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Forest type identification using Sentinel 2 and DEM data

Ioana Lazar (1), Iuliana Gabriela Breaban (1,2), and Cristian Constantin Stoleriu (1)

(1) Alexandru Ioan Cuza" University of Iasi, Faculty of Geography and Geology, Iaşi, Romania, (2) Alexandru Ioan Cuza" University of Iasi, CERNESIM, Iasi, Romania

Part of the monitoring services of forest ecosystem, quantification of all spatio-temporal changes of forest cover has to be assessed through rapid and low-cost tools that are capable to retrieve reliable information. Detailed forest information can be obtained with remote sensing systems such as satellite imagery which has large area coverage and high resolution. Also, due to consistent time series data, even a single scene contains significant forest monitoring information, becoming increasingly accessed for forest degradation and its dynamics in relation with the services quality of the nature and biodiversity, deforestation by improving the estimations of green house gases emissions. The analysis of quantifying the ecosystem services is directly influenced by the resolution of the data sources, modifying the spectral response. Thus, the derivation of forest ecosystem parameters such forest cover, tree species identification, canopy height and density requires the use of multiple remote sensing systems: high resolution satellite imagery and airborne laser scanning.
The study site is located in the proximity of Iasi (Romania), namely Natura 2000 site Bârnova-Repedea Forest (ROSCI0135), and it spatial extent is of 12216 ha. Dacian oak-hornbeam forests and Asperulo-Fagetum beech forests are the two habitat types of community interest. Both derived terrain variables and multi-temporal Sentinel 2 data were used together with the Random Forest classifier.
The dependence of the spectral signature of the forest crown cover is based on the several parameters as electromagnetic radiation, species composition, period of vegetation, health status and crown cover gaps. The reflected electromagnetic radiation is perceived from the perspective of technical characteristics of the sensors mounted on the instrument. Moreover, the shadows caused by a diversity of tree heights and age periods make the younger trees appear less textured and more homogenous. Different spectral band combinations are used together with indices of vegetation, such as LAI and NDVI. A noticeable importance has the RE and SWIR bands that emphasis the suitable periods of data acquisition for tree species classification, a gradient in phenological activity among species being recorded during spring and/or autumn. Furthermore, remote sensing applications on forestry, especially forest parameters of protected area, require extensive field observations and reference data in order to systematically assess and monitor the species, changes of canopy density and stages of development.