Multi-Temporal Analysis of Land Cover Using MERIS Data

Přemysl Štych, Lucie Malíková

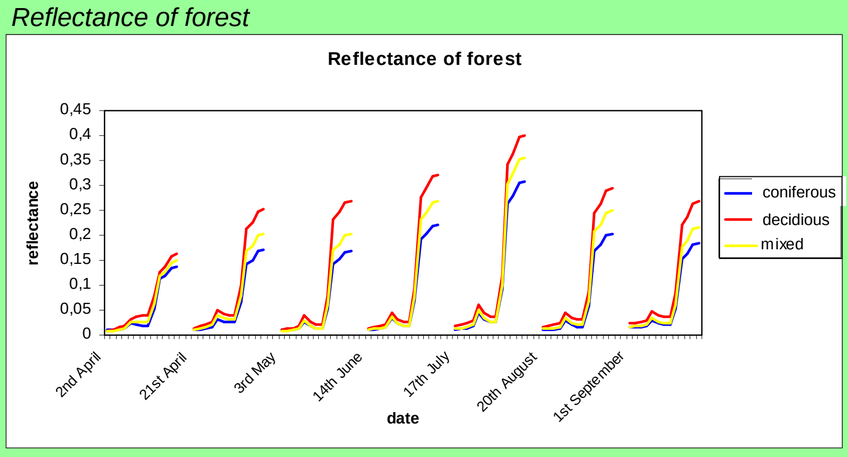
The aim of this study is to analyze the evolution of vegetation cover during the seasons 2009 using MERIS data. Spectral characteristics of vegetation were observed in selected areas in the Czech Republic. Changes of vegetation with a focus on forests and agricultural land were examined. Spectral characteristics of vegetation were examined both by analyzing changes in reflectance as well as using a vegetation indexes. Spectral reflectance of vegetation was the input for the classification of Linear spectral unmixing.

Data and Methodology

The main input data was time series of MERIS images from the period April to September 2009. Full Resolution (FR) MERIS data at L1 level was used. For comparison of spectral characteristics of vegetation in several time periods, it was necessary to perform radiometric and geometric correction of the data. Radiometric corrections SMILE and SMAC were carried out in SW BEAM. Aerosol Optical Depth values were found in the portal GIOVANNI (http://disc.sci.gsfc.nasa.gov/giovanni). Resampling Nearest Neighbor was used in process orthorectification and the pixel size was defined 300 x 300 m.

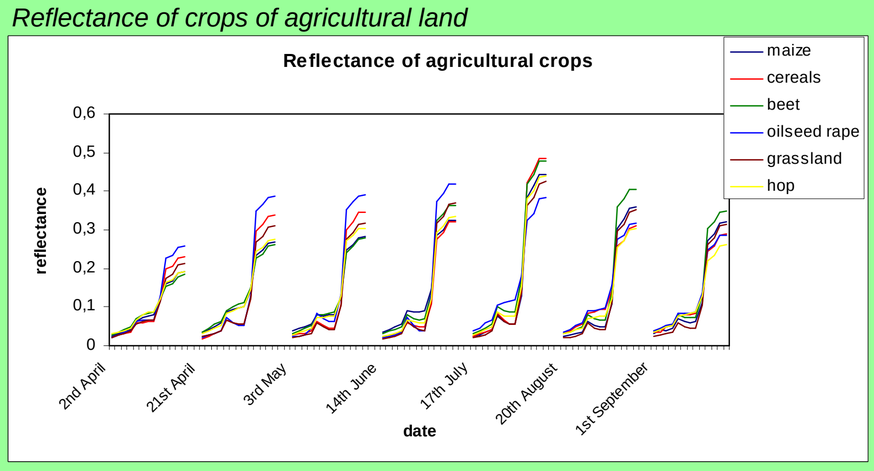
Calculation of selected vegetation indexes was performed using tools MERIS Vegetation Processor, Processor NDVI and MERIS FAPAR Processor in the BEAM. Neurons networks method is involved in pprocessor algorithm and 11 spectral bands of MERIS (excluding the 1st, 2nd, 11th and 15th bands) plus additional data from the MERIS are used. The output were LAI, fAPAR, fCover and LAI.Cab and MGVI index. NDVI Processor uses information from the 6 and 10 spectral band and FAPAR Processor uses the 2nd, 8th, and 13th plus additional MERIS data.

Reflectance of forest

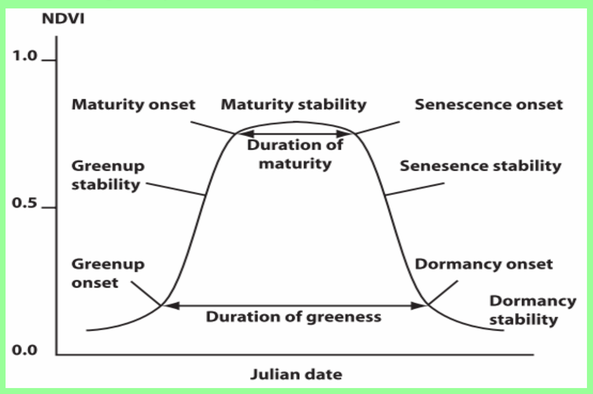


Masking methods were used for the analysis of changes of the vegetation reflectance and values of vegetation indexes. These masks were created in SW Beam in "Mask / ROI Manager" on the basis of reference data GlobCover, LPIS and results of field investigations. SW BEAM creates a spectral curve of vegetation types using two instruments - the PIN and Spectrum Manager View. It was an input for the classification of Linear spectral unmixing (LSU).

Reflectance of crops of agricultural land

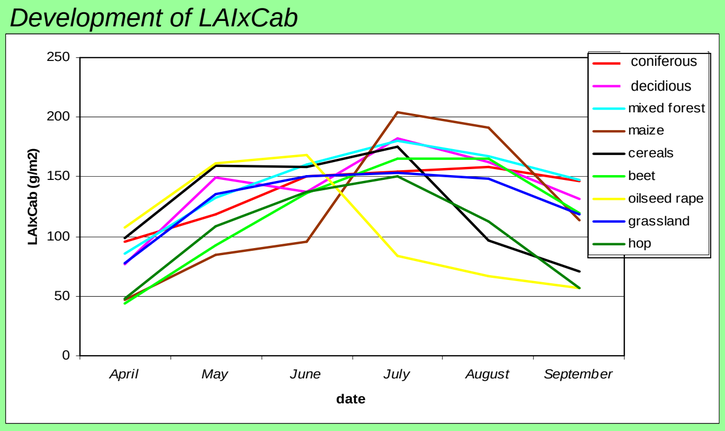


Phenological phases of vegetation



Aurdal, … [et al.] (2005)

Development of LAIxCab

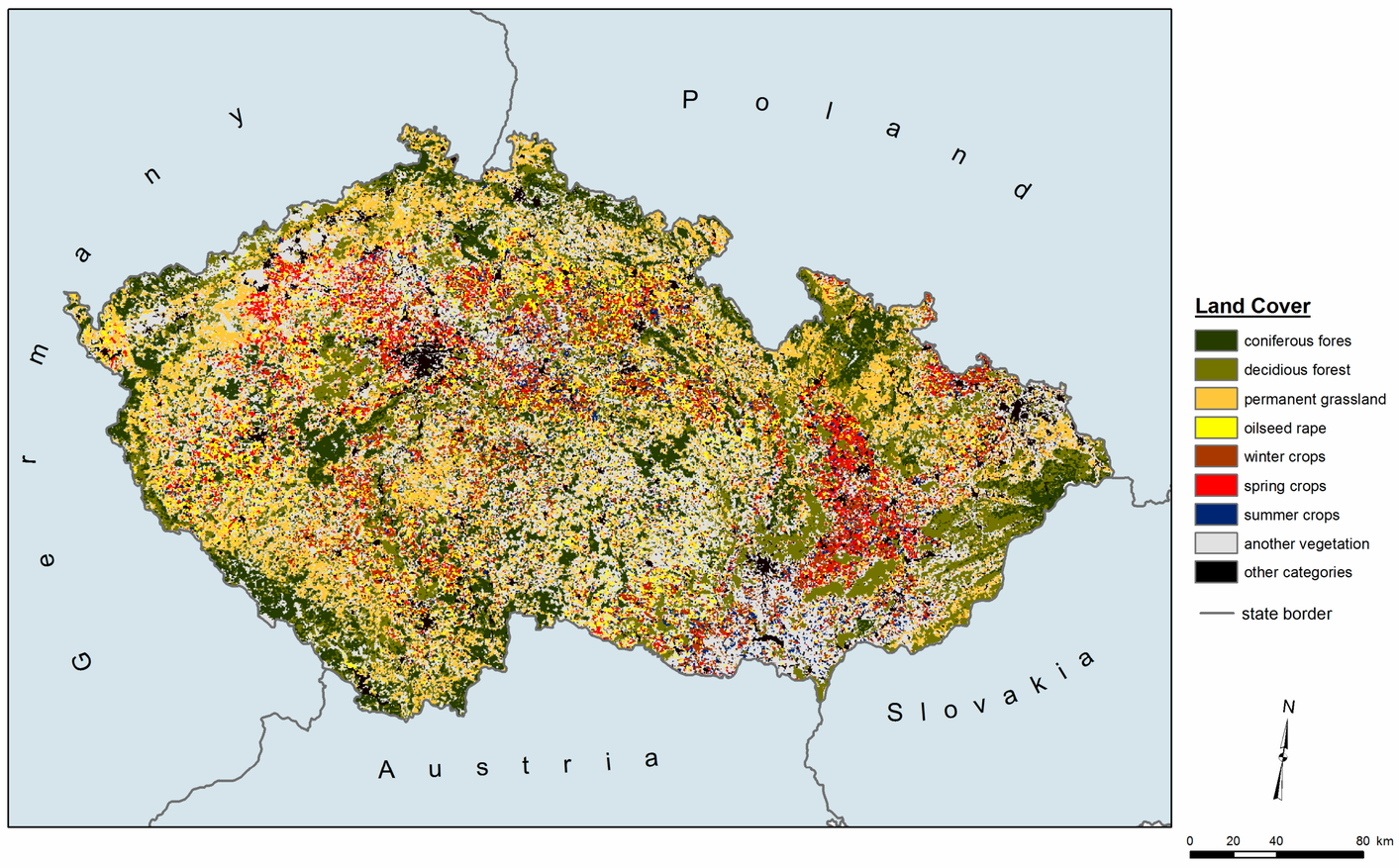


Phenological phases of vegetation respectively period of the maturity can be determined from results of LAIxCab. Oilseed rape was evidently a plant with highest value of index in spring. This crop achieved the period of maturity in late May according to indicators LAIxCab. Therefore, the oilseed rape should be distinguishable and classifiable in the May. Winter cereals reached similar values of LAIxCab during April and May, but they had significantly lower reflectance in the near infrared. This spectral difference can be used to distinguish these two types of crops.
Permanent grasslands were relatively characteristic LAIxCab development, without significant maxima and minima, as well as sugar beets and hops were continuous trend (gradual increase and gradual decrease) in phenological phases. Maturity period of hop was in July, sugar beets in early August. Maize had a specific phenological development. Massive increase in leaf area of maize occurred during June and July and reached maximum in late July and early August.

Land Cover classification - Linear spectral unmixing (LSU) method.

Land Cover in the Czech Republic

year 2009



Summary

The presented study investigated the possibilities of using high temporal data MERIS in monitoring of the spectral characteristics of vegetation and land cover classification. Vegetation spectral curves were created by the using BEAM software. Approximately 15 high quality images of MERIS were available in year 2009. All the images could be combined for reason of the observation of the development of spectral characteristics in each month. Results are helpful in understanding the spectral characteristics of vegetation and in classification of land cover as well. These outputs can be involved into existing vegetation spectral libraries.

Authors

RNDr. Přemysl Štych, Ph.D.; mail: stych@natur.cuni.cz
Mgr. Lucie Malíková; mail: Malikova.Lucie@seznam.cz

Department of Applied Geoinformatics and Cartography, Faculty of Science, Charles University in Prague, the Czech Republic

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