THE DISSEMINATION OF CBERS IMAGES TO UNIVERSITIES IN BRAZIL: PROCEDURES AND RESULTS.

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ABSTRACT:

A Project facing an easier dissemination of China Brazil Earth Resources Satellite-CBERS images to academic teams is being experienced in Brazil. Starting in early 2001 almost 100 users were granted with 389 set of products which mean 1270 individual scenes. Most of the products (254) are CCD frames but a good number of IRMSS (46) and WFI (89) images were also distributed. The teams were selected according to their long term commitment to Remote Sensing and their closer cooperation with INPE through the years. The idea was to include CBERS data in the current scientific activities rather than to create new projects in the academy. The CBERS images were transferred in the CD-GEOTIFF format and a copy of SPRING geo-processing tool was also delivered upon request. Technical results were presented to the general media and to national and regional symposia. The scientific results are driven to be submitted as articles and papers for the next Brazilian Symposium on Remote Sensing-SBSR. The SBSR 11th edition is scheduled for April 2003 in the city of Belo Horizonte. CBERS data are proving to be friendly and costly alternatives to users in Brazil and in the developing partners.

1. INTRODUCTION

The CBERS-1 Satellite was launched in October 14th, 1999 and the first products were available in early February of 2000. By August the data were passed through deeper evaluations and analysis about their quality/content of information. The CBERS images were not fully adopted by the users because of some specific malfunctions of the sensor subsystems. The Wide Field Imager-WFI, the Brazilian sensor in the satellite, entered in the hold mode just in the first week of May, 2000. The Charge Coupled Device-CCD Camera showed hard noises in the blue and the panchromatic bands that still today prevent applications in a true quantitative radiometric fashion although scientific approaches have been achieved by the use of the other three bands. The Infrared Multispectral Scanner-IRMSS lost two of eight detectors from one of the two bands in the short wave infrared range. Despite of these problems it cannot be denied that the Brazilian LANDSAT culture aged 26 years by 1999 was another challenge to overcome in order to insert the CBERS images in the scientific and economic scenery in Brazil. The purpose then was to start with a dissemination project focusing the more traditional and long-term committed users of satellite Remote Sensing in Brazil. Because of the incidental problems referred above it would be easier to transfer and to evaluate the CBERS images with grown experienced people instead of naïve users.

2. CBERS DISSEMINATION PROJECT

A selected list of users was then pursued and e-invitations were forwarded to scientific teams in universities and agencies that close cooperated with INPE through the years. The aim was rather to insert CBERS data in the current research activities than to establish new projects (and new funds) within the partner scientific framework. According to the profile of the application or the scientific purpose of the teams a copy of INPE in-door geo-processing tool named SPRING was also forwarded with the set of images. An informal agreement asked for the presentation of the results in the Brazilian Symposium of Remote Sensing.

The first e-invitations left the User Service Office-ATUS of Sao Jose dos Campos in early March of 2001. The call for partners and lectures about the potential and the going limitations of the data was presented in the Brazilian Congress on Cartography and the SELPER-Latin American Remote Sensing Symposium.

The figures showed that by October, 90 customers including internal researches of INPE were applying CBERS data to different kinds of issues and 389 set of images were distributed. The space distribution of these images is shown in figure 1. The set of images included 254 CCDs, 89 WFIs and 46 IRMSSs what meant 1270 individual frames. By that time the numbers of CBERS were equivalent to 50% of the distribution figures for LANDSAT.

3. TECHNICAL RESULTS

To expand the use of CBERS was part of the project. The issue was also to show the technical skills of the data when applied to Natural Resources or the Environment as usually happens with the traditional Satellite Remote Sensing systems. To pursue these specific purposes some topics were assigned to selected specialists in order to have vigorous results to be addressed to decision makers and to the general media. These topics were: i)

Deforestation Monitoring; ii) Land use planning, and; iii) Image Maps.

The procedures to monitor the deforestation in the Amazonia have been recently upgraded by the use of digital analysis and matrix edition where the classical photo interpretation is made by the analyst directly in the screen. The new methodology is allowing very new standards in computer-aided analysis where the levels of correct classification can reach 95 to 98%. LANDSAT TM-5 images have been usually used but IRMSS-CBERS data showed that they can reach equivalent results following the same procedures (Shimabokuro et al., 2001). According to these authors the numbers of deforestation extracted from Thematic Mapper or IR Scanner data in the complex sites of Rondonia are actually the same. The figures of deforestation arose from these images are shown in the table 1.

Area (km^2)	IRMSS CBERS	TM LANDSAT5	DIFFERENCE
Deforestation	1721	1771	-2.8%
Forest Coverage	9557	9666	-0.9%
Savanna	638	630	1.3%
Lakes / Rivers	860	792	8.6%

Table 1: Deforestation near Porto Velho – RO: Comparing CBERS and LANDSAT5.

Land use planning is another branch where CBERS images were applied with significant results as they can provide friendly and costly information to farmers and to the agencies that monitor the environment mainly in the Mato Grosso State. The State Environmental Agency uses satellite images to register new farming and this information is referred to a data bank (Miller, 2001). Every single farm needs also to be geo-referred to the data bank by the settlers and they are using CBERS-CCD high resolution images to show the areas where they intend to expand the land-use in the farms.(Nunes, 2001). These procedures are helping to organize the territory with clear and precise cartographic boundaries. Further benefits are coming from good crop forecasting data, low environmental impacts and faster decreasing in the deforestation figures.

Image maps at different scales have also succeeded and were issued from regional to local levels. The Rio de Janeiro Image Chart printed in the millionth scale gave to decision makers and to planners a date portrait of the Southeast Brazilian Region. The Chart was developed by the use of Wide Field Imager data merged with states and counties boundaries (Martini and Aulicino, 2002). For the first time the macro axis between Rio de Janeiro and Sao Paulo was depicted in a single frame with reasonable ground resolution allowing studies both for urban sprawling and regional planning. Urban sprawling is also approached through the use of high resolution image maps provided by the CCD Camera data to the scale of 50,000. New charts from Sao Jose dos Campos and their vicinities are helping to map change detections in the bounds of the city-rivers and their flood plains due to mining and sprawling.

The technical results are just part of the achievements of the CBERS Project. The scientific results are going to be presented in the coming Brazilian Remote Symposium that is scheduled for April, 2003 in the city of Belo Horizonte. Some of the scientific results are the stuff of monographs for master level degrees.

4. FIRST CONCLUSIONS

The procedures applied to the CBERS Project were conventional but very practical in the sense that they used paved ways to reach the users. The Project actually used the ways paved by LANDSAT in order to reach new users for CBERS because of the long-term LANDSAT Brazilian culture that started in May 1973 and is still the main source of satellite data for land applications. Traditional LANDSAT users were firstly selected to join the CBERS Project.

Another important action was to deliver CBERS data asking for no comparisons with LANDSAT. The new images should be used just as additional information in the current activities.

Through these terms the users were free to analyze CBERS data by their own skills, software and hardware. Through this way the final figures of distribution for 2001 show that CBERS reached 50% of the LANDSAT demands.

CBERS-1 images are not by now as friendly as LANDSAT-7 ones but they are being adopted by the Brazilian users as additional sources of information. This Project shows that CBERS data are growing to be the main source of data within the timeframe of the second satellite.

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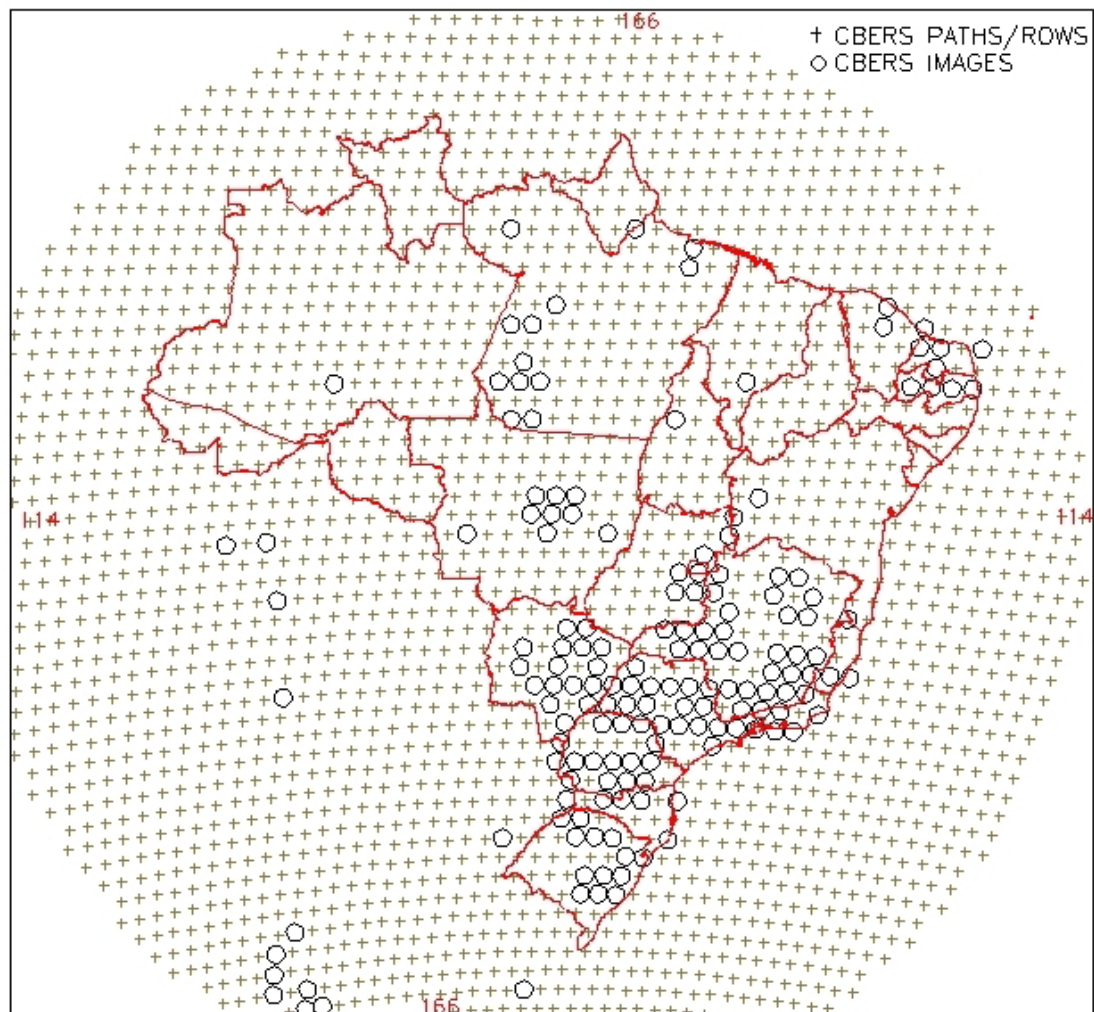
Figure 1: Space Distribution of Images for the CBERS Project.