Temporal patterns of deforestation in Mato Grosso State

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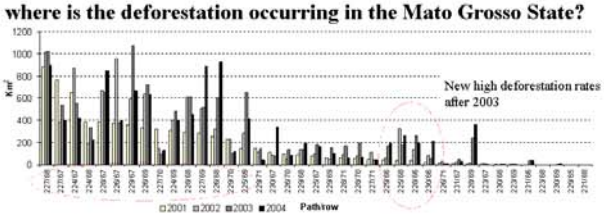
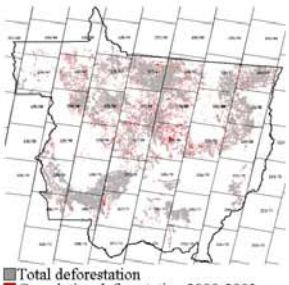
Abstract. The MODIS sensors permit a rapid analysis of deforestation in the Brazilian Amazon, and these data have been used since August 2003 by INPE's DETER project. Based on high temporal frequency of data acquisition, it is now possible to explore not only the shape and the size of new deforestation areas, but also the temporal pattern of its occurrence. This work reports the preliminary results of the evaluation of monthly DETER data for Mato Grosso State. This region was selected for the study site due to its high deforestation rates. With one year of DETER data, we evaluate when the deforestation processes are more rapid, what should be the priorities for the INPE PRODES program based on these new patterns for this region and the integrity of the Conservation Units System (CUS) and indigenous lands (ILs) over the forest region. Our preliminary results showed a presence of deforestation activities during the whole period studied, even in the wet season. The most active frontiers of new deforestation areas were in the axis of the main road (Cuiabá-Santarém) and along the perimeter of the Xingú Indigenous Reserve. The CUS and ILs showed to be an important barrier for the deforestation process, even with all the pressure of land cover change over its outside limits.

Methods

Based on previous annual deforestation data (PRODES project), where is the deforestation occurring in the Mato Grosso State?

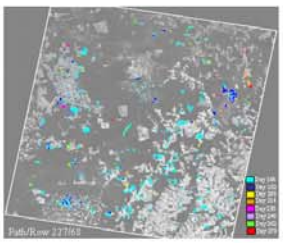


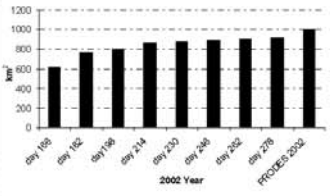


Total deforestation
Cumulative deforestation 2000-2003 (PRODES data).

* 48 TM/ETM+ scenes are used to estimate the deforested areas in Mato Grosso State;
* From 2001 to 2004: was possible to analyse 39 sequential scenes due to clouds cover;
*29 scenes: most representative of the total amount of deforestation (red circle in the graphic x-axis);
* This 29 scenes: 18 had less than 200 km² deforested each year, while 2 had more than 400 km² deforested each year;
*2003/4: New scenes increasing deforestation rates further north.

Using a temporal series of ETM+ scenes for the 2002 dry season, we observed that in June, more than 60% of the total deforestation had already occurred:

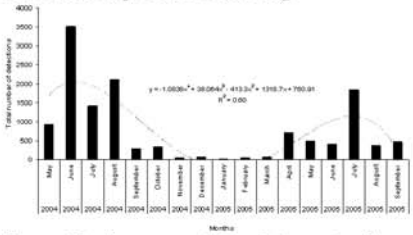




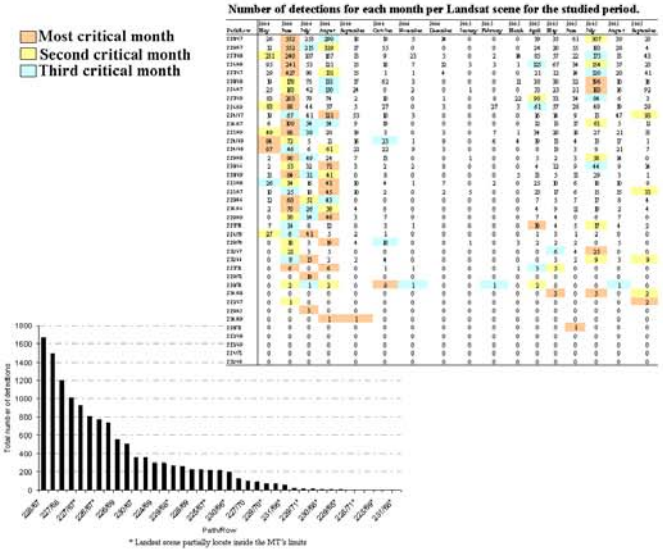
Analysing the DETER data from May 2004 to September 2005 can we establish when the deforestation is occurring? Which are the most critical scenes? Are the Conservation Units System and indigenous lands functioning as a barrier to the deforestation?

Results

When is the deforestation process occurring?



Which are the critical scenes, in relation to the number of new deforestation detections?



Are the Conservation Units System and indigenous lands functioning as a barrier to the deforestation?

Cumulative deforestation detections for the studied period.

Deter data

Limits of Conservation Units and Indian Territories

Conclusions

In spite of the deforestation in Mato Grosso happens all over the year, the dry season is the critical period. The seasonal dynamic could explains 60% of the process variability of the period studied.

The Landsat scenes with higher number of deforestation detections with the DETER data are mostly like the scenes that presented higher deforestation rates in the PRODES data for 2000 to 2004. However, it was possible to observe new scenes with high number of deforestation detections in the northwest of the State. It suggests a new deforestation axis.

In the Mato Grosso State, the Conservation Units and Indian Territories located in the forest biome are functioning as a barrier to the deforestation process.

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