



1st International Electronic Conference on Remote Sensing

22 June – 5 July 2015, online

chaired by Dr. Ioannis Gitas

sponsored by



This presentation has been retracted. A Retraction notice was published on 20 January 2016, at Proceedings of the 1st International Electronic Conference on Remote Sensing, 22 June–5 July 2015; Sciforum Electronic Conference Series, Vol. 1, 2016 , d017; doi:10.3390/ecrs-1-d017

Mapping of Land Use and Land Cover on Brazil

Rodrigo de Campos Macedo¹

João Roberto dos Santos²

Fernando Peres Dias¹

Maurício Zacharias Moreira¹

Luiz Roberto de Campos Jacintho¹

Eloisa Domingues¹

¹Brazilian Institute of Geography and Statistics

²National Institute of Space Research



Introduction

Based on an international methodological framework that identifies the changes in terrestrial ecosystems, this proposal is intended to subsidize the calculations of physical accounts of changes in coverage and land use, which, in turn, will be used in studies aimed at valuation economic environmental changes. It can also be inserted in the attempt of the United Nations Food and Agriculture Organization (FAO) to establish a worldwide system of land cover classification in support of environmental reporting.

RETRACTED



Introduction

This work focuses on the monitoring of Land use and cover change (LUCC) of Brazil, at regular intervals, from the systematic land use and land cover mapping. In this context the following specific objectives were established:

- Land use and land cover mapping for the Brazilian territory, periodically, from the classification and interpretation of satellite images, supported by other surveys for the years 2000 and 2010;
- LUCC mapping for the Brazilian territory, periodically, from the difference between the land use and land cover maps.



Data

- Cartographic maps 1:250.000 (BC250-IBGE) – roads and rivers ;
- Agricultural Calendar – Images selection;
- Agricultural research conducted by IBGE, such as Systematic Survey of Agricultural Production, Municipal Agricultural Research, Municipal Livestock Research and Agricultural Census;
- Pluviometric data, from CPTec – Images selection;
- Deforestation polygons, from PRODES;
- Land use and land cover polygons, from TERRACLASS;
- MOD13A1 product, from the MODIS (Moderate Resolution Imaging Spectroradiometer) satellite TERRA, in the red, near-infrared and mid-infrared spectral regions; and NDVI (Normalized Difference Vegetation Index) – primary data;
- Images from the TM (Thematic Mapper) and ETM+ (Enhanced Thematic Mapper Plus) sensors (Landsat satellite series) - checks;
- Temporal Series - developed by the Remote Sensing Laboratory Applied to Agriculture and Forest (LARF-INPE), available at <https://www.dsr.inpe.br/laf/series>, using the vegetation index EVI (Enhanced Vegetation Index) – checks.

Pre-processing

The acquisition is carried out through the United States Geological Survey - USGS. In the selection of the dates of the images in order to avoid scenes with high percentage of clouds, are subject to the rainfall characteristics of each region and also the national agricultural calendar, aiming to know a priori the types of crops contained in selected images, facilitating the spectral identification of these extensive agricultural plots. The NDVI images were selected by the agricultural calendar and also the rainfall. Thus, we used three different dates of images of the same year, aiming to discriminate annual crops of other types of land cover . The MODIS images are available originally in *hdf* format and are converted to *tiff* format. It held the histogram enhancement (contrast adjustments) and some colorful compositions in order to facilitate the interpretation on screen.



Interpretation and image classification

The land use and land cover classes used were developed from the compatibility with the Land Use and Land Cover Classification System with the System of Environmental-Economic Accounting (SEEA) and the Land Cover Functional Unit (LCFU).

The images are segmented and undergo a unsupervised classification (ISOSEG). Then it made the association between the classes generated by this classification and the previously defined classes to work. This association is performed through image interpretation on screen, using various support data, such as other images (Landsat and Google Earth), agricultural calendars, agricultural data, time series (EVI) and other surveys.

Matrix editing and integration

The matrix editing is a non-automated process, performed in order to correct any imperfections generated by unsupervised classification and the association process. At this stage they are also used other information, such as thematic maps, surveys, medium and high spatial resolution images. In the next phase it is incorporated data from the Brazilian agricultural census, which are spatialized and converted into shape format. In rural census sectors is checked for representative areas of pasture deployed, taking into account the working range. They are also incorporated data generated by various other institutions, such as those specific to the Project "Monitoring of the Amazon rainforest - PRODES" and "TerraClass", referring to the regular annual survey of deforested areas in the Brazilian Amazon. The hydrographic mapping obtained in BC250 are incorporated. After editions and integrations, carried out a technical review, including identification of inconsistencies, especially at the edges and borders. In this review are eliminated polygons with area less than 10 *pixels* and realized geometric adjustments.

Validation

In order to verify the accuracy of classifications, were conducted field campaigns in representative areas. Because of the large capillary present in the IBGE, with over 550 agencies throughout Brazil, there is considerable representation of field coordinates, extensively covering the Brazilian territory.

The validation procedure consists of comparing the mapped class and the coordinated field, obtained with a description of the local landscape. It uses the *Kappa* index for this assessment.

RETRACTED



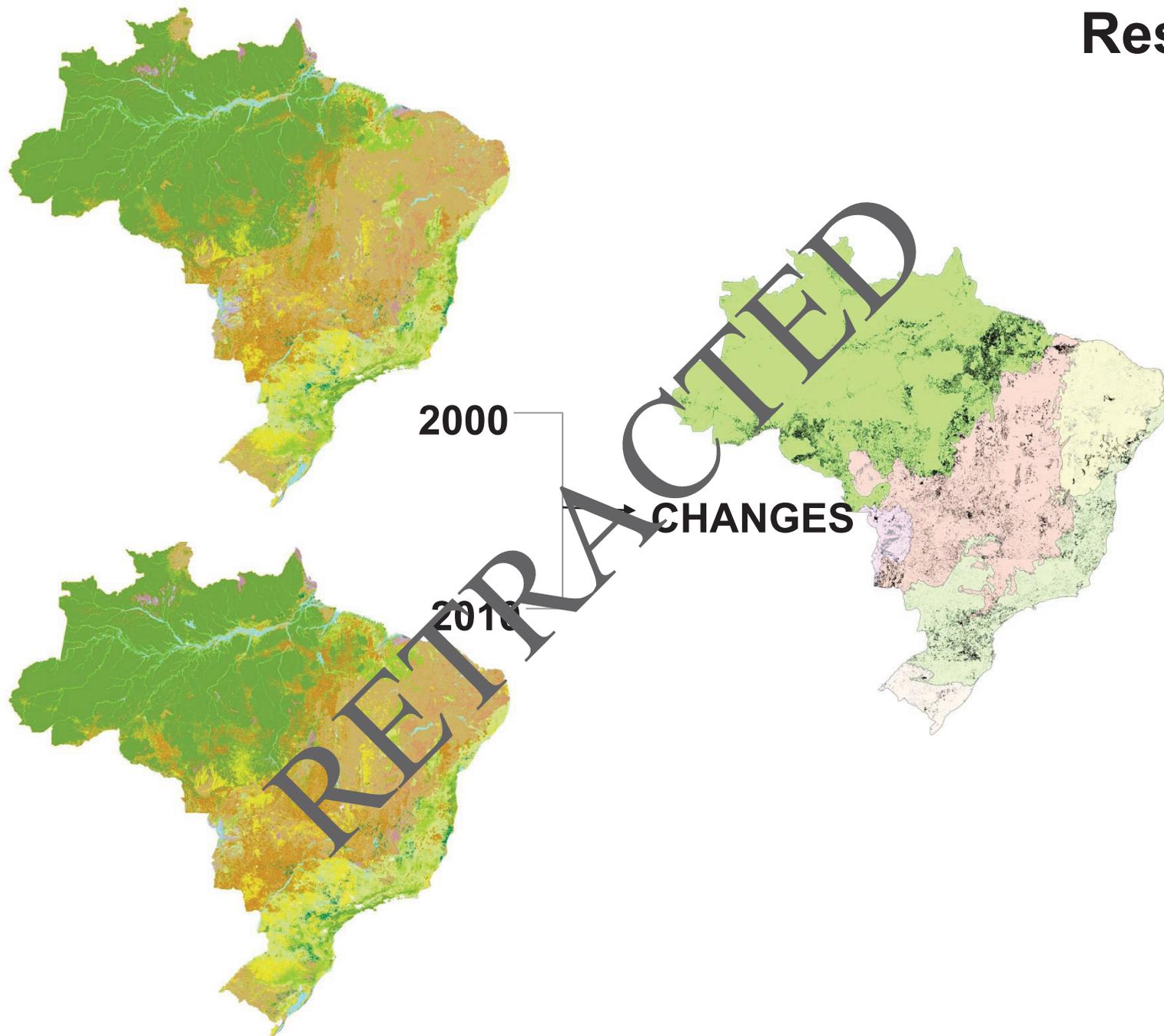
Map algebra

The LUCC maps are generated from the overlay and crosstab of thematic maps for the 2000-2010 periods. These crosses are performed in raster format, thus generating transition matrices.

RETRACTED

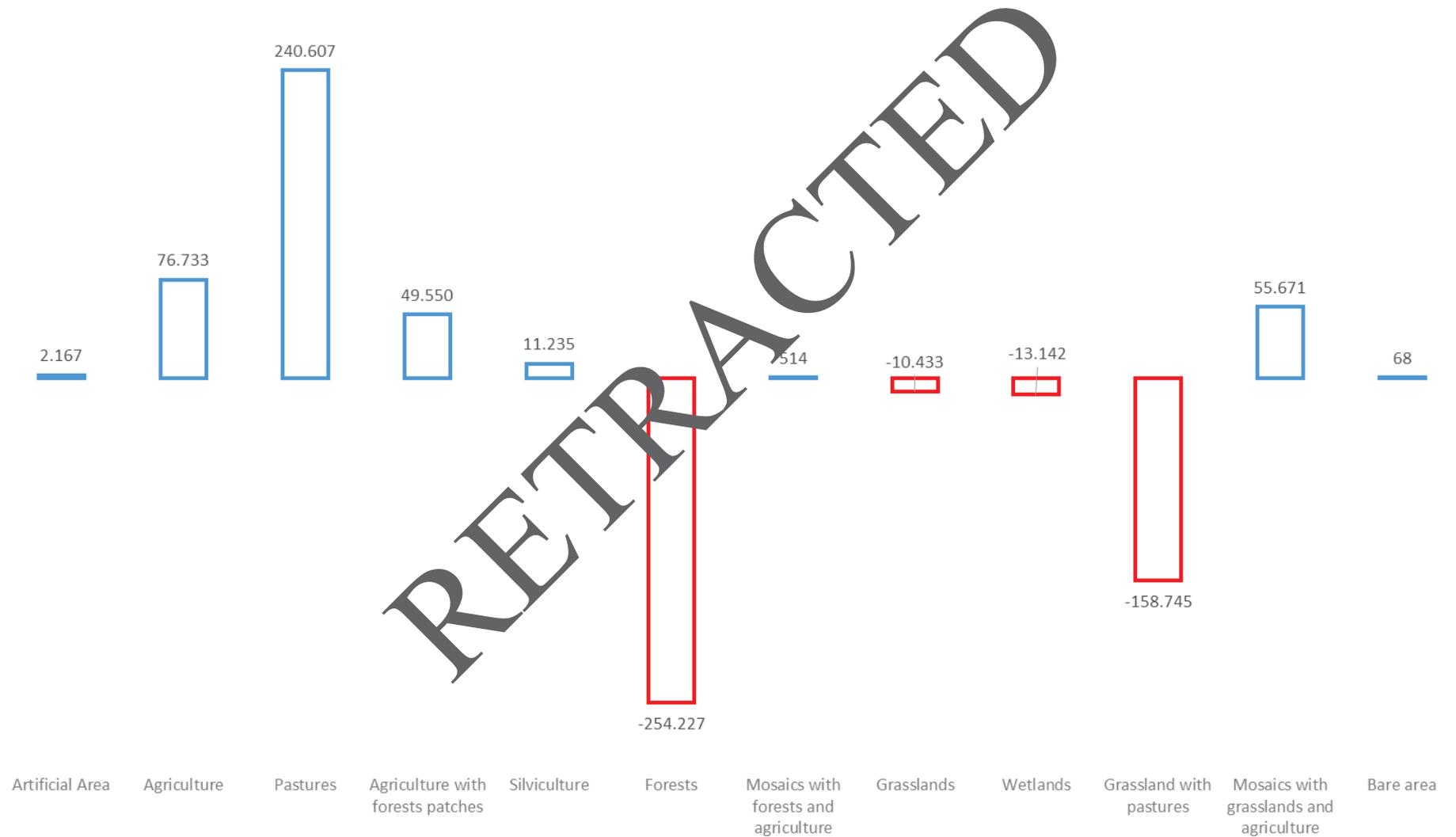


Results



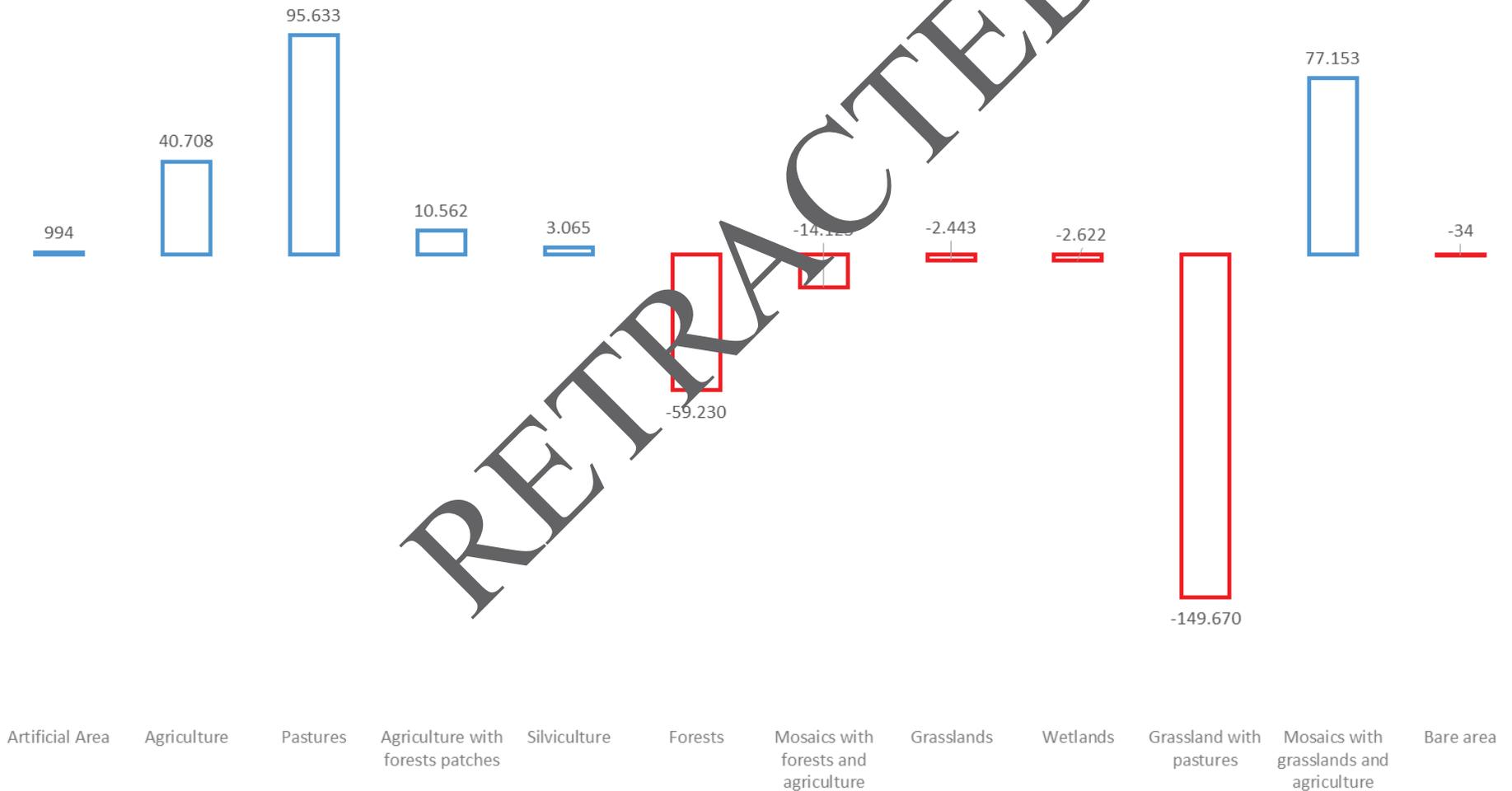
Results

2000-2010 (Km²)



Results

2010-2012 (Km²)



Results

Between the years 2000 and 2010, grassland - savannas, scrublands and pioneer formations - suffering the biggest reductions. In proportional terms, both forests as grasslands have been converted to agricultural land, pastures and mosaics between native and disturbed vegetation types. In Brazil, the changes that deserve greater emphasis are: the steady advance of agriculture and pastures in northern of Mato Grosso state, the increase in pasture in the eastern states of Pará, Acre and Rondonia, and the expansion of silviculture in the south of Brazil.

RETRACTED



Conclusions

There are indications that the agriculture will continue to expand, but prioritizing areas with degraded pastures. Regards to livestock, are increasingly present policies that disincentive the advance of the “cattle frontier”, such as soy moratorium. In addition, there is improvement of intensive farming to meat and milk production.

We recommend more detailed investigations, either in specific areas or in certain LUCC processes, such as selective logging, very difficult to be measured by the methodology presented.

RETRACTED



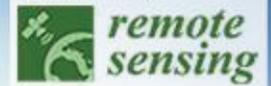


1st International Electronic Conference on Remote Sensing

22 June – 5 July 2015, online

chaired by Dr. Ioannis Gitas

sponsored by



THANKS!

rodrigo_macedo@ibge.gov.br

RETRACTED