE, responsible of the area of remote sensing in Argentina, has been operational until 1991. At this time the activities take place at the new *Agencia de Aplicaciones Satelitarias* which operates at the Processing Station of CNIE¹ at Dorrego 4010, Buenos Aires.

It offers remote sensing services to specialists and users and works as a consultant in applications of satellite data. It has a photographic laboratory to generate the satellite images in paper and tape. It also is equipped to analyze satellite data, has a COMTAL vision One/20 installed on a VAX 11/780, an image processor SIVID with digitizer table.

Centro de Análisis y Procesamiento Digital de Imágenes Satelitarias

Av. 7, No. 1267, Piso 7, (1900) La Plata, Buenos Aires.

Ph. 021-215777

It has been created by resolution No. 861 (10/2/86), by the Ministerio de Obras y Servicios Públicos, as an Organization for the application of the technology of analysis and digital processing of satellite images, to allow the province of Buenos Aires a total independence in obtaining the data for decision making.

This Center studies through visual and digital analysis of satellite images the following subjects: thematic cartography for the evaluation of hydric cov-

¹At this time, due to a Presidential decree, CNIE has been transformed into the *Comisión Nacional de Actividades Espaciales (CNAE)*, which depends directly from the President of Argentina. At this time it is under a restructuring process.

erage, analysis of sowed areas, flooding problems, regional and local experts, management of agricultural soil, plague problems, fires, salinization, forest areas, mine exploitation, hydric and eolic erosion, fluvial and marine coastal modification, water and environment contamination.

It performs professional and technical training as well. It is equipped with the following:

- Microvax II computer, 16 Mbytes of central memory.
- Two 456 Mbytes discs RA81.
- One tape unit TU81 (1600-6250) BPI.
- One Cartridge unit TK70 (296 Mbytes).
- Image processor SIVID 16R.
- High resolution monitor Mitsubishi 19' with Degauss.
- Digitizer Table GTCO, 25 mic. of resolution.
- LA210 printer, 300 cps.
- Optical transfer zoom PROCOM II, high precision, magnification range from 3 to 73 in continuous range.
- 4 VT 320 terminals.

Instituto Geográfico Militar

Cabildo 381, Buenos Aires.

Ph. 771-3031

The Instituto Geográfico Militar was created as a Topographic Military Office in December 1879. It has as a permanent objective the realization of the geodesic fundamental tasks in a systematic and regular way and the topographic uprising over all the national territory.

This task has been initiated by the Army and has been legally supported since 1941, through the *Ley de la Carta*. The work it realizes goes to the user

in the form of topographic charts, physical-political maps, geographical atlas, coordinates listings, technical publications, photographic and photogrametric products with the necessary quality as the one recommended in National and International Meetings.

It has covered through photographic flights great part of the country with scales of 1:20,000 ; 1:40,000 and 1:50,000. It also has important gravimetric works, a database with satellite data, has developed digital models of the land for cartographic purposes, has obtained topographic charts by using digital methods and has an important system of image processing.

Universidad Nacional de San Juan - Facultad de Ingeniería

Laprida 1130 Oeste, (5400) San Juan.
Ph. 226910, FAX: (5464) 210299

The area of research is based in the geometric benefits of using photographic images. The most important projects are: the implementation of a system of territorial information oriented to the administration of a multipurpose database and the development and optimization of photographic techniques to obtain cartographic documents.

It is equipped with data processing systems on several computers, as well as terrestrial equipment, coordinate registration and restitution equipment.

Estación Experimental Agropecuaria INTA Bariloche

C.C. 277, (8400) Bariloche, Prov. de Río Negro.
Ph. 0944-22731/24990, FAX: (54944) 23654

It has the following work groups:

1. Integrated analysis of natural resources.
2. Wild fauna.
3. Natural pastures.

4. Soil.
5. Climatology.
6. Rural developed areas.

It has Cooperation agreements with the following International Organizations:

GTZ Technical Cooperation Organization of the government of West Germany.

ORSTOM Technical Cooperation Organization of the government of France.

It also has cooperation agreements with other local organizations of the *Patagonia* region such as: EEA INTA Trelew, EEA INTA Río Gallegos and CENPAT Puerto Madryn. All of them are involved in the LUDEPA-SME Project for the battle against the desertification of Patagonia and the Ecologic Monitoring System. They are all equipped and have similar working groups as INTA Bariloche.

This equipment is: ERDAS Version 7.4, MSDOS version 3, EPSON LQ400 Printer, Tektronix 4696, CalComp Digitizer Table, Mitsubishi color display Monitor, Current stabilizer and UPS MULTIPAC SX 1200, Streamer EZ tape reader.

INTA Centro de Investigaciones de Recursos Naturales Instituto de Clima y Agua

Las Cabañas y De los Reseros, (1712) Castelar, Buenos Aires.
Ph. 621-1448/1174/0281, FAX: (541) 661-4360

They work in the area of hydrology, soil analysis, agrometeorology, farming supervision and crop foresight. The most important project they are involved in is the foresight of cereals and oleaginous crop.

They have a data processing system of several computers and terminals, 6 microcomputers (Texas AT-Vectra 386 HP), 1 HP 9000/835 (40 terminals) 1 VAX 730 (10 terminals), Vectra 386 - 300 Mbyte disc, 4 Mbyte RAM, ERDAS

and SPOT radiometer. It cooperates with other National Organizations as the *Junta Nacional de Granos* and International as the INRA in France.

5 PRIVATE ORGANIZATIONS

Aeroterra Sociedad Anónima

Gorostiaga 2465, (1426) Buenos Aires
Ph. 771-5881/774-0223, FAX: (541) 774-6183

It is a private organization, created in 1973 as a service company dedicated to the integrated evaluation of natural resources by means of remote sensing technology.

It performs conventional photointerpretation and satellite image analysis using multidisciplinary equipment. It has already surveyed 6 million square kilometers of natural resources with information from LANDSAT, SKYLAB and SPOT, over several regions of Argentina and Paraguay.

Since 1980 it incorporated digital processing and computational thematic analysis of images, therefore offering final products in scales of up to 1:50,000 and 1:25,000.

In 1987, Aeroterra has installed an Image Processing System totally integrated with a Geographic Information System, with ERDAS and some time later it has been completed with the most advanced SIG of its type: the ARC/INFO.

This enterprise represents, exclusively, the following international organizations: ESRI, ERDAS, EOSAT, SCINTREX. It has published more than 150 volumes and has organized and sponsored several courses.

Instituto Foto Topográfico Argentino (IFTA)

Malabia 2139, 1-A, (1425) Buenos Aires.

Ph. & FAX (541) 71-7768, 72-3043/4

It offers the following services:

- Geodetics: Satellite positioning through GPS system, classical topography, gravimetry.
- Photogrammetry: Flight planification, terrestrial support, aerotriangulation, digital restitution, existing cartographic digitalization.
- Satellite image processing.
- Land surveying, legal land surveying: rural and urban survey, mensures, subdivisions, urbanizations, price evaluations.

Tecnicagua

Suipacha 570, 4to. Piso, (1008) Buenos Aires.

Ph. 393-4939/4603/394-0421, FAX: (541) 303-4601 Telex: 25524 TECSA.

An Argentine service company, since 1947 it has provided technology and equipment to companies working in the areas of engineering, agriculture oil and water extraction. Its Department of Interpretation of satellite images consultant services to clients interested in buying satellite data, processing and interpretation and systems of geographic information.

It represents in Latin America the *Terra-Mar Resources Information Services, Inc.* from Mountain View, California. Tecnicagua offers a complete variety of software and hardware for works related to the areas of geology, petroleum, mines, forests resources, agriculture, city planning and cartography, among other applications.

The interpretation services are performed with the system of Geographic Information ATLAS-GIS and the system for satellite image processing MICRO-IMAGE from Terra-Mar Resources. The following services can be offered:

- Assesment and acquisition of satellite images.
- Image interpretation.
- Asisted processing and interpretation.
- Interpretation.
- Assesment for the acquisition of aerial photography.

R.G.B. Asesoramiento y Servicios en Teledetección

Rivadavia 1559, 1-C, (1033) Buenos Aires.

Ph. & FAX: (541) 38-6574

Calle 6 No. 449, (1896) City Bell

Ph. 021-802175

This company is dedicated to work in visual and digital interpretation in the different application areas of remote sensing. It provides support and advice to users and performs research and application works in projects, using teledetection techniques.

AAYAS Teledetección

Av. 44, No. 866, (1900) La Plata.

Ph. 021-38088, FAX: (5421) 30907

This is a service and consulting company dedicated to teledetection.

Geomarine S.A.

Suipacha 268 Piso 7, (1355) Buenos Aires.

Ph. 45-9286/0337, FAX: (541) 11-1959, Telex: 02-1611.

This company was created in 1988 and is part of the *Bolland y Cía.* group. Its main activities are concerned with the following,

- Oceanographic studies: seismic, radioelectric satellite positioning, tides and waves.
- Geodesic: satellite positioning, gravimetry and magnetometry.
- Systems of geographic Information: data capture, interpretation of satellite images, digitalization, development and advise on applications, SIG system.
- Corrosion: Anticorrosive instalations.

The SIG system is used in tax analysis, urban, transport and service planification and analysis of environmental impact. In application to natural resources it is used in agricultural planification, forest, mine exploration, environmental analysis, hydrology, study of the climate, limnology. In defense: identification and analysis of strategic points, tactics planification, cartography, command planification, troops and equipment movement modelling. In petroleum: integration of existing topographic data, level curves, geodesic points, survey data, digitalization of aerophotography information, incorporation of satellite images, geology features, structures limits, vegetal coverage, environmental impact, construction planification.

Sistemas de Visión Digital (S.V.D. S.A.)

Venezuela 1650, (1096) Buenos Aires.

Ph. 38-9137/0473

Since its creation in 1986, SVD has worked on computer digital image manipulation. Its activity covers the following:

- Software development in digital manipulation.
- Hardware development in space applications.
- Consultant in projects related to image manipulation.
- Image processing services.

Its most important application areas are:

1. Remote sensing and Cartography.

- SIVID 16r (PC version)
- SIVID 16r (Microvax version)
- ARGOS (PC and SuperVGA version)
- Services:
 - Rental of Image Processing Systems.
 - Special products.
 - Soil usage evaluation.
 - Construction of floor elevation models.

2. Medicine.

- Systems for Post-treatment images of nuclear magnetic resonance.
- Digital angiographer connectable to a radiology chain.
- Tridimensional reconstruction of TC and RMN images.
- Frame freezer of radiology images.
- Digital Stereoscopy.

Aeromapa S.A.

Venezuela 1650, (1096) Buenos Aires.

Ph. 38-9137/0473

This company has been established since 1979 as a *fact Society* and in 1982 turned into an *anonymous Society (S.A.)*. It works for national, provincial and municipal public companies, as well as for private Enterprises. For this task, it has the necessary photogrammetric flight and processing equipment, topographic support, electronic registration of data and plots.

Its main activities are developed in the following areas:

- Photogrammetry and Photo interpretation.
- Geodesy.

- Topography.
- Land Surveying.
- Oceanography and Hydrology.
- Engineering, Systems and Computation.

Aeroespacio S.R.L.

Av. Corrientes 311, 3er. Piso, (1043) Buenos Aires.

Ph. 311-9055/313-1977, FAX: (541) 312-5290, Telex: 25625 MALABE AR.

It is the *General Representative* in Argentina of the SPOT-IMAGE products. This General representation means that the company can be consulted by the clients of SPOT-IMAGE over any of the following items: cost, characteristics, general conditions of the formal procedure, delivery time, User manuals, data base of the whole territory of Argentina, even at Antartica and any other information that could be used in employing these techniques.

Its permanent connection with Toulouse, France, seat of SPOT-IMAGE, allows their constant actualization in this area so that they can establish programs, develop works and evaluate costs for the products SPOT-IMAGE.

Aeriagen S.A.

Sarmiento 1630, (1042) Buenos Aires.

Ph. & FAX 35-9242, Telex: 17575 EDARG.

This company, by means of its airplanes, performs aerial mapping with lateral radars of synthetic aperture (SAR). It also processes that information for geology, forests, soil use, etc. This enterprise represents *Intera Technologies Ltda.* located at 2500, 101 6th. Avenue, S.W. Calgary, Alberta, Canada, T2P 3P4.



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Electrónica del Atlántico S.R.L.

Sarmiento 1630, (1042) Buenos Aires.

Ph. 35-1201, FAX: 35-9242, Telex: 17575 EDARG.

This Enterprise is a representative of *Darcom Systems Powder Mills*, located at Postbridge, Yelverton, Devon PL20 6SP, that has Receiver Stations for satellite data applied to meteorology.

It also represents *ILWIS* at 350 Boulevard 1945, P.O. Box 6, 7500 AA, Enschede, The Netherlands. This company works with GIS systems for satellite data information processing.

