

## **EDUCA SeRe II PROJECT – ECOSYSTEMS ATLAS OF SOUTH AMERICA AND ANTARCTICA THROUGH SATELLITE IMAGES**

T.M.Sausen<sup>1</sup> ; S.M. F. da Costa<sup>2</sup> ; A. C. Di Maio<sup>3</sup> ; F.V.Barbosa<sup>4</sup>

<sup>1</sup>Instituto Nacional de Pesquisas Espaciais, C.P. 515 CEP 12245-970 São José dos Campos, SP, Brasil;  
tania@ltd.inpe.br  
Universidade do Vale do Paraíba-UNIVAP/IP&D; Av. Shishima Hifumi, 2911; URBANOVA – CEP 12244-000; São José dos Campos, SP, Brasil;  
sandra@univap.br

<sup>3</sup>Universidade Federal Fluminense-UFF-departamento de Cartografia  
adimaio@ig.com.br

Fernanda Viana Barbosa  
<sup>4</sup>viana\_fernanda@yahoo.com.br

### **Comission VI, WG VI 1**

**KEYWORDS:** Remote sensing, ecosystems, Atlas, education, South America, Antarctica

### **ABSTRACT**

This paper is about the EDUCA SeRe PROJECT II-Ecosystems Atlas of South America and Antarctica through satellite images, which main objective was to develop an Ecosystems Atlas, in CD ROM format, using satellite images and the results of remote sensing researches, to be used as educational material in grammar and high schools. The Atlas was developed in partnership with 17 institutions, in 11 countries in South America, and it will be distributed, free, to grammar and high schools, in the region.

### **1. INTRODUCTION**

In May 1997 was held the I Conference in Remote Sensing Education in Mercosul, in Camboriú city, Southern region in Brasil. One of the results of this conference was the Camboriú Document, which presents the state-of-art of remote sensing education activities in the region.

One of the most important discussion topics in the Conference was the lack of educational material for remote sensing teaching in Portuguese and Spanish, the regional languages, besides the high cost and the difficulty to get satellite image to use as educational material in classroom. For this reason INPE decided to create the EDUCA SeRe Program in 1998, through its Dissemination and Education Space Activities Area.

The objective of this Program is to create educational material for remote sensing education, in all level, at low cost and available to everyone. This program is divided into four projects; one of them is designed to create educational CDROMs. The EDUCA SeRe PROJECT II- Ecosystems Atlas of South America and Antarctic through satellite images is an atlas about twenty-two ecosystems in South America and Antarctic.

The ecosystems preservation is very important for the biodiversity. In order to preserve the different ecosystems around the world it is necessary to know

their main characteristics, location and their relation with the surrounding area, besides the man activities impact in the ecosystem itself.

The remote sensing data are very useful for environmental studies and could help to develop actions in order to preserve the ecosystems. For this purpose it is necessary to create a critical mass in the region through education and dissemination actions. One of these actions is to show to the grammar and high schools teachers and students the some ecosystems in South America, how to use remote sensing data to get information about them, and motivate this community to be concern about environmental issues.

This Ecosystems Atlas and its wide dissemination in South will give to the school teachers and students the opportunity to know about remarkable ecosystems in the region, to know about their dynamics, the current preservation status e how to manage them. Moreover, the schoolteachers and the students will have the opportunity to learn about remote sensing through the nice satellite images available in the Atlas.

### **2. OBJECTIVE AND GOALS**

## 2.1- Objective:

The objective of this Project was to develop an Ecosystems Atlas, in CD ROM format, using satellite images and the results of remote sensing researches, to be used as educational material in grammar and high schools.

The specific objectives were:

- To adapt the scientific language used in remote sensing researches to the school teachers and students language, in order to use their as information to develop educational material;
- To disseminate the use of remote sensing data as educational material in grammar and high school, mainly in geography and science areas;
- To put available, widely and a low cost, educational material for remote sensing teaching for natural resources;
- To bring to schoolteachers and students notice about important ecosystems in South America and Antarctic.

## 2.2-Goals:

- To have this Atlas as part of school educational material collection, in order to be widely used in classroom;
- To raise teachers and students awareness about the utility of remote sensing data for the environmental preservation;
- To improve the student's knowledge about remarkable ecosystems in the continent where they live.

## 3. METHODOLY AND MATERIAL

### 3.1-Methodology:

This project was totally develop trough Internet, the projects participants never met in order to develop the Atlas; everything was discussed and developed by internet, even the exchange of satellite data.

To develop the Atlas the following steps were done:

- Contact and invitation to remote sensing professionals and institutions from South American to take part in the Educa SeRe II Project;
- Ecosystems selection-each country has to choose one or two remarkable and well-known ecosystems for the Atlas Project. One of the rule to select the ecosystems was to have already been developed a remote sensing research in this ecosystems;
- Data collecting like images, maps, photos about the ecosystem selected in each country;
- Satellite images definition-this step was concerning to select satellite images, from different satellite sensor systems to be used in the

Atlas, according to the research developed in the ecosystems;

- Definition of the Atlas rules- all members of Atlas executive team have to follow these rules (such as font, size, format an shape of the images, photos, maps, etc) in order to have a homogeneous material
- Development of the Atlas topics, in each country according the rules defined;
- Each country has sent the documents about their one ecosystems for the Project coordination, through FTP or internet;
- Revision and integration of Atlas documents;
- CD ROM development.

### 3.2-Materials:

There were used the around 250 images from LANDSAT 5/TM (temporal data); LANDSAT 7/ETM; SPOT (temporal data); CBERS (WFI, CCD e IRMS-temporal data); NOAA/AVHRR; Aqua and TERRA (MODIS and ASTER); SAC-C and GOES satellites. Besides were uses several maps on scale 1:100.000 e 1:250.000, field work and local photos, books, texts, and wheatear, climate, statistic, economic and history information.

Some satellites images were given by the institutions that were involved in the project, such as CONAE, INPE, ESA, CLIRSEN and IGEOMINAS, some images were gotten from Internet websites. These images are available in JPG format, they are free download for educational issues, if is the educational material is distributed with no cost.

## 4.ATLAS TOPICS

The Atlas was coordinated by the National Institute of Space Research-INPE in partnership with the Vale do Paraíba University-UNIVAP. Forty-four professionals from seventeen institutions from Argentina, Bolivia, Brasil, Chile, Colombia, Peru, Ecuador; French Guiana, Venezuela and Uruguay took part in this Atlas. These professionals are geographers, ecologists, biologist agronomist, cartographers, forest engineering, oceanographers, meteorologist, geologists and from computer area (Figure 1).

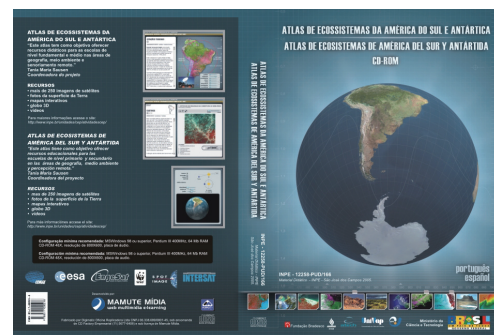


Figure 1. Atlas cover

The Atlas is in Portuguese and Spanish version. There are 147 texts about the following topics:

- General information about the Atlas and the CD ROM (Figure 2);
- General information about the EDUCA SeRe Program-objectives, goals and educational materials;
- General information about the South American countries and Antarctica-history, language, economy, rivers, relief, vegetation, fauna, traditions;
- Fundamentals of remote sensing-espectro-eletromagnetic, radiation, spectral behavior;
- Satellites programs (LANDSAT, CBERS, SPOT, TERRA, AQUA, NOAA, ERS,etc);
- Satellite track stations in South America-Cuiabá-Brasil, Cotopaxi-Ecuador and Falda del Carmen-Argentina
- Fundamentals about ecosystems;
- Biomass in South America;
- Climate of South America;
- Antarctica-History, Climate, Environment, Fauna;
- Ecosystems:
  - Llancanelo lagoon-Argentina;
  - River Plate estuarine and Parana river delta-Argentina;
  - Peninsula Valdes-Argentina;
  - Uyuni Salar-Bolivia;
  - Titicaca lake-Bolivia;
  - Alto Valley-Bolivia;
  - Caatinga-Brasil;
  - Pantanal-Brasil;
  - Malvinas and Brasil Ocean Streams-Brasil/Uruguay;
  - Lençóis Maranhenses-Brasil (Figure 3);
  - Serra Interandina-Ecuador;
  - Galápagos-Ecuador;
  - Vilcabamba Valley-Peru;
  - Atacama Desert-Chile;
  - Chiloe Archipelago-Chile;
  - Maracaibo lake-Venezuela;
  - Bañados del Este-Uruguay;
  - Colombian vulcan's
  - Ecoregions;
  - Deforested areas in Amazonia-Brasil;
  - Atlantic forest-Brasil;
- Links to homepage and websites about remote sensing, satellite images and educational materials
- Globe 3D



Figure 2. General Information about South America-Terrain map



Figure 3. Lençóis Maranhenses Ecosystem

**THE ATLAS DISSEMINATION ACTIVITIES:**

In November 7<sup>th</sup> the Atlas was officially presented to the remote sensing professionals and educators in South America, during a ceremony in the National Institute for Space Research-INPE, São José dos Campos, São Paulo State, Brasil (Figure 4).



Figure 4. Atlas presentation in INPE main Auditorium in November 7<sup>th</sup>, 2005

In November 11<sup>th</sup> the Atlas was presented to remote sensing professionals and educators from Mercosul

during the 5<sup>th</sup> Conference on Remote Sensing Education in Mercosul, that was held in the CONAE Space Center “Teófilo Tabanera”, in Falda del Carmen, Cordoba Province, Argentina (Figure 5).



Figure 5. Atlas presentation in the 5<sup>th</sup> Conference on Remote Sensing Education in Mercosul

Since that the Atlas has been distributed, free, to grammar and a high school in South America, this dissemination is in partnership with INPE and the Education Committee of the Latin American Remote Sensing Society-SELPER and SELPER National Chapters.

In order to get an Atlas the schools have to fill a registration form, with some information about the institution, such as:

- Identification and full address;
- Information about the school status-public (county, state or national) or private
- Level: grammar or high school
- Which topics the school will use the Atlas-geography, science, environment, history, chemistry, physics, biology, others;

The school has to nominate a teacher focal point to be in touch with the Atlas project coordination. The project coordination will contact these focal points after latter in order to know additional information about the school and the way they are using the Atlas in classroom and to get their critics and suggestion about this educational material.

The BRADESCO, ATECH and VITAE Foundations have supported the Atlas. The BRADESCO Foundation supports 40 grammar and high schools in Brasil. The teachers and schools from this foundation will be the test areas for the Atlas. A first test was accomplished in 2005, as part of the Pilot Project “Validation of the Use of Digital Ecosystems Atlas of South America and Antarctic in High School”, developed by Fernanda Viana Barbosa, geographer, during the 18<sup>th</sup> International Course on Remote Sensing and SIG, specialization level, held in partnership with INPE, Campus Brasil/ Regional Center for Space Science and Technology Education for Latin America and the Caribbean-CRECTEALC, the National Council for -

CNPq and United Nations University-UNU. The Atlas was tested in two BRADESCO Foundation high schools and the results of this test were very successful.

During the test the teachers have accomplished some practical exercise, in classroom using the Atlas, and at the end the test two questions were answered students and teachers:

What you considered is the most interesting in the Atlas?

“... The wonderful, easy, fast and detailed approach about geographic topics...” (Marcel Vieira Pereira, E. E. M. E. P. J. A. Embaixador Assis Chateaubriand-Fundação Bradesco).

“... it is a program quite advanced program that makes easy the learning among other Atlas...” (César Carobrez, E. E. M. E. P. J. A. Embaixador Assis Chateaubriand-Fundação Bradesco).

“... I liked because it is easy to get in, it is easy to use. I liked the videos about the topics and the illustration in the text, with photos...” (Leandro Cerqueira Lemos, E. E. M. E. P. J. A. Embaixador Assis Chateaubriand-Fundação Bradesco).

“... The satellites despite of the complexity, was the topic I liked most....” (Felipe Otaviano Gonçalves, E. E. M. E. P. J. A. Embaixador Assis Chateaubriand-Fundação Bradesco).

“... The Atlas versatility...” (Thalita Tavares de Freitas, E. E. M. E. P. J. A. Jardim Conceição-Fundação Bradesco).

“... Hole the content is more then interesting...” (Laís de Souza Secundino, E. E. M. E. P. J. A. Jardim Conceição-Fundação Bradesco).

“... The images their applications, are approached in a very easy way...” (Geisa Priscila de L. Santos, E. E. M. E. P. J. A. Jardim Conceição-Fundação Bradesco).

“...The Atlas content visualization, and the interactive way was approached...” (Tiago de Lima Silva, E. E. M. E. P. J. A. Jardim Conceição-Fundação Bradesco).

“... The way the hole topics were approached...” (Nadya Nathaly Vicente da Silva, E. E. M. E. P. J. A. Jardim Conceição-Fundação Bradesco).

Your suggestions to improve the Atlas:

“... The Atlas is educational and different from other Atlas, because have satellite images.....” (Josiane Barbosa Aliste, E. E. M. E. P. J. A. Embaixador Assis Chateaubriand-Fundação Bradesco).

“... *The Atlas is excellent, any change would be only to have additional topics...*” (Watusi F. dos Santos, E. E. M. E. P. J. A. Embaixador Assis Chateaubriand-Fundação Bradesco).

“... *No suggestion, because the Atlas fit for the students interests...*” (Priscila Soares Brandão, E. E. M. E. P. J. A. Jardim Conceição-Fundação Bradesco).

Up to now 342 educational institutions in Brasil, 30 in Argentina, 50 in Bolivia, 3 in Colombia and 1 in Uruguay have registered to get the Atlas. Concerning to the Brazilian institutions:

- 47% are from São Paulo State (the state where INPE and UNIVAP University are located);
- 10,2% are from Minas Gerais State (the reason of this amount is because a professor from University of Uberlândia; located in Uberlândia city-Mina Gerais State, has attended the XI Brazilian Remote Sensing Symposium where the Atlas was presented in an education technical session. This professor disseminated the Atlas to all grammar and high school in Uberlândia city)
- 7,60% are from Brasília, the Federal District (The Brazilian Space Agency-AEB is located in Brasília, and they have disseminated the Atlas through the AEB School Program);
- 6,7% are from Rio Grande do Sul State (the Atlas General Coordinator is developing educational activities in remote sensing area in this state);
- 4,67% are from Goiás state (the Atlas dissemination was through the XI Brazilian Remote Sensing Symposium that was held in April 2005 in Goiânia city);
- 3,80 are from Pernambuco state (a local newspaper published an article about the Atlas);

From the 342 schools:

- 48% are publics
- 36% are privates
- 17% did not answer the question;
- 35% are grammar schools
- 58% are high schools
- 5% are graduation courses

These educational institutions intend to use the Atlas as educational material in the following subjects:

- 73% in geography;
- 54% in science;
- 42% in environmental issues;
- 34% in history;
- 22% in physics;
- 17% in chemistry;
- 13% has answered others (cartography, topography, Spanish, tourism, mathematics, remote sensing, astronomy, climatology, Portuguese, geology, etc)
- 5% in biology;

Concerning to the foreign educational institutions:

- 32% are publics schools;
- 5,8% are county schools;
- 26,4% are state schools;
- 3% are national schools;
- 23,5% área grammar schools;
- 79,4% área high schools;
- 6% are universities;

These educational institutions intend to use the Atlas, as educational material in the following topics:

- 76,4% in geography,
- 44,1% in sciences;
- 23,5% in history;
- 12% in chemistry;
- 12% in physics;
- 38,2% in environment;
- 18% in others (technology, cartography, tourism)

The BRADESCO Foundation has disseminate this Atlas to all BRADESCO associated schools, that are located in 20 Brazilian states, and it is helping in the dissemination to other educational institutions in Osasco city, São Paulo State, where the Foundation is located.

At this moment the Atlas has been disseminating in Argentina, Bolivia, Chile, Colombia, Ecuador, French Guyana, Paraguay, Peru and Venezuela with the help of Atlas executive team members, SELPER Educational Committee members and the SELPER National Chapters. In each country it has been holding a one-day seminar to disseminate the Atlas and to teach the schoolteachers how to use it in classroom.

The National Commission of Space Activities-CONAE from Argentina is helping the Atlas dissemination in this country, through its educational program. In November 2005 the Atlas General Coordinator was invited by UNESCO and the Minister of Education from Colombia to take part in Space Education Workshops, designed for grammar and high schools teachers and students, in Barranquilla, Cali, Medellín and Bogotá cities, where the Atlas was presented. As a consequence the Minister of Education is helping in the Atlas dissemination in Colombia.

In Cochabamba, Bolivia, one member of the Atlas executive team is organizing one-day seminar for 50 schools in partnership with Lions Club. In Santiago city, Chile, another member is organizing, in partnership with Chilean Space Agency a one-day seminar for 40 schools. In Lima city, Peru, the SELPER National Chapter is organizing a seminar 60 schools. In Quito city, Ecuador, the SELPER Chapter in partnership with education authorities Peru, is organizing a seminar for 60 schools. In Montevideo city, to members of Atlas executive team, together with SELPER National Chapter is organizing a seminar to 70 schools.



INPE, together with local's authorities and universities is organizing similar seminars in many Brazilian states with emphasis in the cities where INPE regional centers are located Cuiabá-Central West region, Natal-Northeast region, Santa Maria-South region).

The VITAE Foundation has supported the CD ROM development and the first 2000 copies. The Brazilian Remote Sensing Symposium is supporting additional 1000 copies, and the Project coordinator has applied in the BOTICARIO Foundation in order to get the support for more 3,000 copies. The goal is to have 10,000 copies to distribute free to South American schools. In the beginning the Atlas was planned to be distributed only for grammar and high schools, but many coordinators and professors from graduation courses from geography, science and biology areas, responsible for the graduation of schoolteachers have ask for the Atlas. So, the project coordination has decided to give a free copy to these graduations courses as well.