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HYPERION HYPERSPECTRAL REMOTE SENSING - CHARACTERIZATION OF THE DIFFERENT VEGETATION COVER OF THE ATLANTIC FOREST, IN RIO DE JANEIRO - BRAZIL

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BACKGROUND AND OBJECTIVES

The hyperspectral remote sensing techniques have innovative methods of discrimination of the physicochemical properties, resulting from the electromagnetic interaction of the surface with the sensor. The main objective of this work was to evaluate Hyperion images to identify and discriminate different vegetation cover, after the removal of noise stripes and atmospheric correction , comparing the results obtained between hyperion images and Landsat TM images, in the same region. The study presents the initial findings of a doctoral research which aims to contribute to the characterization of different successional stages of the Atlantic forest, in the state of Rio de Janeiro - Brazil.

APPROACH AND METHODS

During the study was used hyperspectral images of Hyperion sensor, aboard the satellite EO-1, obtained from the American Geological Agency. The selected image covers approximately 7.7 km in the direction perpendicular to the flight, with a length of the 42 km. The work compared HYperion images with Landsat Images.

The Hyperion image has 256 columns and 1400 rows for each band. The section covers the municipalities of Paraíba do Sul, Areal, Petrópolis, Belford Roxo, Duque de Caxias, São João de Meriti, Three Rivers and Rio de Janeiro, located in the State of Rio de Janeiro, Brazil. The picture 1 presents the study area.

The study used the Hyperion image - 1R level with radiometric corrections - for facilitating the removal of noise stripes, according to the standard horizontal and vertical, radiance values 16-bit and format HDF (Hierarchical Data Format).

The methodology was developed in three main steps:

- image digital processing (removal of stripes, atmospheric and geometric correction);
- samples coleta (to represent the vegetation cover);
- comparação with Landsat images (graphing and analysis).

The Hyperion image was acquired in June 10, 2008 with low cloud cover. Of 242 bands present in the image only 196 were used in this study and correspond to the bands of number 8 to 57 (in the visible and near infrared) and the number of bands from 79 to 224 (in the range of short wave infrared). Other scenes were subsequently excluded for the selection of samples, totaling 140 bands used in the analysis.

In the preprocessing step, for removing Stripe noise was used a correction routine in the software ENVI, that replace the dark lines through the mean of its neighbors in the vertical direction by an algorithm that automatically identifies and corrects the columns. In this case were used the tools: 1. Basic Tools - Convert Date (the Hyperion scenes were converted to the standard format of ENVI - extension BIL), 2. Rotate / Flip date, was used to transform columns into rows, 3. Replace bad lines (was used to indicate the lines with noise and correcting them), and finally the conversion of the lines in columns again, using the tool Rotate / Flip date.

The atmospheric correction was performed using the module FLAASH - MODTRAN model also available in ENVI software, best suited for the atmospheric correction of Hyperion scenes.

The stage of sample selection consisted of identifying areas according to type of vegetation of the Atlantic, which were classified, ranging from dense forest and pasture. For each class were collected four or five samples, for the set of images Hyperion and for the seven Landsat TM bands.

The last step was to evaluate the developed spectral responses in the samples in the set of images by Hyperion and Landsat scenes.

RESULTS

Regarding the results of the preprocessing stage in the scenes hyperion, the ENVI software tools used presented good results to the removal the noise Stripes. The perform of the methodology to the atmospheric correction improved the quality of the scenes, and presented good results too.

After the comparative analysis between the spectral signatures of the samples, in the scenes hyperion and Landsat, enabled observe a better discrimination of vegetation by the hyperion scenes.

The hyperion image presented a better characterization of the samples compared to Landsat image, allowing identify differentiate areas of pasture and dense vegetation on the slopes.

CONCLUSION AND FUTURE PLANS

For the development of future stages of the research will be used an extended image area, with 185 km long, to complement the results already obtained in order to obtain greater area vegetation cover to analysis.

Importantly, the study presents the initial results of a doctoral research which is being developed at Universidade Federal Fluminense in partnership with the Federal University of the Rio de Janeiro.