

# Vegetation Dynamics in the Southern Amazon Basin, Brazil, by SPOT4 Imagery

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**Abstract.** This paper is about the potential use of SPOT4/VEGETATION imagery for estimating the extent of burned areas, for static and dynamic vegetation and land use cartography in the Southern Amazon Basin.

**Keywords:** Southern Amazon Basin, Mato Grosso, vegetation burnings, burned areas, vegetation cartography, land use cartography, vegetation changes, vegetation indexes, rain forest, savanna, SPOT4.

This work will provide a better understanding of the vegetation dynamics in the Southern Amazon Basin. The proposal is the result of a multi-institutional agreement between ECOFORCE and NMA/EMBRAPA, with the support of INPE and PRIFAS-CIRAD. The investigation was therefore planned to value, in a complementary and synergetic way, the existing facilities, human and financial resources of the participant institutions. The experimental objectives of this proposal are two:

- Potential use of SPOT4/VEGETATION imagery for estimating the extent of burned areas in the Southern Amazon Basin, Brazil.
- Potential use of SPOT4/VEGETATION imagery for static and dynamic vegetation and land use cartography in the Southern Amazon Basin, Brazil.

The VEGETATION Programme is developed jointly by France, the European Commission, Belgium, Italy and Sweden. The satellite component of the programme will be launched in October 97 onboard SPOT4 and will deliver measurements which were specifically tailored to monitor land surfaces' parameters with a frequency of about once a day on a global basis and a medium spatial resolution of one kilometre.

The overall objectives of the VEGETATION system are to provide accurate measurements of basic characteristics of vegetation canopies on an operational basis. The SPOT4/VEGETATION's mission objectives are surface parameters mapping; agricultural, pastoral and forest production and terrestrial biosphere monitoring and modelisation.

The VEGETATION system, consisting of a satellite-borne sensor and of its associated ground segment, will provide long term basic measurements adapted to biosphere studies. Opportunities for scale integration are provided by the combination with the main SPOT instruments which allow high spatial resolution for detailed modelling activities or multilevel sampling procedures. Availability of data to different types of users is facilitated through the centralisation of reception and archiving global data sets. The launch date and duration of the system (5 years of estimated life time for a first model and continuation on future SPOT satellites) are adapted to a systematic and extensive long term monitoring of the biosphere.

Clearly this system will benefit from detailed studies based on other systems that are dedicated to specific studies of the characteristics of remote sensing measurements or to their relationships with surface or processes' parameters.

There are three mission objectives:

1. surface parameters mapping;
2. agricultural, pastoral and forest production;
3. terrestrial biosphere monitoring and modelisation.

The vegetation data sets have been defined by the International Users' Committee. They are adapted to the particular missions and coherent as much as possible with the needs of existing projects, VEGETATION (1994).

The main study site is located in the State of Mato Grosso and has an area of about 250,000 sq. km. It is a climatic transition area between the

savanna and the rain forest. The use of fire in grass and shrub lands and the practice of deforestation followed by burnings to open new agricultural fields and pastures are very common. The continuous changes in the land use and the large size of farms are favorable in principle to the classification of the SPOT4/VEGETATION data. The even larger fields with pasture, soybeans, sugarcane, maize and rice will provide an opportunity to compare the vegetation index with other environmental parameters. Since 1991, the ECOFORCE and NMA's research teams have been working with daily data from NOAA/AVHRR to monitor vegetation burnings, during the dry seasons. Since 1990, with INPE's collaboration, seasonal vegetation changes were analyzed, using NOAA/AVHRR (NDVI) data. Vegetation cartography, at 1:250,000 scale, was developed based on LANDSAT/TM images, with the PRIFAS-CIRAD's collaboration and the European Commission's financial support. These data, combined with VEGETATION system, could provide new multitemporal and multispectral analysis related to the dynamics of the surface processes. The main expected outcomes of this investigation proposal are:

- The multispectral measurements, to obtain a cartography of the detected burnings sites (NOAA/AVHRR) and the burned areas

(SPOT4/VEGETATION), that will improve the "Multi-Institutional Integration System for Monitoring the Burnings in Brazil";

- The simultaneous and/or asynchronous integration of processes at different scales: low resolution, high resolution orbital data, airborne and ground acquisitions will provide a better and new understanding of the vegetation spatial and temporal variability, in the Southern Amazon Basin;
- The multitemporal analysis of the vegetation indexes related to the dynamics of the surface processes that influence the vegetation development (water availability, soil type, topographic situation, land use and land management), in a transition area between the rain forest and the savanna woodlands, Miranda et al. (1995).

#### **Referências**

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