ECOAIR - ENVIAIR

Automatic monitoring of soil degradation by satellite

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Description

Study Area

High Taquari basin (tributary to Pantanal) where soil degradation is caused by agricultural practices and cattle breeding.
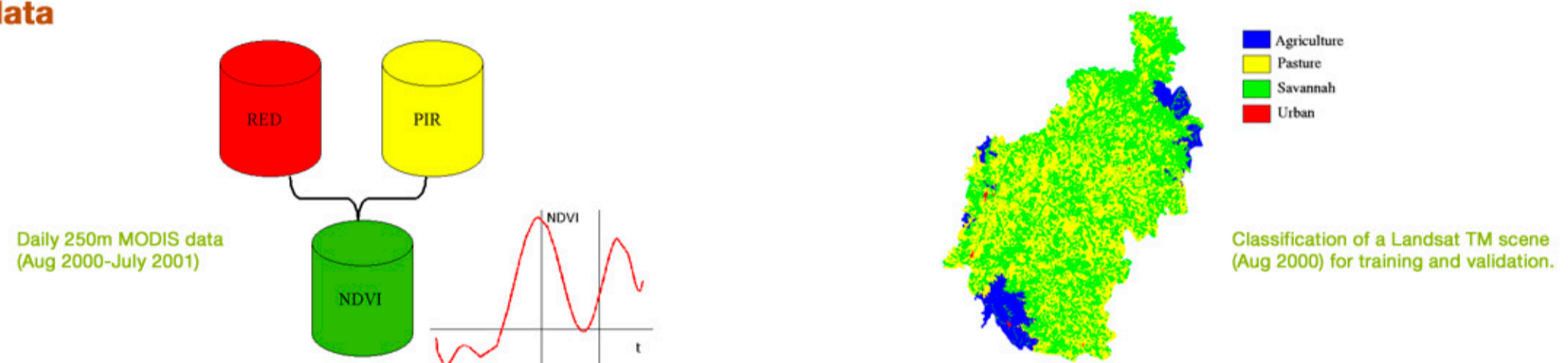
Objectives

Monitoring land use/land cover changes by analysis of time-series of MODIS data with 250m resolution. MODIS data enable application to very large areas at low cost.

Analysis of vegetation indices (NDVI) on a daily basis. NDVI time-series are characterized in a space of meaningful parameters.
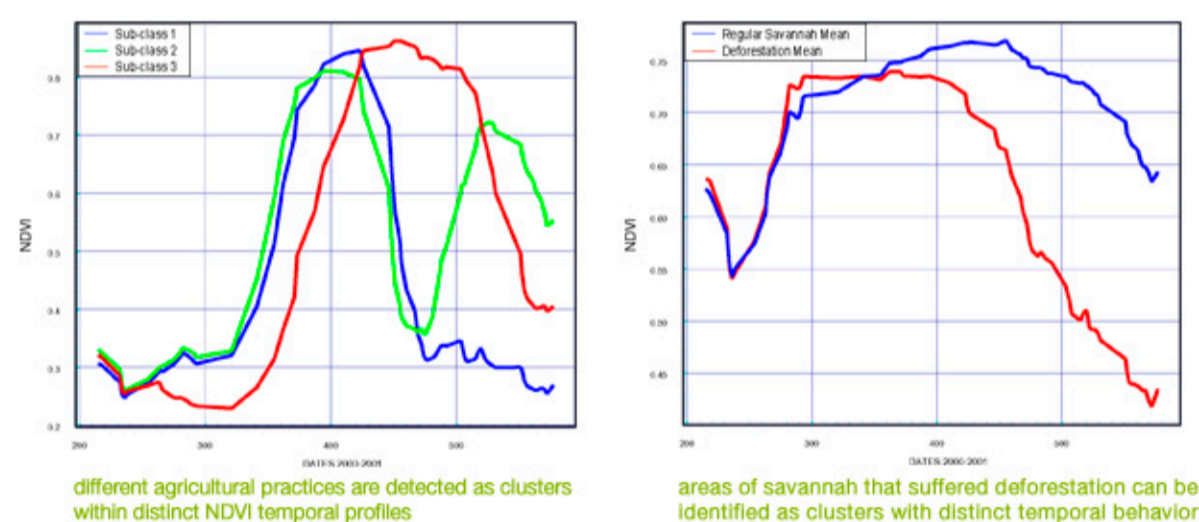
Land use/land cover is classified in the latter space, that characterises temporal behavior.

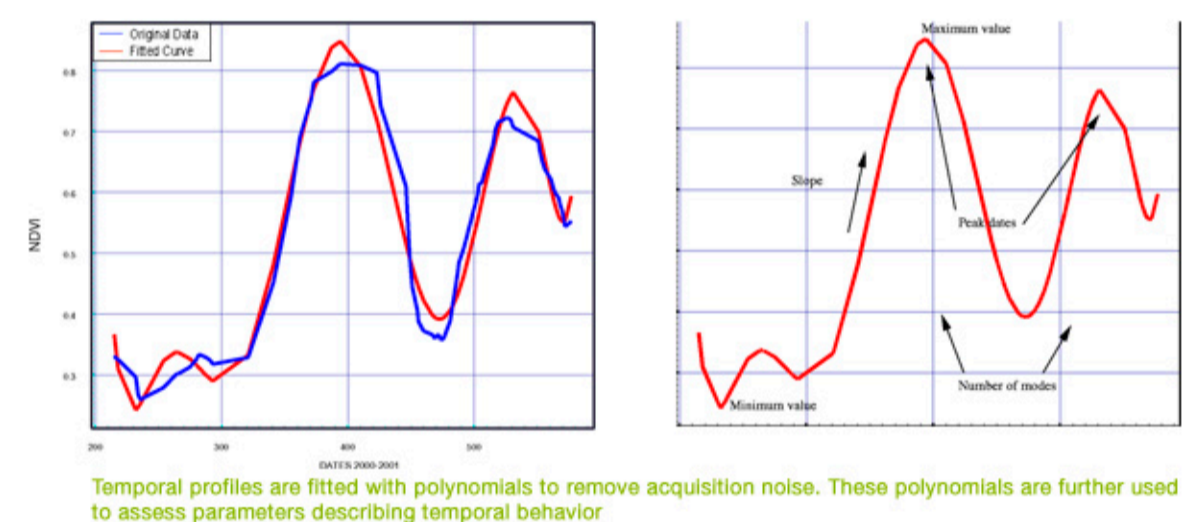Deforestation is observed in this space, since it corresponds to a quick decrease of NDVI.

Available data

Daily 250m MODIS data
(Aug 2000-July 2001)

Agriculture
Pasture
Savannah
Urban

Classification of a Landsat TM scene
(Aug 2000) for training and validation.

Methodology: identification of temporal behavior classes

different agricultural practices are detected as clusters within distinct NDVI temporal profiles

areas of savannah that suffered deforestation can be identified as clusters with distinct temporal behavior

Methodology: characterization of temporal profiles

Temporal profiles are fitted with polynomials to remove acquisition noise. These polynomials are further used to assess parameters describing temporal behavior

Results

The classification of MODIS time-series yielded an overall 84% accuracy as compared to Landsat TM classification: suitable for analysis of large areas.

Concerning deforestation: no ground truth, validation by visual inspection of Landsat TM images. The vast majority of detected deforestation areas were correct. Can be used as an environmental alert system.

Deforestation detected
(white pixels)

LANDSAT TM image
before

LANDSAT TM image
after
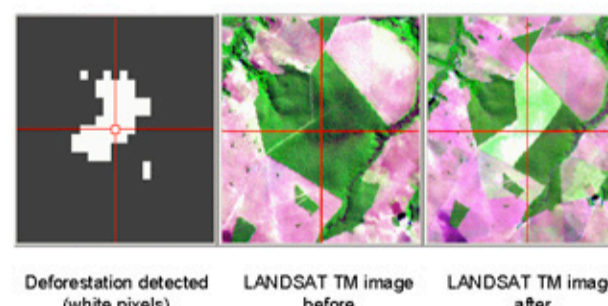
Common publications

M. Jonathan, M.S. Mereilles, J.P Berroir, I. Herlin, H.L. Coutinho
Regional scale land use/land cover classification using temporal series of MODIS data at the High Taquari basin, MS, Brasil.
XII Simposio Brasiliero de Sensoriamento Remoto, 2005.

M.S. Mereilles, G.A. Coste, D. Singh, J.P. Berroir, I. Herlin, E.F. Silva, H.L. Coutinho
A methodology to support the analysis of environmental degradation using NOAA-AVHRR data.
Int. Soc. for Photogrametry and Remote Sensing, 2004.