Prevention of Illegal Deforestation in Amazon Forest using the ALOS/PALSAR

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Abstract:

A JICA project was conducted using Japanese ALOS satellite data to decrease Brazilian Amazon deforestation. The project continued from 2009 to 2011 operationally before the abrupt termination of ALOS. Through the project, deforestation monitoring using SAR data proved to be very effective even in the rainy season in the Amazon.

1. Introduction

It is a well known fact monitored by satellite observations that Amazon forest is decreasing for a long time due to the human activities in the area. The Brazilian Space Research Institute (INPE) [1] started monitoring the area from 2004, using optical space borne sensors and provided the results to the Brazilian environmental agency (IBAMA)[2] to enforce law on illegal deforestations. The system has a problem that, in the rainy season, the system almost looses the power due to the cloud cover in the region. In response to the request from IBAMA and Federal Police Department (DPF) of Brazil to solve the problem, we had started a technology transfer project funded by JICA to realize a cloud free deforestation monitoring system using Japanese ALOS/PALSAR data and establish a good system operation to detect illegal deforestation in the region.

2. Deforestation monitoring by L-band SAR data

L-band SAR sensors which is adopted on ALOS or ALOS2 satellite is useful to monitor forest conditions. Especially, the wavelength, which is longer than that of C or X band SAR, well discriminate deforestation in a forest. Deforestation by tree cut causes dark response among the forest area which usually shows a gray tone. Along with the fact, SAR provides us with cloud free images even in the rainy season, which is an advantage over the optical sensor system. We had utilized these characteristics for deforestation detection happens in Amazon forest. With the contiguous Scan SAR data delivery to IBAMA from JAXA, refreshment of new data was provided almost every 46 days which is satellite recursion day cycle.

3. Developed system

In the project, two data server to handle satellite images and deforestation information was developed. One data server was for IBAMA to enhance existing one by adding new hardware and software. Another data server was newly developed for DPF. ScanSAR mode data of ALOS was delivered contiguously to realize refreshment of ScanSAR images every 46 days. Image preprocessing for visual interpretation were conducted in IBAMA and results were shared among IBAMA and DPF staff either in central office or local offices in Amazon area.

4. Operation Results

The system started its normal operation from November 2009 and detected many deforestation signals until April of 2011 when ALOS stopped its operation due to a fault of satellite power system. Fig 1. shows detected deforestation points as red mark on the back ground of multi temporal SAR image composite.
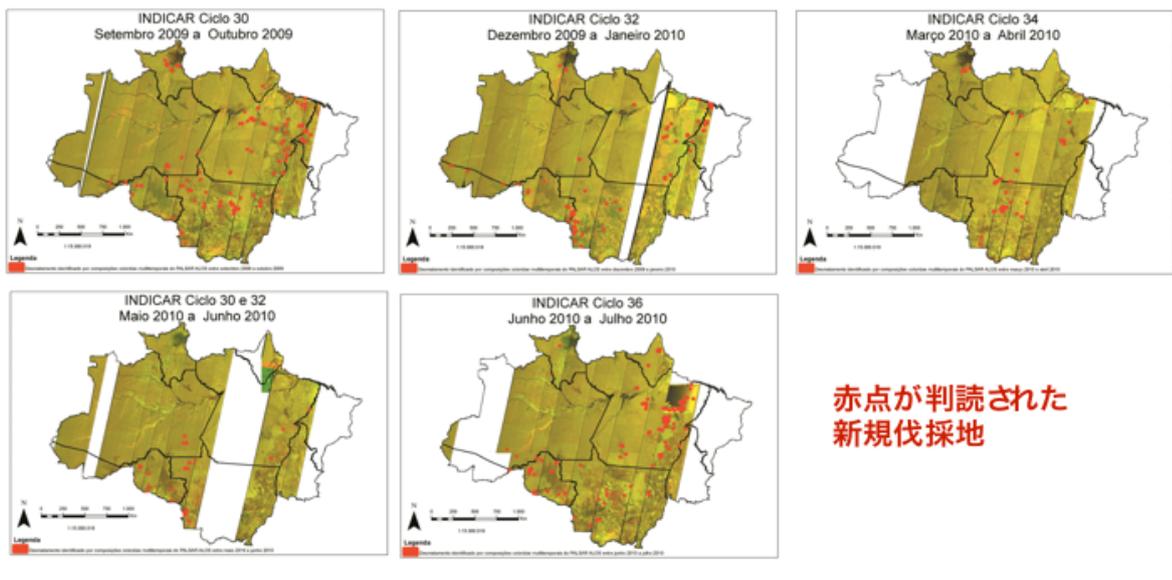
Fig. 1. A time series of new deforestation detections by ALOS PALSAR data.

As the results of operation in 2010, total 1007 new deforestation were detected, among which 140 cases were illegal deforestation. According to the annual statistics of deforestation which were issued by INPE, deforestation has been decreasing significantly from 2009[3]. We believe this is one of the deterrent powers of the system owing to the advertisement of the system by Brazilian staff through mass media.

5. Remarks

We have proved the effectiveness of deforestation detection by ALOS/PALSAR. It must be emphasized that the high technology for image quality maintenance provided by JAXA is important factor to realize the results. The project will survive after the launch of ALOS2, which is scheduled late this year.

References
1）http://www.obt.inpe.br/prodes/index.php

2）http://www.ibama.gov.br/projetos/desmatamento-da-amazonia

3）http://www.obt.inpe.br/prodes/prodes_1988_2011.htm

Profile of Makoto Ono:

Received the B.Eng. degrees in 1963 from Electrical Engineering, Tokyo Institute of Technology, Tokyo, Japan. From 1963 to 1993, he was with Mitsubishi Electric Corporation, Japan. He had participated in various space programs including JERS-1, ADEOS and EOS sensor development. In 1993 he had promoted to a Chief Engineer of the company. From 1994 he has moved to Remote Sensing Technology Center of Japan where he has conducted satellite image related software development and education using the software. Now he is an Advisory Scientist, Data Analysis and application Division.