

2660640

STRUCTURAL LINEAMENTS CHARACTERIZATION USING PRINCIPAL COMPONENTS ANALYSIS FROM LANDSAT-8 DATA FOR ENVIRONMENTAL STUDIES AT SOUTHEASTERN RIO DE JANEIRO, BRAZIL

Fernando Machado de Mello¹; Rômulo Machado²; Teodoro Isnard Ribeiro de Almeida³

^{1,2,3} IGc - Universidade de São Paulo (USP), Brazil

RESUMO: In this paper, Principal Component Analysis (PCA) has been applied as an image enhancement technique for major structural lineaments recognition after directional filtering processing. The purpose is to improve the spectral signal of these features. In this work, there were used recent satellite images performed by Landsat 8 with OLI sensor (Operational Terra Imager). The scene of Rio de Janeiro state used in this study was 218/76. PC1, the first principal component, was extracted from select bands, the "green" Band 3 (0.53 – 0.59 μm of spectral resolution), the Near Infrared (NIR) Band 5 (0.53 – 0.59 μm) and from the Short Wave Infrared (SWIR) Band 7 (2.11 – 2.29 μm), all of them with spatial 15m resolution, obtained after the "PAN" Band 8 fusion processing, performed with ENVITM software. Kernel type filters were used to discriminate the main trending lineament systems. The data analyzed here were acquired in 2014-02-07 and provide good lineament detection in the PC1 filtered band. This project was proposed to evaluate modern geological mapping tools for landslides predisposing factors, mainly from combined geological discontinuities and geomorphologic features. Structural features were enhanced with NE, WNW, NNW, EW and NS filters. Previous results indicate four main groups of structural lineaments, associated with major stress fields, linked with Precambrian ductile structures and Phanerozoic brittle structures, some of them related to the Gondwana breakup. In order of importance, the largest major heterogeneities are related to "Brasiliano" cycle, like shear zones of high-angle of Além-Paraíba and metamorphic foliations roughly trending NE. These structures were reactivated as faults, fractures and joints, which promotes the action of the water inside the mass increasing the susceptibility of slopes to failures. NW open structures, mainly brittle faults associated with transversal structures were created after the onset of the Guandu-Sepetiba Sub-Graben, in the Guanabara Graben context (part of the Continental Rift of Southeastern Brazil, roughly trending NE). Structures with NNE, WNW and NNW trends assume their importance depending on the structural domains where they occur. Also, they are concentrated in some areas. The last group of recognized directions is of minor importance, but locally E-W and N-S structures are strongly concentrated and may obliterate the latter group.

Acknowledgments: This research was supported by a grant received to the Associate Professor at Universidade Federal Rural do Rio de Janeiro (UFRRJ) Fernando Machado de Mello from the Coordination for the Improvement of Higher Level Personnel (CAPES) for a Postdoctoral fellowship (PNPD/CAPES) at USP. The second author (Rômulo Machado) thanks the National Council for Scientific and Technological Development - CNPq for the concession of productivity in research grants (process 300423/82-9).

PALAVRAS-CHAVE: REMOTE SENSING, STRUCTURAL GEOLOGY, GEOPROCESSING