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Satellite-based Analysis of Forest Fragmentation and Land Use Dynamics in the Atlantic Forest of Rio de Janeiro

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Abstract

The Brazilian Mata Atlântica is one of 25 world wide hotspots of biodiversity, with a high degree of species diversity and endemism. Historical land use has reduced the Mata Atlântica biome to about 11.5% of its original extent. Efforts in nature conservation in the Mata Atlântica of Rio de Janeiro are part of an overall plan to protect larger forest patches in the biogeographical corridor of Serra do Mar. Smaller forest fragments in the bordering agricultural landscape of the lowlands play an important role as stepping stones to aid connectivity to the corridor. Apart from these biological functions the forest fragments provide important ecosystem services for food production, such as water storage, purification and erosion prevention. Therefore, protection and sustainable management of these small fragments are of utmost importance. Recent landscape dynamics has been characterised by small losses and gains at the forest edges. To better understand the small scale changes of the forest cover, an analysis of land use / land cover dynamics was carried out. Former studies based on medium-resolution imagery were not able to identify these small changes in the forest cover. Therefore the present study, which focusses on the municipality of Cachoeiras de Macacu, is based on the interpretation and analysis of high-resolution SPOT 5 imagery from the years 2003, 2005, 2007, 2008 and 2009, using ENVI 4.7/IDL 7.1 and ArcGIS 9.3. We present the methodology used, identify and quantify the small scale changes of the forest cover, and discuss the consequences for forest connectivity and land use management. The study is embedded in the interdisciplinary research of the Brazilian-German cooperation project DINARIO/MP2.

Keywords: Atlantic forest, ecosystem services, forest fragmentation, land use dynamics, remote sensing