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Landscape Dynamics in Southern Ecuador′s Tropical Mountain Forest Ecosystem Using Remote Sensing Techniques

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The analysis of land cover change of the past decades is fundamental for a deeper understanding of the natural and anthropogenic landscape dynamics in Southern Ecuador′s tropical mountain forest ecosystem. Not only to clarify the past and present situation but also to estimate the future landscape development through predictive models. This information will be finally a powerful basis for the elaboration of sustainable land use options.
A time period of 35 years (1975 - 2010) will be studied using 12 images from different satellites and sensors (Landsat 2 MSS, Landsat 5 TM, Landsat 7 ETM+, SPOT 2, SPOT 4, Terra Aster and QuickBird). Particular attention will be dedicated to the deforestation process and to the spatial distribution of the tropical bracken (Pteridium arachnoideum and Pteridium caudatum), a fern species which grows abundantly in anthropogenic disturbed areas like abandoned pastures and forested areas cleared by fire.
Due to the heterogeneity of the satellite data, each image is processed in a particular way depending on its spectral, spatial, temporal or radiometric resolution. Laboratory work as well as field work are combined in order to accomplish the following tasks: image orthorectification, atmospheric and topographic effects correction, spatial resolution standardization, radiometric intercalibration, spectral multitemporal data comparison, land cover classification and change detection.
Preprocessing of individual satellite scenes is a fundamental step to prepare the images for information extraction. Orthorectification was made using a digital elevation model and ground control points collected in the field. When it was not possible to collect spectral information during the overflight, topographic and atmospheric effects were corrected using a new physically-based atmospheric and topographic program (AtToCor), developed within the working group. This model, which combines the Sandmeier & Itten algorithm and the Teillet. et al. C-correction, is specifically appropriate for dealing with the complex topography of the Andean region.
Once the data was corrected to obtain ground surface reflectances, the spatial, spectral and radiometric resolution was standardized through resampling and intercalibration. In this way, the pixels values of the resulting images are comparable.
For the classification phase, field spectral data was collected and handled to improve the accuracy in the definition of land cover classes.