# Object-oriented image analysis for assessment of the pasturage activity impact in the alpine domain. A case study: The Retezat-Godeanu range (Southern Carpathians, Romania).

The study area, which has approximately 3000 $km^2$ in size, is located in the western part of the Southern Carpathians and reaches the maximum elevation in Peleaga Peak (2509m a.s.l.). This area was chosen because the alpine level, with rich grasslands, has a great surface extension and has offered excellent conditions for the pasturage activity. Centuries of grazing in the Retezat-Godeanu range led to many changes of the mountain environment, like the lowering of the timberline, transformation or even the extinction in many areas of the treeline ecotone and the decrease of the forested areas.

It is difficult to make the assessment of the intensity of the pasturage activity because of the lack of statistical data regarding the livestocks for historical period or because of the exaggerated data in the communist period. Another problem is the impossibility to make a correct evaluation of the number of sheepfolds. Some of the sheepfolds have perished; for some sheepfolds the location has changed and many of these are not represented on the topographical maps.

The paper presents a semi-automated method of detecting the sheepfolds and their corresponding curtilages based on the object-based image analysis (OBIA) of the remote sensed-data and morphometrical data derived from a digital elevation model (DEM). The method is based on the fact that the vegetation of the curtilages differs significantly from that of surrounding areas because of the nutrient accumulation in soil. This vegetation is very persistent and occurs even in areas where the grazing has been stopped for many decades. These very small areas could be easily visual distinguished on the satellite composite images. The data we have been used were: SPOT 5 multispectral images (10m spatial resolution), a 10m resolution DEM derived from remote sensed data, 1:25,000 topographic maps and GPS data. Segmentation and the classification process were made in eCognition Definiens v.8 software. The criteria used in the classification process were the following: the spectral information in Green and NIR, the ratio between Band 1 and Band 4, the slope (the sheepfolds are located in areas with gentle to moderate slopes), the area and also a shape criteria (close to an elliptic shape). The accuracy assessment showed that the classification was 93 percent accurate with respect to the location of these areas. The errors have been recorded especially in areas with very thin soil and where the barren rocks were dominated. The method also allowed detecting the location of the very old sheepfolds. These sheepfolds didn't exist in present but some of them are recorded on maps from eighteenth and nineteenth centuries. The result showed that areas used as sheepfold or curtilages are with 35 percent greater than the number of sheepfolds estimated on the recent topographical maps. The method offered a better perception of the pasturage activity impact in the alpine domain and could be improved in further studies by using very high resolution satellite images and LiDAR data.

**Key words:**
OBIA, livestock grazing, Sothern Carpathians

Authors:
(Contact person)
Marcel Török-Oance
West University of Timişoara, Department of Geography
torok@cbg.uvt.ro

Mircea Voiculescu
West University of Timişoara, Department of Geography
voicu@cbg.uvt.ro

Rodica Török-Oance
West University of Timişoara, Department of Biology
rodica.torok@cbg.uvt.ro

Florina Ardelean
West University of Timişoara, Department of Geography
ardelean_f@yahoo.com

Alexandru Onaca
West University of Timişoara, Department of Geography
onacaalex@cbg.uvt.ro