Geophysical Research Abstracts
Vol. 12, EGU2010-13247-1, 2010
EGU General Assembly 2010

Multiscale assessment of landscape structure in heterogeneous forested area

T. Simoniello (1), S. Pignatti (1), M. T. Carone (1,2), L. Fusilli (3), M. Lanfredi (1), R. Coppola (1), and F. Santini (3)

(1) CNR, IMAA, Tito Scalo (PZ), Italy (simoniello@imaa.cnr.it), (2) STAT Dep. University of Molise, Italy, (3) CNR, IIA, Montelibretti Rome, Italy

The characterization of landscape structure in space or time is fundamental to infer ecological processes (Ingegnoli, 2002). Landscape pattern arrangements strongly influence forest ecological functioning and biodiversity, as an example landscape fragmentation can induce habitat degradation reducing forest species populations or limiting their recolonization. Such arrangements are spatially correlated and scale-dependent, therefore they have distinctive operational-scales at which they can be best characterized (Wu, 2004). In addition, the detail of the land cover classification can have substantial influences on resulting pattern quantification (Greenberg et al.2001). In order to evaluate the influence of the observational scales and labelling details, we investigated a forested area (Pollino National Park; southern Italy) by analyzing the patch arrangement derived from three remote sensing sensors having different spectral and spatial resolutions. In particular, we elaborated data from the hyperspectral MIVIS (102 bands; $\sim$7m) and Hyperion (220 bands; 30m), and the multispectral Landsat-TM (7 bands; 30m). Moreover, to assess the landscape evolution we investigated the hierarchical structure of the study area (landscape, class, patch) by elaborating two Landsat-TM acquired in 1987 and 1998.
Preprocessed data were classified by adopting a supervised procedure based on the Minimum Distance classifier. The obtained labelling correspond to Corine level 5 for the high resolution MIVIS data, to Corine level 4 for Hyperion and to an intermediate level 4-3 for TM data. The analysis was performed by taking into account patch density, diversity and evenness at landscape level; mean patch size and interdispersion at class level; patch structure and perimeter regularity at patch level. The three sensors described a landscape with a quite high level of richness and distribution. The high spectral and spatial resolution of MIVIS data provided the highest diversity level (SHDI = 2.05), even if the results obtained for TM were not so different (1.93), Hyperion showed the lowest value (1.79). The obtained evenness index was similar for all the landscapes ($\sim$ 0.72). At class level, the interdispersion increases as the spatial and spectral resolution power decrease. Due to the low labelling detail, TM classes represent an aggregation of MIVIS and Hyperion classes; therefore they result larger and more diffused over the territory favouring higher interspersion values in the computation. The investigation of the patch structure highlighted the highest MIVIS capability in describing the patch articulation; Hyperion and TM showed quite similar situation. The historical analysis based on TM imagery showed a fragmentation process for some forested patches (mainly beeches): an increase of structure complexity (higher FRACT) is coupled with a higher patch number and an extension reduction.
On the whole, the obtained results showed that the multispectral Landsat-TM images represent a good data source for supporting studies on landscape structure of forested areas and that for analyzing the articulation of particular species the high spectral resolution needs to be coupled with a high spatial resolution, i.e. Hyperion sampling is not adequate for such a purpose.