ке относительно степного войлока примерно в два раза и уменьшение в слое 5-60 см в 1.3 раза. Достоверные различия в содержании азота между слоями лесной почвы и почвы под травянистой растительностью наблюдались на глубинах 0-5, 5-10, 10-20 и 20-30 см, а в содержании углерода – 30-40, 40-50 и 50-60 см.

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SUSTAINABLE FOREST AND WILDLIFE RESOURCES IN CZECH REPUBLIC

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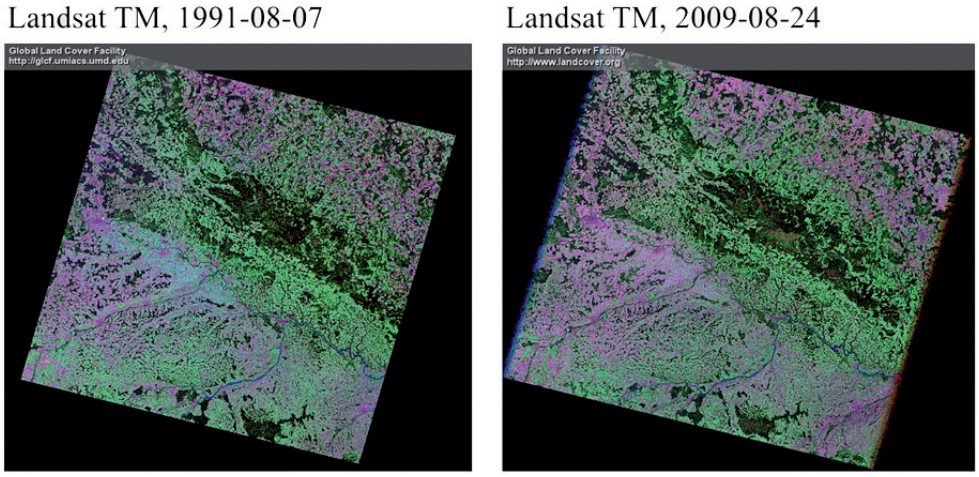
The study area is Šumava National Park (ŠNP), the largest of the four national parks located in the south-west of Czech Republic, on the border with Germany. Being a unique mosaic of natural and secondary habitats of exceptional natural value of European-wide significance, the ŠNP is established as a special regime of environmental protection with unique biological communities. The area is represented by the vast wooded areas, precious mountain spruce and protected mixed forests of various ages, peat bogs, meadows biotops. Altogether, they create a unique mosaic of biotopes, which encompass a variety of rare, endemic and endangered species. Geobotanically, the ŠNP belongs to the Bohemian Forest divided into two national parks, located in Czech Republic and Germany.

However, parts of the ŠNP experienced changes in the landscapes due to climate changes and human impacts. Some parts of ŠNP were previously deforested and used for agriculture since the last decades. At the same time, many species are threatened by land-use changes [1]. Other anthropogenic activities in Šumava area include treatments of mountain meadows and soils regularly practiced in the ŠNP, which significantly affected plant species diversity, shifts of dominance among certain species, decrease of the



Satellite remote sensing data (Landsat TM) covering Šumava area.

species richness [3]. Other triggers of ecosystem dynamics include multi-year variation of climatic parameters and natural vegetation succession. As a result, the mountain vegetation is gradually degrading. At the same time, rural landscapes strongly influenced by human activities should be maintained in view of decreasing production. The environmental sustainability is highly important in the area of Šumava [2].

The research aim was to analyse how the ecosystem landscapes located within the study area changed since 1991 until 2009 (18-year time span) using remote sensing data and GIS. The data include GIS layers and Landsat TM images with 18-years interval (1991 and 2009). Methodology included following major steps: 1) Data capture; 2) GIS project. 3) Geo-referencing; 4) Activating GDAL remote sensing plugins. 5) Preliminary data processing. 6) Generating contour layers; 7) Landsat TM Colour composition; 8) Defining Study Area; 9) False colour composites; 10) Image classification; 11) Spatial analysis. The GIS analysis is used to test the importance of the natural and human-induced land used changes for survival of the important floristic locations in several case studies.

The outcomes are illustrated by two maps showing geographic distribution of land cover types within the study area in given time periods of 18-year time span. The results demonstrate visualization of the ecosystems in 1991 and 2009 showing dynamics of land cover types in the given time. The work demonstrated effective application of QGIS software combined with multi-source data (remote sensing and geoinformatics) for the purpose of environmental protection of precious areas of the Šumava National Park. The combination of remote sensing data and GIS tool for pattern recognition is proved to be effective tool for geo-botanical research. The spatio-

temporal analysis was applied to raster images taken at 1991 and 2009 which enabled to process geospatial data and to derive information for geobotanical modelling. The images classification was used to analyse changes in the ŠNP area that consist in different geobotanical land cover types. The results of spatial analysis demonstrated that structure, shape and configuration of landscapes in ŠNP changed since 1991.

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МЕТАБОЛОМИКА ЛЕСНЫХ РАСТЕНИЙ, ПОЧВ И БИОГЕОЦЕНОЗОВ

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Развитие современных технологий, таких как спектроскопия протонного магнитного резонанса, ядерного магнитного резонанса, высокоэффективная жидкостная хроматография и газовая хроматография с масс-спектрометрией, биоинформатика, big-data и т.д., произвели революцию в возможностях исследований биологических систем. Появились новые области исследований, так называемые «омики»: геномика, транскриптомика, протеомика, метаболомика. В отличие от транскриптомики и протеомики, метаболомика позволяет давать прямые оценки фенотипического ответа. Компоненты метаболома рассматривают как конечные продукты экспрессии генов, которые определяют биохимические фенотипы клетки, тканей и целого организма (см. рисунок). Метаболомика – общий термин, определяющий научную область, характеризующую пул низкомолекулярных органических метаболитов, выделяемых живыми организмами в ответ на воздействия/раздражитель. К важнейшим компонентам метаболома растений относят, например, углеводы, аминокислоты, органические кислоты, липиды и жирные кислоты, витамины и различ-