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Foreword

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Dear colleagues,

we are delighted to introduce a new online geographical journal to you. Contemporary geographical publishing in the Middle-European countries comprises wide-ranging spectrum of journals, however often issued in national languages. We are aware of the ability of many geographers to look-up and understand most of significant results and consequences of regional or national research, although written in foreign languages. Even then (and partially because of that fact), it is beneficial to present these results also in a language accessible to scientific majority.

Another focus of the journal is to discuss what the Middle-European geography really represents. According to various landscape types and culturally-scientific influences, the Middle-European geography solves the large number of problems through different theoretical and methodological ways. Our intended future effort is to find common themes and modes of understanding to the landscape as well as to acquaint readers with some alternative ways of dealing with geographical study (e.g. inter/trans-disciplinary cooperation).

Between "solitude" and "drowning": The point is to preserve in searching for geography as unified science, to avoid a crisis of absolute disintegration... In last few years, leaders of one of the most significant Dutch technical universities intended to finish education of the separate study program Land Surveying. This subject had crumbled into several directions – practical taught in civil engineering, higher in astronomy, electrotechnics, etc. Similar tendencies can be seen in present higher geographical education. Logically and rightly, environmentalism, landscape ecology, regional development and other disciplines take theoretical and methodical parts of geographical science. Actually the problem is not right there. It is especially represented by certain deficit of reciprocity of these theoretical and methodical inspirations and even more in increasing effort to transfer the main subject and concept from geography to mentioned disciplines. These are becoming applied and therefore more progressive variant of contemporary often theoretically based geography. In comparison with the above mentioned disintegrative separation, an apparently inverse process, which is recently in progress, can be expressed as a gradual transformation of pluridisciplinarity into transdisciplinarity. There, the significance of partial sciences may (although need not) decrease till real drowning and loss of their own position. Final result is then similar to the consequence of mentioned separation. The difficultly realizable point is to sustain uniqueness of each discipline in practical transdisciplinarity. Perhaps, we will find out, that geography still has its own scope and it is contributive, otherwise we should discuss what next ...

We believe that previous lines aptly explained the journal title and subtitle – GeoScape – Alternative Approaches to Middle-European Geography, both of them expressing the regional and theoretic-methodological dimensions of it.

We hope that the GeoScape will become the medium for manifold discussions on geographical and landscape studies themes and the source of respectable and useful information. Therefore, we decided for specific journal inner structure combining both research and informative chapters. *Main Articles* is the fundamental chapter while presenting significant research results in prescribed form of *scientific article* or *essay*. Second chapter, *Discussions*, then represents the reflection of former articles or another geographical issue. Last chapter, *Selected Publishing and Events*, has the informative function for it acquaints readers with papers published in selected Middle-European geographical and landscape-ecological journals, or with current news of geographical "life", e.g. conferences, workshops etc.

In sense of previous lines, we invite all of you to take your part and to contribute to better understanding to the landscape. You may also visit our official website <geo.ujep.cz> to contact us with your suggestions and comments and to see instructions for contributors.

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Review of Geographical Research in North-western Bohemia

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Abstract

The contribution focuses on a past course and contemporary progress in geographical research on a landscape in the Northwest Bohemia, Czechia. At first, some basic approaches and trends of the regional geographical research since 50´ of the 20th century are briefly discussed. A special attention is then given to a description of so far most significant geographical research project „Methodical Procedure of Social and Ecological Links Assessment with Economic Transformation: Theory and Application" occupied by the Department of Geography, Faculty of Science (UJEP). The grant project, which was assigned by Czech Ministry of Labour and Social Affairs, is widely composed with regard to complex character of the economic (resp social-economic) transformation and to mutual interconnection and interdependence of social, ecological and economic changes.

Key words: geographical research; economic transformation; social and ecological links; Northwest Bohemia

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1. Introduction

It was once said that a best way to understand to the matter of any scientific discipline is the glance to its own history (E. B. Tylor; free transcription). In this contribution, authors evaluate the former approaches of geographical research (in rather complex meaning, excluding partial research topics) of the landscape in North-western Bohemia and the course of its recent development. The review can serve as a medium for assessment of long-term changes of both landscape and discipline, by which this research object is being studied.

To a large degree, a common feature of the geographical research in the North-western Bohemia is represented by territorial determination of studied areas within the former Ústí nad Labem administrative region. Only lately research projects aimed to apply the acquired knowledge also to other regions in Czechia and to generalize that knowledge.

Former and recent geographical works may be differentiated by themes or by spatial determination. We can distinguish at least three main hierarchical levels. The meso-regional level (approximately the administrative region level in sense of work origin) is related to the foundation of the Department of Geography at Faculty of Education in the Ústí nad Labem in the mid 50´s of the 20th century. The first significant work was the „Geography of the Ústí nad Labem region" ("Zeměpis ústeckého kraje") issued in 1957 (Havrda, Vrána 1957, 1958). This work, which is divided into two parts - the first one dealing with physic-geographical conditions and the second one focusing on economy, settlement and transportation, describes and assess the administratively determined territory, which did exist since 1949 to 1960.

Publications of researchers from the Geographical Institute of Czechoslovakia Academy of Sciences represent an example of the research in micro regional level. These works dealt with the environmental assessment of the Liberec region and the Ústí region and despite the common difficulties with understanding to the complexity and mutual conditionality of the environmental components, these works present a good review of the state of environment and their authors uncover many interesting methodical ways for solution of ecological and other related problems.

The third hierarchical level is characteristic with local spatial determination and according to a professional quality of authors, these works often brings valuable information immediately applicable in praxis. However, this is not the case of former guiding territorial plans (and frequently also of their "descendants"), because in that case the geographical theme was mechanically comprised among other parts of the plan, while there was an apparent lack of the understanding to its synthetic role. The territorial plan of the Ústí nad Labem town from the beginning of 90´s represents the rare exception with its emphasis given to the landscape and historical continuity of basic components of the plan. These basic components are then essential for following ones: settlement area, production and technical infrastructure. Next works which are comprised in the group of the local hierarchical level (cf. Růžička 1987) are e.g. ecoprogrames for development of the industrial companies (Anděl 1986) or the environmental assessments of towns.

According to a thematic differentiation, the attempts for more complex geographical assessments, urban solutions, or environmental assessments and social development plans can bee seen at least since 80´s of the 20th century. This corresponds also with prevailing orientation of regional research teams dealing with geographical problems.

The Department of Geography (since 4th November 2005 being the part of the recently established Faculty of Science, UJEP) aimed its effort until mid 90´s dominantly to regional geography in intention of the former Ústí nad Labem region (e.g. Němeček et al. 1983, Štěpán et al. 1984). The Ústí nad Labem town was also a place of work of the Sociological Institute of the Academy of Science (CSAS-ČSAV) with major interest in study of social structures in the government point of view, and of the Economic Institute of the Academy of Science (CSAS-ČSAV) dealing with economic development of the region. Some of the above mentioned topics were partially transferred to the Faculty of Social and Economic Studies (UJEP) (Šašek 1997a, 1997b, 1998, 2001 ed., 2003 ed.).

Environmental issues were widely studied in the Institute for Construction and Architecture (RICA-VÚVA), whose researchers published generels of environment and other works interpreting the environmental conditions in the region (aesthetic direction - Kocourková 1974, complex environmental approach - Anděl 1986a, 1986b, 1990 et al., 1991 et al., 1992 et al.). The notable attempt to create a complex method for assessment of the ecological and social burden has been done at the Institute. Since then, the method has been used many times for the determination of ecologically affected areas of Czechia (Anděl 1994a, 1994b, cf. Poštolka 1996) and cross-border regions (e.g. Anděl, Poštolka, Šašek 1998). Contemporary activities of the Department of Geography (UJEP) follow to a large degree former research of the VÚVA Institute, however accentuating especially geosystematic substance of the matter. Ecologically based research of a landscape in the region belongs to the scope of activity of the Faculty of Environmental Studies. Teachers and researchers at the Faculty deals with the problematic of recultivation of areas affected by brown coal mining, environmental management (e.g. Ritschelová 2005 ed.), or geoinformatics for landscape-ecological applications (e.g. Brůna, Buchta Uhlířová 2002).

2. Methodical Procedure of Social and Ecological Links Assessment with Economic Transformation: Theory and Application

2.1 Introduction

The following chapter presents input information for the Ministry of Labour and Social Affairs' project (MLSA project) entitled "Methodical Procedure of Social and Ecological Links Assessment with Economic Transformation: Theory and Application". The framework of the research program is quite broad with regard to the integral character of economic (or – if understood as a broader concept – socio-economic) transformation, and the interconnectedness and interdependency of social, environmental or economic changes (Balej, Anděl 2005, Hampl et al. 1996). When being monitored, especially when it is necessary to collect data, dynamic changes in the post-totalitarian system transformation process and their historically unique character create pressure at the empirical studies level. From the point of view of the needs of the user, this task was important, yet not primary. The primary task was the process itself, used to evaluate the social and environmental context, search for space differentiation and development, identify conflict areas and determine the limits to socio-economic development.

The structure of this chapter conforms to the conceptual objectives of the project. It is oriented partly from general to specific, partly towards goal setting, from measures to their implementation. The following text covers theoretical issues and focus on the methodology used for evaluation of the environmental context in which the economic transformation developed as well as on the basic solution trends.

2.2 Model Areas and Design of the Project

The model areas for the research are differentiated hierarchically by levels of the following order of magnitude: the macro-regional level represents the Region of Ústí nad Labem (where the transformational changes are probably most sweeping within the Czech Republic), the meso-regional level represents the so-called Eastern Ore Mountains Region (very problematic mountain area in the districts of Most, Teplice and Ústí n. L.). The micro-regional level is represented by four specific landscapes (see an example on **fig. 1**), which are significant representatives of differentiated types characteristic of the meso-regional and macro-regional level (Anděl, Balej 2004).

Fig. 1 The orthophotomap of the Bílinsko model region - landscape affected by mining in the Northbohemian brown coal basin. (source: authors)

The whole project is divided in two basic levels:

1. research (theory), focusing on assessment of development and contemporary state of spatial socioeconomic structures differentiation in selected types of cultural landscape (in borderland x inland, periphery x nuclear, devastated area x stable area, highland x valley), in connections with economic transformation changes, and to definition social, ecological, cultural - historical and legislative limits of the territorial socioeconomic development.

2. practical (application), concentrating on formation of methodical procedure for delimitation of optimal alternatives of territorial development, i. e. creating the practical device for reasoned decision making process about optimal directions of socioeconomic development of a region (location) in relation to social and natural potential of the territory, its actual social and ecological load, existing natural resources, landscape carrying capacity, it all in the light of the sustainable development. General objectives of the project react to actual necessity of a finding of specific approaches to monitoring, or regulation of socioeconomic development in selected (especially peripheral, rural and non-built-up) territories in context with requirements on sustainability of this development in conditions of economic transformation changes and expected entrance of the Czech Republic to the European Union. Practical purposes of the project are oriented to acquire a background - synthetic fact-finding materials for government agents and municipal authorities and to increasing public awareness by means of popularization of retrieved findings on www pages or of seminars with experts from a practice.

Project is responding to a state, when a methodological procedure, which would support decision making sphere to optimally decide about development of region with respect to natural and social potential and landscape carrying capacity, is missing. In sequence, definitions of biotic, ecological, social, cultural and legislative limits territorial development, natural and social potential territory and landscape carrying capacity is principal objective of the project (theoretic part). Principal output of the project will be standardized methodical procedure, which will be point to finding an optimum socioeconomic development of locations, with regard to social needs and requirements for sustainable development (practical part). Methodical procedure will be applied on model locations, published in monographs, made public on seminars for specialists from practice and presented on www pages.

In the scope of this project, the authors remarks on some substantial themes **(Fig. 2)**:

1. Social structures - demographic, resident and economic factors show a synergic effect; created qualities form social structures (this forming process is - among others - affected by the environment of inherence) and we will define their basic qualities as social stresses. Social structures originate under the influence of the environment they belong to; we will define their decisive qualities as social stresses – the analysis of the interaction of social structure x cultural landscape and evaluating the incidence in particular components of social structures “inside” will lead to determining a criteria system of variables. With their help, we will evaluate social stress in particular territories, applicable for any model territory (or its type). We will proceed with the help of data collected in model regions (questionnaires – demographic data, data of a socio-economic character – functionally utilizing the territory via Global Positioning System (GPS), secondary data and their verification in the field).

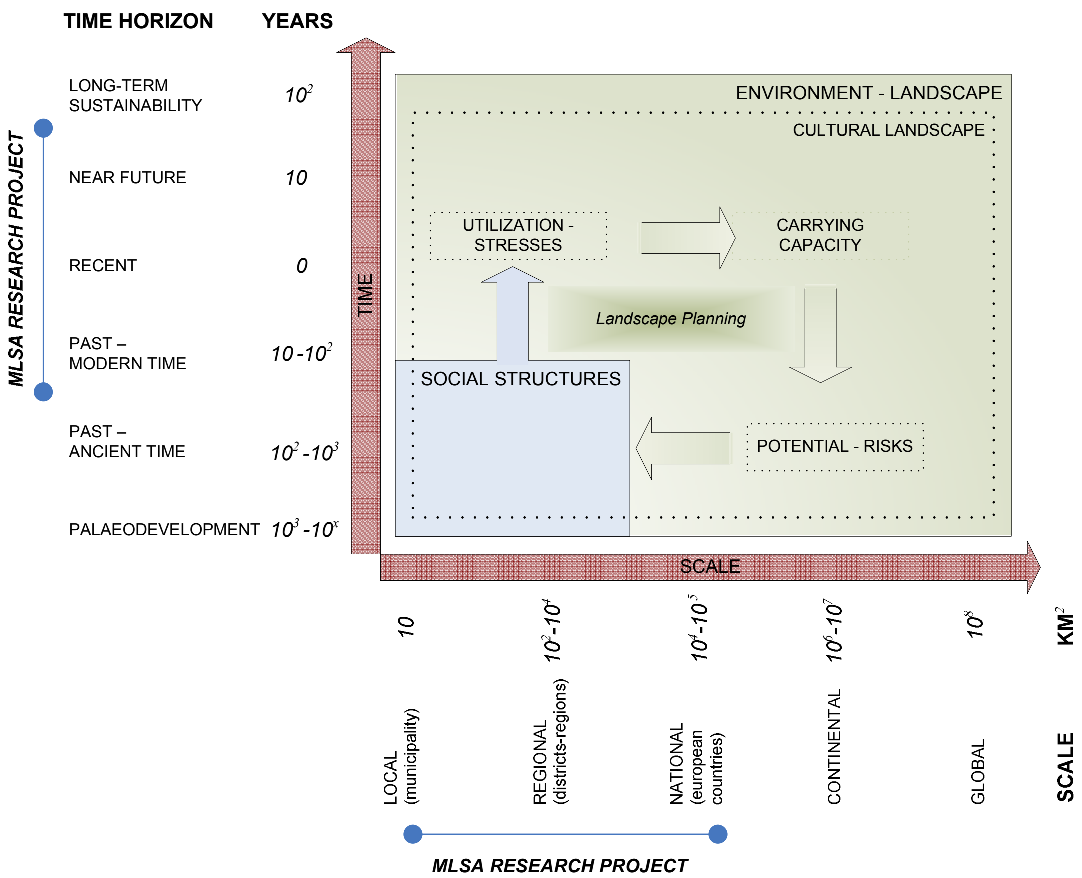
2. Cultural landscape - social structures affect (being an integral part of cultural landscape) the environment and they stress it in some way (Forman 1999, 2003); this we will define as environmental stress. Our output will be an adjusted system of criteria (we will work on the Research Institute for Construction and Architectures´ in Prague RICA/VÚVA methodology (Anděl 1994a, 1994b); we intend to adjust it, complete and subsequently apply it in various time horizons during the period of transformation in the Czech Republic). Concerning methodology, it especially concerns verifying secondary data obtained in the field by GPS (digitized digital spatial maps DMÚ DSM, DMR digital model of terrain DMT and other thematic physical geography maps).

3. Via linking systems of social and environmental stresses, we can obtain a system of variables; by using them, we are able to determine *environmental stress* in selected areas, to localize environmental stressors and risks and to quantify them and interpret them in connection with the bearing power of the landscape; another partial task that we cannot omit in this field is determining the *landscape potential* (Naveh, Lieberman 1994).

4. Connecting landscape *carrying capacity*, landscape potential and environmental stress enable us to formulate optimum cultural landscape utilization with respect to potential capacity of the environment and its stress; as a secondary effect, we can suppose defining collisions in a territory, as well as defining problematic localities in model areas. Concerning methodology, we will be using the *LANDEP* (Růžička, Miklós 1982, Růžička, Miklós 1990) and *ECCL* (environmental carrying-capacity of the landscape; Hrnčiarová 1996) ones with regard to ecological stability/dynamics concepts (Míchal et al. 1991, Míchal 1993, Buček 2002, Lipský 1996).

5. Scientific procedures obtained/verified will be a welcome improvement in the field of *landscape-ecological planning*, and thus territorial planning and decisions.

Fig. 2 Territorial, Temporal and Thematic Scope of the MLSA Research Project



Source: authors

3. Methods and Material

3.1 Collection and verification of data

Standard methods will be used for collecting data. As regards the collection of so-called primary data in the field, we will use the modern facilities of the Department of Geography at the Faculty of Education of J. E. Purkinje University in Ústí nad Labem, including geoinformatics equipment and the available software database (data on the existing utilization of a territory, its civic amenities, municipal services etc). As secondary data we consider those that have been acquired by other institutions, e.g. aerial photos (available thanks to contractual cooperation with the Department of Informatics and Geo-informatics at the Faculty of Environmental Studies of J. E. Purkinje University), digitized thematic (geological, geomorphologic etc.) maps, data from the Czech Hydro-meteorological Institute and the Czech Statistical Office, etc. However, we intend to verify secondary data by means of GPS devices and field research so that we can eliminate inaccuracies caused e.g. by generalization.

Recently, any socio-economic (territorial) development research also includes as an integral part – besides a traditionally processed “objective” view based on so-called hard data – an empirical (field) survey. Its objective is to depict (map) the “subjective” situation of a specified section of land, namely on the basis of the evaluation of so-called soft primary data. The survey process itself depends on the purpose of the project: the prevalence of research or application, the corresponding selection of respondents and, ultimately also selection of the topic. Basically, it is possible to use three types of survey, while in the project we plan to make use of the following possibilities:

1. nationwide (representative) survey of inhabitants, made to order by a specialized agency (about 1100 respondents, in 2005)

2. expert interviews with representatives (5 persons per group in the respective type of territory, i.e. 40 per group – altogether 120 interviews realized by the workers´ team, in 2006) of

a. *territorial authorities* (villages, towns and regions, specialized authorities – e.g. labour exchange offices)

b. *business subjects* performing business activities to make profit (production/non-production, with inland/foreign capital, with nationwide/regional/local coverage)

c. *NGOs* (classified according to their objectives, importance, and function)

A questionnaire submitted to inhabitants in model micro-regions (8) and selected localities of the Ústí nad Labem Region will be carried out through a network of interviewers made up of students at J. E. Purkinje University, in 2007. The respondent group was selected according to the method of so-called quota selection (gender, age, education, 8 x 300 respondents)

3.2 Objectives and steps of the research

As it was mentioned in the chapter 2.2, the project objectives are divided into two levels: theoretical (research) and practical (application).

The general objectives of the proposed project reflect the current need to find specific approaches towards the monitoring, or rather routing of socio-economic development of selected areas, especially peripheral, rural, and non-urban areas, in the context of the economic system that is undergoing transformation, accession of the Czech Republic to the European Union, and the requirements concerning sustainability of this development. The practical goals depend, in accordance with the project specifications, on the development of supporting information documents for state and territorial authorities and on increase of the public awareness to be achieved through the popularization of acquired knowledge. In the scope of methodology, the major goal is to create a methodological system that would reflect the social and ecological effects of the transformation of the economic system.

The goals of the project may be specified using the following steps:

1. To study foreign methodologies and to diagnose problems related to the utilization of biological and social potential as regards the environmental carrying-capacity of a landscape and requirements concerning economic development.

2. To identify and update methodologies through the study of local as well as foreign literature. To define the main factors influencing the process of searching for optimal socio-economic development.

3. To collect primary data (basic physic-geographical and socio-economic characteristics identified by the research team directly by the way of the field survey) and secondary data (from data-collecting institutions e.g. the Czech Statistical Bureau, the Czech Hydro-meteorological Institute, the Ministry of Agriculture, the Population Census, the Ministry for Regional Development, the Ministry of Labour and Social Affairs…), and to verify secondary data in the field.

4. To define biological, abiotic, social, ecological, cultural and historical, and legislative limits of socio-economic development.

5. To specify the biological and social potential of the territory and its current ecological and social load.

6. To determine carrying capacities and their suitability for economic utilization.

7. To draw up a structured standardized methodology designed to identify suitable (optimal) economic development as regards the socio-economic requirements of society and the requirements concerning sustainability of this development.

8. To verify the methodologies during internship stays (Institute of Landscape Ecology at the Academy of Sciences of the Slovak Republic in Bratislava, the University of Manchester, The Environment Centre, Technische Universität Dresden, Leibniz - Institut für ökologische Raumentwicklung, Dresden).

9. To develop a practical presentation in electronic form, to publish the outcomes, to give lectures. To create a web site with maps and supporting graphic documents.

4. Discussion - optimization of landscape utilization – working hypotheses and their verifications

After 1989, economic development in the Czech Republic was diversified, landscape heterogeneity, tessellation and granularity increased (Bičík 1991, Bičík et al. 1996, Jeleček 2002); differences inside social structures grew (Hampl 1995, Hampl et al. 1996). There is no doubt that these changes have their own geographical dimension as well (there are certain regularities in spatial deployment; Lausch 2003), e.g. the intensity of positive socio-economic development was much lower in rural areas (Lipský 1996), in peripheries, in mountain and foothill areas as well as in regions with long-term excessive load (social or ecological) or region of specific exploitation, such as military areas (Raška 2006). On the other hand, urban and suburban areas have suffered from non-conceptualized development many times.

Fig. 3 The multitemporal scope of the research supposes the use of historical comparative methods, which enable to concretize and visualize important changes in the cultural landscape. The picture shows the Verneřice Town in 1922 with typical historical architecture. (source: authors archive)

In total, the amplitude of differences in the socio-economic environment has increased (Hampl, Gardavský, Kühnl 1989, Hampl et al. 1996, Lipský 1996). In areas where an outflow of inhabitants and economic activities has been detected, it is necessary – in relation to the accession of the CR to the EU (chance to obtain investment capital from funds) - to search for a suitable version of economic development as regards the initial situation in a given area (biological and ecological potential, including natural resources, and set the abiotic, ecological, social, cultural and legislative restrictions of economic development) with a view to the lasting sustainability of this development. As regards the mentioned areas, this would mean: revitalization of the socio-economic environment; improvement of social, economic, and demographic characteristics; and routing of economic development of peripheral, rural, and devastated areas (e.g. Svoboda 2000).

Fig. 4 An example of new economic branch formed during the period of economic transformation - sale of kitschy article in the border areas. (source: authors)

The expected outcomes relate to the presented goals of the project especially, in the area of methodology. Members of the workers´ team are continuing their earlier research activities focused on the development of evaluation methodologies applied to some sections of objective reality; these mainly involve methodology for the evaluation of the ecological and social load in the territory of the Czech Republic (Anděl 1994a, 1994b, etc.), which was implemented in the border areas of Poland, Germany, and the Czech Republic, together forming the so-called “Black Triangle”, and socio-economic research projects in peripheral areas of North-West Bohemia. However, it is expected that the benefits for research will be much more wide-ranging. Identification of the ecological and social load on a territory represents just one partial approach (step, aspect) as far as the evaluation and appraisal of development and the state of the socio-economic environment is concerned, and as regards subsequent identification of perspectives for the economic development of spatially and qualitatively differentiated areas.

6. Conclusions - outcomes and application

Concrete outcomes of the project may be summarized in the following two basic sections:

- publications: a comprehensive methodological system applicable in the decision-making sphere, which would refine the regional and local policy of territorial economic development by defining biological and social potential, and the current ecological and social load, specifying natural resources, abiotic, ecological, social, cultural and historical, and the legislative restrictions of economic development; a treatise analyzing the load-bearing capacities of potentials, the suitability of their economic utilization as regards transformation of the economic system, and the outcomes resulting from utilization of partial methodologies; and published contributions presented at international conferences (the Czech Geographical Society, the International Geographical Union, the International Association of Landscape Ecology),

- lectures: international conferences; specialized seminars for government officials working in the area of regional development, landscape planning, protection of nature, the landscape, and the environment,

Besides the acquisition of scientific knowledge, important outcomes also include expert support for effective and well-founded decisions made at regional and local levels (regional and municipal authorities – sections or departments of landscape planning, environmental protection, and regional development). Namely, this includes the following areas:

- mapping or, as the case may be, updating of components forming individual socio-economic structures (facilities, demographic and socio-economic data, functional utilization of the landscape, structure of settlements etc),

- development of methodology which would use model localities to analyze economic development suitability as regards the current biological and social potential, environmental and social loads, natural resources, and the abiotic, ecological, social, cultural and historical, and legislative restrictions of economic development.

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Geodetic Methods in a Study of Earth Surface Processes

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Abstract

Despite both geodesy and geography "plays on the same playground" (in sense of studying, describing and modelling Earth surface, resp. landscape), cooperation of these two disciplines is not on the level as it could be. Following text should offer brief overview of available modern geodetic methods (with their basic principles), both better and less known. Beside possibilities of data collecting, some examples of following data processing are shown (as creating and use of digital terrain models). Potential and use of geodetic measuring is displayed with three practical examples (all dealing with land deformation, but each one with slightly different approach – in sense of used geodetic technique). Text describes some current research or illustrative jobs being performed and shows great potential of geodetic methods for geomorphologic studies.

Key words: deformation analysis; earth surface monitoring; geodesy; geodetic methods; landslide

1. Introduction

Challenging demands of scientific as well as commercial domain leads to breaking of "traditional" approach of any modern scientifically or/and technically based discipline. Field of Geodesy, as an example of modern technical branch, is not an exception, thus being pushed from its old-fashioned "work-for-itself" to cooperation with many different disciplines. In following text, there is described how geodesy could take its part of work in cooperation with a lot of other more or less related scientific/technical branches.

After historically long period of "method stagnation", esp. during the second half of 20th century geodesy made a huge jump in developing new methods of both collecting and processing data. However as far as geodesy made its own progress, insufficient contact with other disciplines or the public led to closing up the geodesy, as "very (maybe too much) specialised discipline, intelligible only for very limited group of people". As a result, others couldn't, or still can't, imagine what products could be achieved from geodesist and often search for certain service in other branches, despite geodetic professional is trained exactly for that work “customer” is searching for.

Purpose of this article is to show the wide variety of jobs a geodesy could support other specialised branches with, esp. those dealing with landscape or Earth surface, like geography, or geomorphology and to inspire other specialist to take into account potential of geodetic methods, while solving their project.

In Section 2 brief overview of available geodetic methods and achievable results will be shown. Section 3 will take a closer look at some methods with their practical applications. There are described three examples, all with similar kind of result, but each using different way of solution. In Section 4, some of the possible applications of geodesy in other disciplines will be described. Paragraph will more focus on geo-related sciences and give a short overview of planned works on research project “Geodetic service for Geotechnics”.

2. Methods and Material

Because we can combine collected data with data processing in many ways (depending on required product), these will be described in two separated paragraphs[1].

2.1 Collecting data

Depending on final product, proper technique (or combination of techniques) should be chosen. For making this selection, we should know requirements and outputs of each method. One of basic division could be done by selecting terrestrial and non-terrestrial approach to collecting data.

2.1.1 Units and Coordinates

In most cases, modern geodesy uses standard SI units. Several distinctions could be found, depending on national conventions. Usually, metres (m) are used for distances, square metres (m^2) for area, cubic metres (m^3) for volumes, second (s) as basic unit of time.

Many countries (including Czech Republic) use some special units for certain quantities in geodesy. E.g. for angles, geodesists usually do not use degree (°), but it is replaced by grad or gon (gon). 400 gon make a circle (instead of 360° while using degrees) and smaller units are derived in decadic number system (this simplify successive computing). Another significant change is in using gal (gal) as unit for free fall acceleration (1 mgal = 10^{-5} $m.s^{-2}$).

Measured values are usually transformed to some kind of coordinates. These could be seen in different forms. Spherical coordinates use two angles with apex in Earth’s centre[2] (from reference meridian plane to measured point known as longitude, from equator plane to measured point known as latitude) and distance (sum of Earth’s radius and height of measured point), while rectangular system uses three distances of observation point from origin, measured along parallel with each of three axes (these are perpendicular to each other). Values of each coordinate system depend on selection of reference body (sphere, ellipsoid and their parameters). These coordinates are than usually transformed to national coordinate system or left in some international one. For more information about coordinate systems see Hofmann-Wellenhof, Lichtenegger, Collins (2001), Cimbálník, Mervart (1999).

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[1] The most products are connected with some analog/digital form of displaying measured data. Because in most cases we just can’t display rough measured data, some pre-processing is needed. Usually it contains more or less simple computing, while transforming achieved data (observation) to e.g. 3D coordinates. These are used for following data processing.

[2] It is good to know, that apex of latitude angle is in Earth’s centre only in case we assume that the Earth is sphere. In geodesy, reference body is usually ellipsoid. In this case apex of latitude (called sometimes geodetic latitude) angle is intersection of ellipsoid normal (leading from observation point) with equator plane and it is NOT located in the centre (centre of gravity) of Earth.

2.1.2 Terrestrial Observing

One of the basic, and still the most used, is "traditional" theodolite[3] measuring. Technically, machines changed a much, but in principle they are very similar to those used many years ago. Every theodolite is able to measure both horizontal and vertical angle. During ages, electronic measuring of distances (using infrared or laser beam) became possible, thus potential of theodolite has increased. Theodolites equipped with integrated distance measuring unit are called Universal Electronic Theodolites or more frequently "Total Stations" (this name became usual since instruments are able to store measured data, show CAD[4] background drawing, etc.; **see fig. 1**). Problematic and principles of measuring angles or distances are more thoroughly described in Joeckel, Stober (1999) or Ratiborský (1998). Rough measured data from total station are horizontal angle, vertical angle, and distance to measured point. From these, 3D coordinates could be computed and passed to successive processing. Depending on final product, we can choose from many types of total stations, which differ mostly in accuracy of measured data. Modern total stations could achieve precision of measured angle 0,1 mgon – 20 mgon and 1 mm – 1 cm in measured distance. Final coordinates are usually achieved with centimetre precision, but while using special methods of measuring, even sub-millimetre precision of final coordinates could be achieved. Area of measuring (performed from one position of instrument) is limited by maximum range of measuring distances, which could be even few kilometres.

Another terrestrial method is photogrammetry, which uses images taken by (special) camera to gain spatial information about measured area/object (e.g. coordinates). Nowadays digital images are used for taking pictures. These are than processed with special software and instruments (e.g. 3D glasses). Main advantage of this method is fact that images are stored in archive and new processing with historical measuring could be made. Modern methods of close-range photogrammetry are able to gain coordinates with sub-centimetre precision. Area, which could be measured with one image (or a pair of images) depends on quality parameters of camera (resolution, etc.).

Fig. 1 shows an example of modern total-station, manufactured by Trimble (code-named Trimble S6), which performance was tested in Raška (2005).

1 alidade („body" of theodolite)
2 control unit (computer with color active display, equipped with Window.CE system)
3 ocular
4 radio antenna (used for communication with control unit during remote mode – so called „one man station").
5 focusing controller screw
6 horizontal and vertical fine-adjustment screw
7 on/off button

One of the most modern methods is so-called "3D-laser scanning". In basic principle, we could imagine laser scanner as theodolite with pulse-laser distance-measuring unit, which is able to measure and store ranges and angles very rapidly, while automatically incrementing angles' value

[3] Theodolite - instrument used for measuring horizontal and vertical angles.
[4] CAD – Computer Aided Design

(usually with constant step). In final effect we get huge cloud of measured points (even millions), covering area (or object) of interest with very high density. Truly real model of object could be gained, but processing of such a huge number of observations requires capable software (ability of fitting real geometric shapes and cloud of measured points is fundamental problem there). Effective area for 3D laser scanning depends on maximum measuring range of used pulse laser. Usually, modern 3D laser scanners are able to observe with field of view 360° (horizontal) and up to ranges of few hundred meters (depends on reflectivity of measured surface) with sub-centimetre point position precision (still with rate of thousands observed points per second).

Branch of geodesy could offer more interesting terrestrial methods, like gravimetry (more about gravimetry and related problems could be found e.g. in Zeman (1998), but these are of less importance for purpose of this text.

2.1.3 Non-terrestrial Methods

In fact, almost all terrestrial techniques could be "lifted-up" to the skies and be practised as aerial (or space) methods of data collecting. In general, all aerial techniques have similar advantages (e.g. large covered area) and disadvantages (unable to "see" hidden places, e.g. under dense vegetation coverage). Modern technologies also offer precision of measuring comparable to terrestrial methods results.

Logical step of photogrammetry led to so-called aerial photogrammetry. Basic principles are similar to those used in terrestrial photogrammetry, but camera is now placed in aircraft. Problem of camera position and orientation now became crucial.

Remote Sensing is in fact same as aerial photogrammetry, but camera is now placed in space, usually as a part of some satellite equipment. Some additional sensor could be added (e.g. infra-red) and coverage area became really large and data from whole part of land could be collected by one "snapshot" (while it is good to take into account high cost of images, which has to be paid to owner of satellite).

As well as photogrammtery, laser scanning could be performed as airborne technique, too. Principles are the same, but requirements on instrument position and orientation are much higher than in terrestrial version. This technique (very well described e.g. in Baltsavias 1999, an example of application in geomorphologic research is presented in Schulz 2004), is very well suitable for linear ground objects (road or railroad network, etc.), but could be as well used for topographic purposes (suffering with the same disadvantages as aerial photogrammetry – e.g. dense vegetation cover). Main advantage is achieving large amount of (high precision) data in relatively short time.

Radar interferometry (in more details described e.g. in Hanssen 2001), uses radio waves transmitted by satellite for topographic mapping, but more importantly deformation analysis, which could be performed even with sub-centimetre precision. This method is very progressive and could be used for studying land surface changes, as described e.g. in Bürgmann, Rosen (2000).

Satellite navigation is very popular in last few years, one of the most used, GPS, will be described in more detail. Whole system of GPS (Global Positioning System) consists of three segments, space segment (includes 24 satellites with nearly circular orbits with an altitude about 20200 km above Earth.), control segment (control and monitor stations, they care of functioning of whole system) and user segment (all GPS receivers). Each satellite transmit continuous signal (using two, in near future three, modulated carrier waves). While receiving signal at least from 4 satellites, we are able to compute distances to each "visible" satellite (because these measured distances differ from real geometric distances, we call them pseudoranges). With some computation performed, from satellites' position and measured pseudoranges, position of receiver (user) could be derived. Precision of achieved position differ with used type of receiver and technology used. With geodetic GPS receivers and common used methods of observing, centimetre precision (usually about 2 cm in position and 3 cm in height) of final coordinates could be gained. Moreover computing could be performed with computer integrated with GPS receiver, and final coordinates are then achieved in real-time. Advantage of using GPS is large (practically unlimited) coverage area. On the other side, we are not able to perform measuring under dense vegetation cover, inside buildings or underground. Very detailed description of GPS is presented in Hofmann-Wellenhof, Lichtenegger, Collins (2001).

2.1.4 Special Methods

There are some other techniques, focused on outer space, like satellite laser ranging (SLR) or very long base interferometry (VLBI). These are very useful for studying earth rotation parameters as well as modelling exact earth's shape or crust movements.

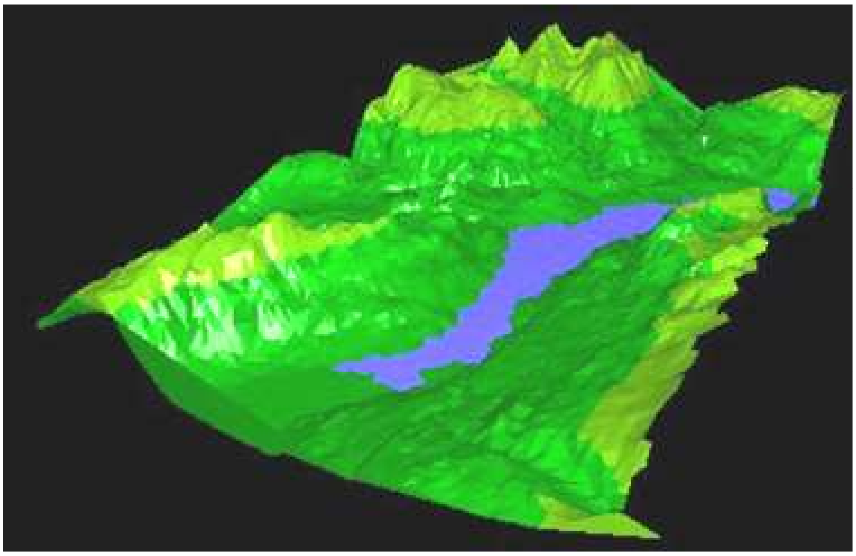
2.2 Data processing and results

With cloud of points with valid coordinates, which we receive from some kind of geodetic measuring, different ways of following processing could be done.

Nowadays, most common next step is to draw a model (2D or 3D) of measured object. Usually, some of CAD systems are used to perform that. Finally, we can get digital interactive drawing and/or "traditional" paper map. Let's take a closer look at terrain modelling and final product that could be achieved.

Very popular are so-called Digital Terrain Models (DTM), in fact, these are 3D digital drawings of part of land. DTM Software is able to compute in real time different tasks, while solving visibility of different surfaces. As basic surface we could have our DTM and by adding horizontal surface, we could model e.g. floods in displayed area. While adding bundle of parallel light beams (and then slowly moving by them), we can simulate lightning of different parts of DTM with daylight during different parts of day/year. One of the basic tasks is to transform 3D model to 2D map with contour-lines. If we imagine two DTMs of the same part of land, but each created from measuring in different time, it is easy to display land surface changes over certain time period.

Fig. 2 An example of DTM outcome from Bentley MicroStation



Source: Bentley MicroStation, modified by author

Moreover, computing of transferred volumes of soil is there really simple. It is clear, that creating profile map along arbitrary line is also possible. **Fig. 2** displays an example of DTM visualisation (area with buildings and landscape).

3. Discussion

In this chapter, some practical examples of geodetic methods will be shown. In following sections 3.1 and 3.1.1 we will try to display, how different could be the way (in sense of used method) to achieve similar goal (in this case, changes of land surface had to be monitored), while section 3.1.2 will describe combination of GPS and total-station measuring.

3.1 Total-station measurement

Unlike other geodetic methods, so-called "polar" measuring (storing angles and distances) is the most common and every geodetic company is able to perform this (and is usually adequately equipped with instruments needed to perform this kind of measuring). Because of its versatility, achievable high precision and relatively low expenses (comparing with other mentioned methods), measuring with total station is the most favourite technique for performing geodetic job.

3.1.1 "Pure" total-station measuring

Several times repeated measuring with constant time period intervals between (so-called epoch measuring) has been performed by Geodetic Company of Ing. Karel Turčin (Karlovy Vary, Czech Republic). Aim of the project was monitoring of landslides, caused by nearby activity of mining industry. Meantime, two sites are being monitored. Each required slightly different method of measuring, but in principle both are very similar (in sense of used equipment or precision requirements).

Each land slope, "suspected" to be changing, has been covered by set of stabilized point (iron rod in concrete block or long steel rods, placed into top layer of soil were used). By geodetic measuring of each of this point, precise coordinates have been gained and after some epochs, we could derive movement (or acceleration) of each point. While these points cover whole area, modelling of behaviour of whole slope could be derived. Results on site 1 (clay-quarry "Osmosa", movement of land slope (in "the worst" case, movement nearly 6 m over time period of 22 months was found). **Fig. 3** shows emplacement of range rod, used for measuring on site 2.

Fig. 3 Emplacement of ranging rod during measuring of landslide on site "Nepomyšl". Land check at background could be noticed. (source: authors)

Nowadays, re-analysis of measured data and combining with GPS method is being performed, as part of research project MSM 684077005).

3.1.2 Combination of total-station and GPS observation

While combining more methods, disadvantages of each of them (while used separately) disappears. It is possible to perform GPS measuring in open areas and fill the gaps with total station measuring. Example will be given in next paragraph, where description of one commercial job will be described.

Task was to create map with contour lines of large area (1,5 square kilometre) in as shortest time as possible, with precision in height up to 0,1 m. We divided the area into two parts. Clear/open space (fields and meadows) and woodlands. While woodlands were measured “traditionally” with total station, rest was measured with off-road car moving in “meander” pattern and with GPS receiver on the top of its roof. Each 2 s observation had been stored (later we found cloud of points too dense, so with self-made software some kind of selection – point every 25 m – had been performed). Finally, over 6000 points were used for creating contour lines map and rough measuring was finished in four days. This combination of geodetic methods proved to be very effective in measuring large areas.

3.2 Terrestrial Laser Scanning

Very useful method for monitoring landscape changes is laser scanning. Nowadays, some projects are already being performed. One of the actual one is the research project of Department of Special geodesy, Faculty of Civil Engineering, Czech Technical University in Prague. Main object of project is to develop methods for using terrestrial 3D laser scanner for monitoring movements and deformations (see Pospíšil, Štroner, Křemen 2005). In its initialisation phase, characteristic of used instruments had to be tested as well as reflectivity of different surfaces. Theoretical part of research is interested in suitable techniques of processing (and analysis) of collected data. As mentioned above, great advantage of laser scanning is high density of measured points, as well as high level of measuring automation. Illustrative example is given by works of Geodis Brno s. r. o., which uses 3D laser scanning e.g. for monitoring of cliff changes around the roads and highways (e.g. Tejkal 2005, Kolejka 2003).

3.3 Airborne and combined technologies

As well as in previous chapter, in this will be described method for monitoring landscape changes. Area of interest is located in Groningen Gas Field, the Netherlands, where subsidence was caused by Natural Gas Production (see NAM B.V. 2000).

Firstly, only levelling method was used for monitoring subsidence, but in last years two other methods have been added. Since 1994, several GPS campaign has been performed. While take GPS results alone, its precision was not good enough for purposes of subsidence monitoring. Same results have been obtained by using InSAR (Interferometric Synthetic Aperture Radar – radar interferometry method). Aims of actual research project, being performed at Technical University Delft, the Netherlands (Faculty of Civil Engineering and Geosciences) are to integrate all techniques to get final product with advantages of all techniques (both precision and area coverage and speed of collecting data). Some conclusions, preferring integration method to levelling-only case could be read e.g. in Odijk, Kenselaar (2004).

6. Conclusions

As part of research project (Pospíšil, Štroner, Křemen 2005), in near future (part of PhD project), topic “Geodetic service for Geotechnics” should be solved. Planned works include designing of suitable models for landslide movements (considering dynamic models, while combining measured movements in time with acting forces, tensions and pressures), which will allow to predict future behaviour of slope more reliable. Standardisation and testing procedures should be designed and together with models, complete step-by-step procedure of landslide measuring and analysis should be created.

Landslide measuring is in fact monitoring of landscape change, thus experience gained during this research could be easily practised in larger scale for geomorphologic studies of Earth surface and its changes.

Considering previous text, it is clear that geodetic methods hold great potential for studying changes of landscape. For each location (in sense of area size and geomorphology), there can be found suitable geodetic method to create basic 3D model and perform continuous monitoring of landscape changes in time. Since different techniques offer precision of measured point even in millimetre values, precision of such model is not limiting condition. Combination of high precision and coverage of large area is challenging for integrating/combining different geodetic methods. While assuming accessibility of all mentioned methods (or at least some methods dissimilar in their principle), practically every task could be completed to fit needs of following geomorphologic analysis.

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Cluster Analysis of Stream-gauging Stations in Northern Bohemia and Northern Silesia

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Abstract

This contribution deals with a method of cluster analysis used in applied hydrogeography. Author uses the method for determination of groups of Czech and Silesian river basins according to datasets of annual discharges 1931 - 1960. At first, several definitions of cluster analysis are presented and the basic principles of the method are characterized. In the following paragraphs, author describes the process of clustering and interprets the results according to hydrogeographical, but even climatic and geomorphic conditions of the model river basins, while he notices also several methodological advantages and disadvantages of the cluster analysis and mentions other examples of using the method in a geographical research.

Key words: cluster analysis; cluster diagram; drainage basin; runoff

1. Introduction

In recent time we can observe a tendency of general use of exact mathematical methods not only in traditional natural sciences as physics, biology but in geography too, resp. in partially integrated disciplines such as hydrogeography or applied hydrology (e.g. Ramachandra Rao, Srinivas 2006a, 2006b, Barsch, Mäusbacher, Pörtge, Schmidt 1994 eds., Nacházel 1993). This article will demonstrate using of cluster analysis for classification of randomly chosen rivers. As an example, we have chosen rivers of northern Bohemia, surroundings of the Ostrava town and two rivers of southern part of Czechia. Data of flow rate were originated from publication "Hydrological conditions CSSR", part two (1967). Data sequence of annual discharge then cover the period between the years 1931 and 1960.

2. Methods and Material

2.1 Cluster analysis - definitions and interpretations

Lukasová, Šarmanová (1985) show on the page 15 several definitions of cluster analysis according to different authors, e.g. (loose transcription):

- by Tryon (1939) "cluster analysis is universal logic process, formulated as a procedure by which we objectively aggregate single subjects into groups on a basis of their similarities and dissimilarities";

- by Bonner (1965) "there is a set of objects, while each of these is defined by the aggregate (family) of characters related to it. This family of characters is for all objects the same. We have to find clusters of objects (subset of original objects family) in a way, that all members of cluster are similar to each other, but are not too similar with objects out of this cluster";

- by Fischer, Van Ness (1971) "one of the main goals of clustering it to compress the broad information set by reduction of individual descriptions of many objects to really (objectively) smaller number of general descriptions of clusters";

- by Anderberg (1973) "this problem is usually characterized as a looking for natural groups. More concretely, it is the process of classification of observations into the groups so that degree of natural association of members of the same family is higher and members of different groups lower".

Many amendments and forms of cluster analysis have been created until these days. Their summary and selection is included in the process program which we use for processing. The important principle of clustering is the necessity to go through in this program, rate all offered separate forms of the method and to select for the interpretation only those, which agree in configuration of clusters most frequently.

2.2 Model river basins

Altogether 9 river basins were selected for the clustering and our interpretation **(see fig. 1)**. Brief characteristic of each of them is given in next paragraphs.

1) Vltava river – Zvíkov station: is situated above the confluence of the Vltava and Otava rivers. The observation proceeded during the period 1923 - 1960. Drainage area in front of the water gauge is 8197 km^2. Vltava river drains large non homogenous territory – the Táborská vrchovina (Upland), Budějovická pánev (Basin), Novohradské hory Mts. (including foothills) and Šumava Mts. (with foothills). Average annual precipitation vary from 600 mm in the Táborská vrchovina (Upland) to approximately 1000 mm in the Šumava Mts. slopes.

2) Otava – Sušice: is situated in the Svatoborská highland with hinterland of the Šumava Mts. and its foreland. Drainage area above the water gauge are 536 km^2, its altitude is 466 m. Station belongs to a basic gauging net of the Czech Hydrometeorological Institute. Average annual precipitation vary from 650 to 1200 mm.

3) Bílina - Trmice: is situated in suburb of the Ústí nad Labem and has been observing since 1898. Drainage area above the water gauge is 964 km^2 and its altitude 139, 5 m. Station belongs to basic gauging net of the Czech Hydrometeorological Institute. It drains southern slopes of the Krušné hory Mts., basin under foothills of the Krušné hory Mts. and a small part of the České Středohoří Mts. Average annual precipitation oscillate from 500 (in basin) to 800mm (at upper edge of the Krušné hory Mts.).

4) Ohře – Kadaň: has been working since 1908 (nowadays not comprised in gauging net). Drainage area over water gauge is 3505 km^2, altitude of the station is 315 m. The water is collected from slopes of the Krušné hory Mts., Doupovské hory Mts., Slavkovský les (Forest) and Smrčiny Mts. This territory is relatively rugged and annual precipitation range from 600 mm in basin to 900-1000 mm on the top of mountains.

5) Ploučnice – Benešov nad Plouíčnicí: has been observing since 1910 till nowadays. Drainage area is 1156 km^2, altitude of the gauging station is 189 m. The water drains the Lužické hory Mts. and the Ralská vrchovina (Upland). Several ponds are located in the drainage area. Precipitation vary between 600 and 800 mm per year. The gauging-station belongs to basic gauging net of the Czech Hydrometeorological Institute.

6) Odra – Ostrava Svinov: has been observing since 1878 till nowadays. The drainage area above the station is 1615 km^2, altitude of zero point 205 m. The water is collected from the Oderské vrchy (Hills), Hrubý Jeseník Mts. and Pobeskydská vrchovina (Upland). The river flows through the narrow profile of the Moravská brána. The upper reaches of the river is characteristic with several smaller water reservoirs. Annual precipitation vary about 700 mm. Station belongs to basic gauging net of the Czech Hydrometeorological Institute.

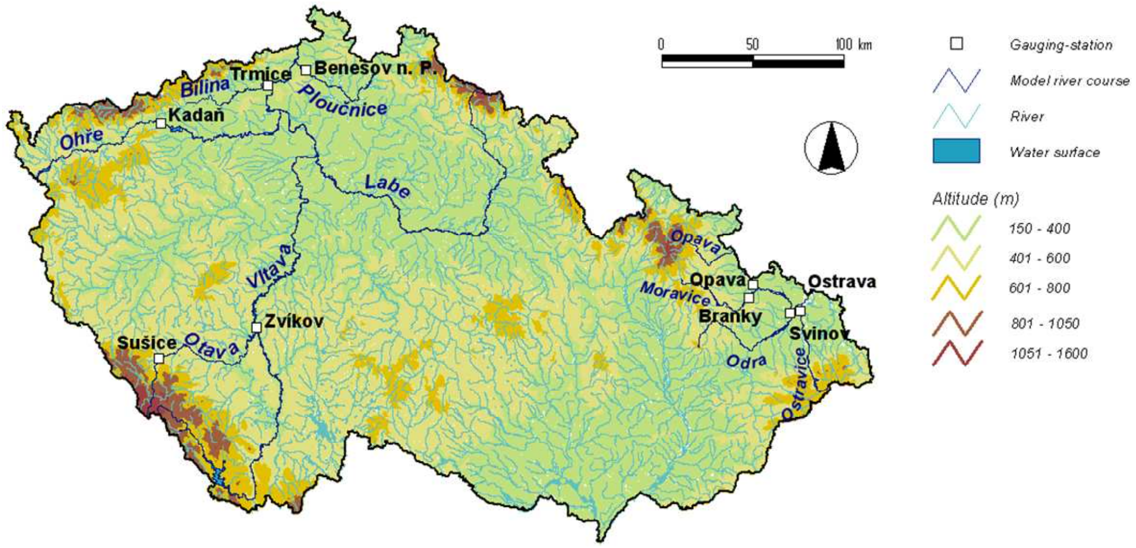
7) Opava – Opava: has been working since 1923. Drainage area is 930 km^2, altitude of the zero point 242 m. The river drains water from the Hrubý and Nízký Jeseník Mts. Annual precipitation range from 650 to 1000 mm. Station belongs to basic gauging net of the Czech Hydrometeorological Institute.

8) Ostravice – Ostrava: has been observing since 1905. Drainage area is 820 km^2, altitude 202 m. The river drains the Moravskoslezské Beskydy Mts. A large water reservoir Šance has been situated at the river basin. Annual precipitation vary between 750 and 1200 mm. Station belongs to basic gauging net of the Czech Hydrometeorological Institute.

Fig. 1 Overview and map of model river basins and gauging-stations

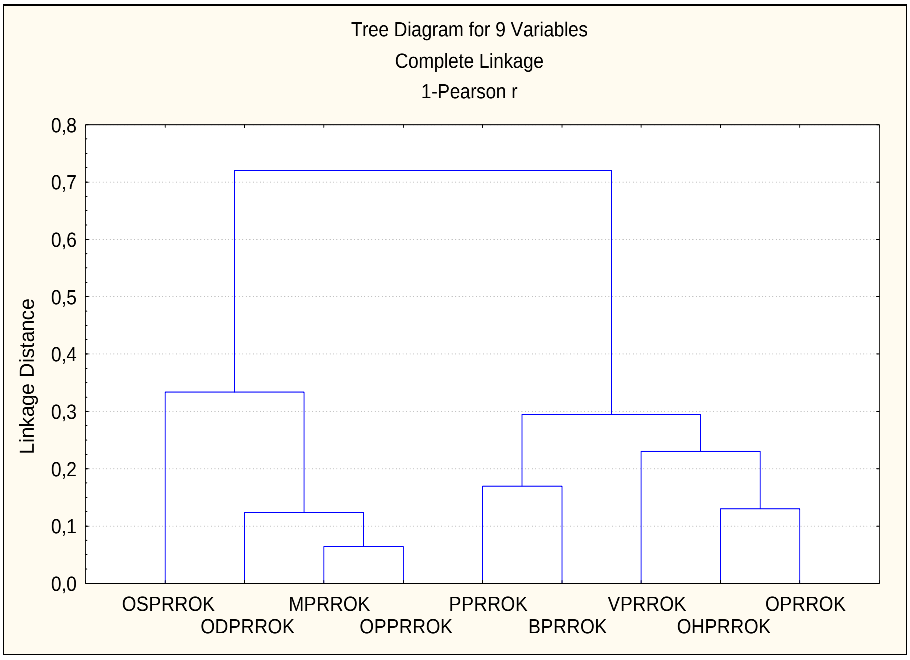
No	River	Gauging-station	Region	Observation	Drainage area (km^2)	Altitude (m)	CHMI	Code
1	Vltava	Zvíkov	S Czechia	1920-1961	8197	-		VPRROK
2	Otava	Sušice	S Czechia	since 1931	536	466	Y	OPRROK
3	Bilina	Trmice	N Czechia	since 1898	964	139,5	Y	BPRROK
4	Ohře	Kadaň	N Czechia	since 1908	3505	315		OHPRROK
5	Ploučnice	Benešov n. P.	N Czechia	since 1910	1156	189	Y	PPRROK
6	Odra	Ostrava Svinov	N Silesia	since 1878	1615	205	Y	ODPRROK
7	Opava	Opava	N Silesia	since 1923	930	242	Y	OPPRROK
8	Ostravice	Ostrava	N Silesia	since 1905	820	202	Y	OSPRROK
9	Moravice	Branka	Moravia	since 1925	716	258	Y	MPRROK

N Northern
S Southern
Y Station belong to the basic net of Czech Hydrometeorological Institute´s gauging-stations

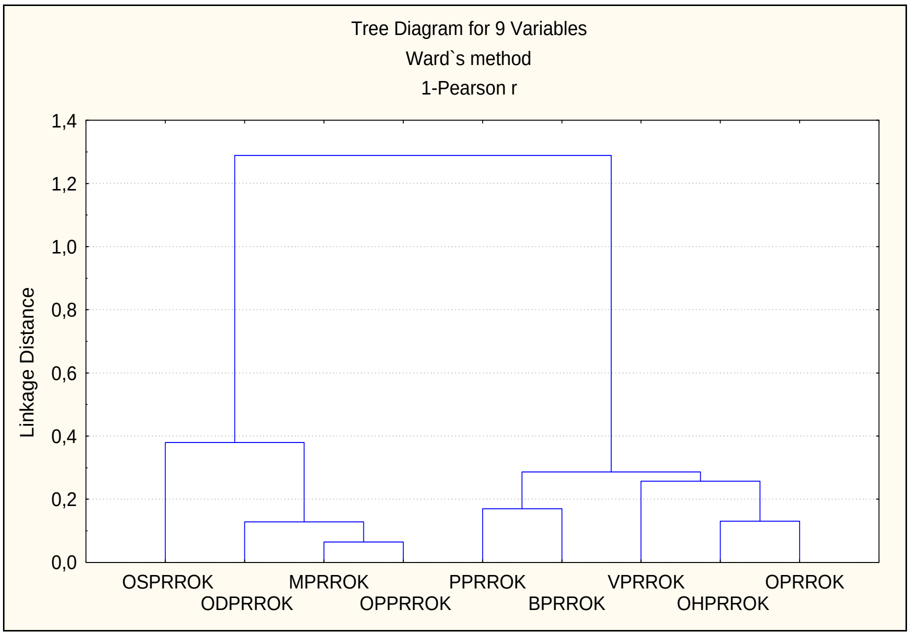


Source: author (map by P. Raška according to author’s data)

Fig. 2 Cluster diagrams for annual discharges



Explanatory notes: OSPRROK mean average discharge of OStravice river, OD – Odra, M – Moravice, OP – Opava, P – Ploučnice, B – Bílina, V – Vltava, OH – Ohře, O – Otava



Source: author

9) Moravice – Branka: has been observing since 1925. Drainage area is 716 km^2, altitude of its zero point is 258 m. It drains water from the Jeseníky Mts., Bruntálská and Vítkovská vrchovina (Upland). A large water reservoir Slezská Harta is located at the basin in present days. Annual precipitation range from 750 to almost 1200 mm. Station belongs to basic gauging net of the Czech Hydrometeorological Institute.

4. Discussion

4.1 General classification according to clustering

For our assessments we used the dataset from years 1930-1960 for it enables to evaluate the relatively natural climatic-discharge conditions without influences of water reservoirs and artificial (human) regulation of flow rates (Kaňok 1997, Balej 2004).

The first cluster **(Fig. 2)** is built by river basins Moravice, Opava, Odra, completed by slightly receding Ostravice. This cluster is quite logical. It demonstrates the climatic similarity of drainage basins, which can be illustrated with precipitation amount. Hydrologic similarity, which classified all of above mentioned rivers to the identical category, is evident for instance on rate of runoff in separate parts of drainage basins. While the Opava and Moravice is almost same in this rate and both of these rivers differs slightly in comparison with the Odra, rate of runoff by the Ostravice over 3 $l.s^{-1}.km^{-2}$ higher. Also the precipitation conditions are slightly different (especially in the regime during the year). If the 3 first rivers have only one maximum between May and July, the Ostravice has two peaks - in summer and in autumn (analogously the Olše River). This fact shows the interdependence in differences of drainage territorial determination between the basins drainaged to the Moravská brána from the Jeseníky Mts. and Beskydy Mts. Geomorphic and climatic conditions are obvious also in the flow rate, while the Ostravice is rather typical with higher flow rates.

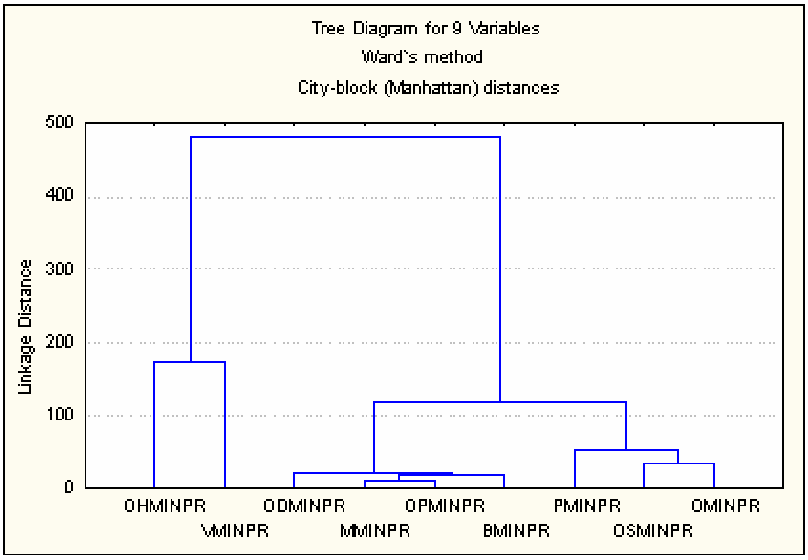
The second cluster creates the Otava with Ohře together with a pair Bílina and Ploučnice. Slightly aside is, analogically with Ostravice in the first cluster, Vltava, even not with such distinct differences. Another cluster analysis amendment gives Vltava to the group with Otava and Ohře. This cluster has a logic sense too. Similarities of these two rivers (Ohře, Otava) can be seen in comparison of conditions of outflow from surrounding hills, and similar hydrogeological structure and therefore a drain reaction on causal precipitation too. Similar is also the rate of runoff and disjunction of runoff during the year in all three stations with small dissimilarity shown at Vltava River gauging station Zvíkov. The climatic similarity is very distinct. The cluster of Bílina and Ploučnice set at the same level points on almost identical above introduced part of the cluster. Thus, it can be considered as an almost homogenous region, which is differentiated at the lower hierarchical level by certain geographical variances of local character.

Cluster analysis of randomly chosen gauging stations indicated explicit differences of rivers on Northern Moravia and in Bohemia. This conclusion is possible to complete with data processing of flow maximum **(Fig. 3)**. In case of using data of flow maximum for the same period, we can state, that the first cluster is created by two parts too (Silesia, Bohemia).

Their differences in conjunction refer to divergences in drain conditions in Silesia and Bohemia again.

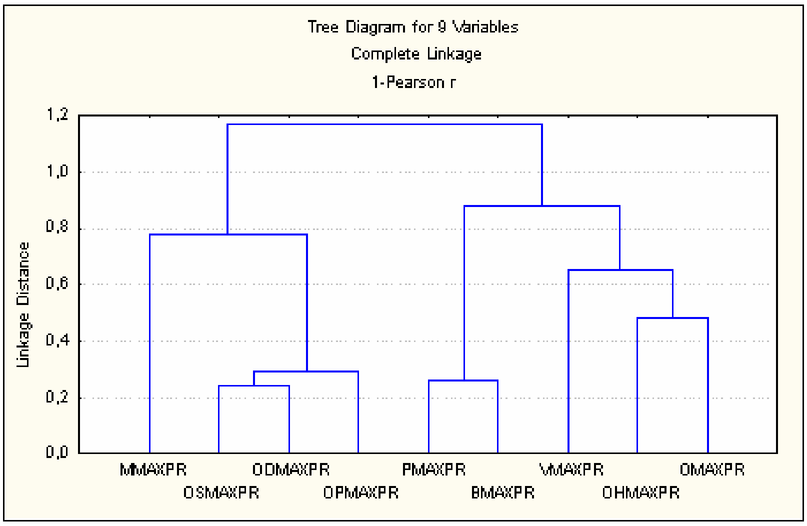
By using data of minimal flows there are two differences represented by Ohře and Vltava in comparison with above-mentioned schema. It is probably caused by the fact, that both river basins are more extent than other and so the minimal flow do not totally duplicate the precipitation situation and have not so swift runoff reaction as small drainage basins.

Fig. 2 Cluster diagrams for minimal discharges



Source: author

Fig. 3 Cluster diagrams for maximal discharges



Source: author

6. Conclusions - outcomes and application

Aim of the contribution was to emphasize the significance of cluster analysis method (in Czech hydrogeography still quite neglected) in theoretical and even applied hydrogeographical study. The method can be successfully used for regionalization of geographical objects at all (for climatology see e.g. Farský 2004, for landscape ecology and land-use changes see Raška, in press) through the processing of extent datasets. In combination with another geostatistical method, such as mass curve, resp. probability curve (or stage-discharge relation in hydrogeography) or with use of estimation theory (Nacházel 1993) the method can also serve for an assessment of impacts of landscape changes on outflow characteristics.

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GeoScape 1 (2006) 28

Congress of the Czech Geographical Society

Four years full of work, research and education passed quickly and next congress of the Czech Geographical Society is coming soon taking its place in České Budějovice in the southern Czechia. The Congress, which is organizationally supported by the Department of Geography, University of South Bohemia, will proceed during 30. 8. - 2. 9. 2006 in the following sections:

1. Sociogeographical Processes

(Head of the Section - Prof. Petr Dostál, M.A., Ph.D.)

2. Changes of a Landscape and Sustainable Development

(Head of the Section - RNDr. Vladimír Herber, CSc.)

3. Local and Regional Development/Policy

(Head of the Section - Doc. RNDr. Jan Kubeš, CSc.)

4. Cartography and Geoinformatics

(Head of the Section - Doc. RNDr. Jaromír Kaňok, CSc.)

5. Teaching of and by mean of Geography

(Head of the Section - Doc. PaedDr. Eduard Hofmann, CSc.)

6. Historic Geography and Environmental History

(Head of the Section - RNDr. Leoš Jeleček, CSc.)

7. Poster Section

Accepted contributions will be published in Proceedings of the Conference (in electronic form) and as a book of Annotations.

The time for applications is actually over, however, it is possible to come and widen anyone's geographical knowledge and contacts and get these around.

Editorial Board

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IGU 2006 Brisbane Conference

In the first half of July, the world conference of International Geographical Union (IGU) took place in Australian Brisbane, while presenting also the Czech geographical research and thought. The conference of IGU took its place in extent campus of Queensland University of Technology (QUT), which belongs with approximately 40000 students (12 % from abroad) among the largest Australian universities. As the accompanying event of the conference the 6th international geographical Olympiad proceeded with an attendance of 23 countries. Final ranking was as follows: Poland, Esthonia, Romania, the Netherlands and Australia.

The title of the conference: *Regional answers to global changes - viewpoint of "down-unders"* predetermined also the main thematic direction of the conference. IGU 2006 in Brisbane focused especially on the problematic of regional consequences reflecting the global changes of the Earth´s (natural and social) systems with emphasis given on tropical, arid, respectively long-term degraded regions. Key issues aimed at local and regional impacts and influences of natural resources exploitation; at constructive solutions of natural risks, disasters, including climatic change; at ability of regions to sustain and improve their social, cultural and environmental values; at role of geographers in regional an urban planning of sustainable environment.

The IGU 2006 program comprised plenary sessions, keynote sessions and specialist session. Plenary sessions were held by significant geographers such as Gary Brieley (University of Auckland, New Zealand), Blair Fitzharris (University of Otago, New Zealand), Jamie Kirkpatrick (president IAG, Australia), or Michael Goodchild (University of California, USA). These speakers emphasized the increasing importance of Asia-pacific region in global system, influence of global warming on island areas, or the necessity of preservation of original species in urban environment. Main sections were thematically oriented for instance on: vulnerable populations, geography and administration, geographical perspectives of sustainable development, social aspects of global changes, climatic changes and their consequences. Totally, more than 50 specialist sessions proceeded presenting almost 850 geographers from ca 50 countries (e.g. Japan, Singapore, USA, Australia, Saudi Araby, Romania, France, New Zealand, India, Egypt, UK, Czechia, Russia, Switzerland, China, Canada, South Korea, Poland, Taiwan, Brazil, the Netherlands, Ireland, Spain, Slovakia, Island, Italy, Argentina, Belgium, Vietnam, Portugal, Israel, Finland, Norway, JAR, Sweden, Turkey, Fiji, Denmark, Mexico, Croatia, Latvia, the Philippines, Indonesia, Thailand, Austria, Papua New Guinea).Specialist sections met the wide ranging spectrum of geographical-related problems concerning issues of arid, coastal, tropical or polar environments, as well as tourism development, regional and local planning, cultural globalization, social and health risks of population, or newly improved tools of GI modeling. Most engaged sections were "Multicultural space and cultural geography", "Mankind and its vulnerability", "Geographical Informational Systems", "Sustainability of hydrological systems", "Tourism, recreation and changes of social systems".

Closing ceremony was started with speech of chairman of organizational committee of IGU 2006 - John Holmes (University of Queensland, Australia), followed by forthcoming president of IAG (Institute of Australian Geographers, Australia) Jim Walmsley, and subsequently by president of IGU Adalberto Vallega (Italy). Ceremony continued with a speech of former and new secretary of IGU Ronald Abler (USA) and Woo-ik Yu (South Korea). At the end, Adnane Hayder (Tunisia) invited all attendees to Tunis 2008 IGU conference.

Czech geography was represented by 12 geographers from Charles University Prague (8), Palacký University Olomouc (2) and University of J. E. Purkinje Ústí nad Labem (2).

Jiří Anděl, Martin Balej

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Students from Bielefeld at the University of J. E. Purkinje

Cross-border based cooperation in research and study belong among the best sources for improvement of language as well as methodical (applied research) skills. Thus, any example of such cooperation deserves a top attention, especially when the prime participation pertains to students on both border sides.

Prof. Hennings speaking at the end of presentation of the project

Several students of geography from the Technische University in Bielefeld (Germany) led by Prof. Hennings were studying recent socio-geographical and environmental situation in the North-western Czechia during the summer months of 2005. Organizational and translation help was offered and provided by the academic worker and student of the Department of Geography, UJEP Ústí nad Labem (Czechia). Collection of statistic data from several institutions, field work (inquiry focusing on perception of long-term landscape changes in North-bohemian brown-coal basin) and following statistic processing and interpretation of acquired information formed a fundament for the official presentation at the Department of Geography, UJEP (spring 2006).

Editorial Board

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Web-contact list of Selected Middle-European Geographical and Related Journals

According to aims and above mentioned future effort of editorial board (see the Foreword to this issue of GeoScape journal), we would like to help any interested geographer with better orientation in both thematically and regionally wide-ranging spectrum of scientific journals published in the Middle European countries. Thus, we decided to create a permanent chapter of the journal, which should support our intention and will be published in actualized form in every issue. List of web-contacts has a simple structure combining regional and thematic structure. Basic informational sheet about each journal includes its title, publisher and web site contact.

Notes for simple searching:

1.X Czech journals

2.X Slovak journals

3.X Polish journals

4.X German journals

5.X Hungarian journals

X.1 GEOL-GEOPH	geology and geophysics (often combined with geodesy)
X.2 GEOM	geomorphology
X.3 GEOGR	geography
X.4 SOCIO	social aimed sciences (sociology, demography etc.)
X.5 ENV	environmental issues
X.6 CART-GEOINFO	cartography and geoinformatics
X.7 SCIENCE	other unspecified sciences

If you know any other concerned journal, which should by add to this list, we would be grateful for your information. You can also improve the basic information sheet (e.g. characteristic of the journal, e-mail contacts, free web issues, submission conditions, etc.). After the control made by editorial board, the list will be automatically actualized.

<u>1. CZECH JOURNALS</u>

1.1 GEOL-GEOPH

GeoLines

- *Geological Institute, Czech Academy of Sciences*

http://www.gli.cas.cz/geolines/

Journal of the Czech Geological Society

- *Czech Geological Society*

http://www.geologickaspolecnost.cz/jcgs/index.php

1.3 GEOGR

Geografie – Sborník ČGS

- *Czech Geographical Society*

http://www.geography.cz/

Historická geografie

- *Historical Institute, Czech Academy of Sciences*

http://www.hiu.cas.cz/perio-histgeografie.php

Moravian Geographical Reports

- *Institute of Geonics, Czech Academy of Sciences*

http://www.geonika.cz/MGR.html

Acta Universitatis Carolinae - geographica

- *Charles University*

http://www.geography.cz/acta/

Acta Universitatis Palackianae Olomucensis - geographica

- *Palacký University*

http://publib.upol.cz/~publ/AUPO.htm

Geografické rozhledy

- *Cartography Prague, a.s.*

http://www.geografickerozhledy.cz/

1.4 SOCIO

Czech Sociologic Review

- *Institute of Sociology, Czech Academy of Sciences*

http://www.lib.cas.cz/casopisy/cz/Sociologicky_casopis.htm

1.6 CART-GEOINFO

Geodetický a kartografický obzor

- *Czech Office for Surveying, Mapping and Cadastre; Geodesy, Cartography and Cadastre Authority of the Slovak Republic*

http://www.vugtk.cz/odis/cd2001/cuzk/adr07/gako/gako.html

Zeměměřič

- *Czech Office for Surveying, Mapping and Cadastre*

http://www.zememeric.cz/

2. SLOVAK JOURNALS

2.1 GEOL-GEOPH

Contributions to Geophysics and Geodesy

- *Geophysical Institute, Slovak Academy of Sciences*

http://gpi.savba.sk/cgg.html

Geologica Carpathica

- *Cartpathian-Balkan Geol. Assoc.; Geological Institute, Slovak Academy of Sciences*

http://www.geologicacarpathica.sk/src/main.php

2.2 GEOM

Geomorphologia Slovaca

- *Association of Slovak Geomorphologists, Slovak Academy of Sciences*

http://www.asg.sav.sk/gfslovaca/index.htm

2.3 GEOGR

Geografický časopis

- *Institute of Geography, Slovak Academy of Sciences*

http://www.aepress.sk/

Geographia Slovaka

- *Institute of Geography, Slovak Academy of Sciences*

http://www.geography.sav.sk/vyd_cinnost.html#geog_slovaca

Acta geographica Universitatis Comenianae

- *University of Komenský*

http://www.fns.uniba.sk/~aguc/index.html

2.4 SOCIO

Sociológia

- *Institute for Sociology, Slovak Academy of Sciences*

http://www.sociologia.sav.sk/socas/index.html

2.5 ENV

Ekológia

- *Institute of Landscape Ecology, Slovak Academy of Sciences*

http://www.aepress.sk/ **http://uke.sav.sk/journals.htm**

Životné prostredie

- *Institute of Landscape Ecology, Slovak Academy of Sciences*

http://gopher.fns.uniba.sk/zp/casopisy/zp/index.htm

http://uke.sav.sk/journals.htm

Slovak and Czech journals dealing with Environmental Issues

http://gopher.fns.uniba.sk/zp/casopisy/index.htm

2.6 CART-GEOINFO

Kartografické listy

- *Slovak Academy of Sciences*

http://www.geography.sav.sk/vyd_cinnost.html#geog_slovaca

2.7 SCIENCE

Journal of Hydrology and Hydromechanics

- *Institute of Hydrology, Slovak Academy of Sciences*

http://www.ih.savba.sk/jhh/

3. POLISH JOURNALS

3.1 GEOL-GEOPH

Studia Geologica Polonica

- *Institute of Geological Sciences, Polish Academy of Sciences*

http://www.ing.pan.pl/stud4www/index.html

Geologia Sudetica

- *Institute of Geological Sciences, Polish Academy of Sciences*

http://www.ing.pan.pl/sudewww/index.html

Acta Geophysica

- *Institute of Geophysics, Polish Academy of Sciences*

http://agp.igf.edu.pl/

3.2 GEOM

Landform Analysis (Journal of the Association of Polish Geomorphologists)

- *University of Silesia, Association of Polish Geomorphologists*

http://www.sgp.org.pl/la/lav1.htm

Studia Geomorphologica Carpatho-Balcanica

- *Geographical Commission of Cracow Branch of Polish Academy of Sciences*

http://www.fns.uniba.sk/cbgc/studiaCB/index.htm

3.3 GEOGR

Geographia Polonica

- *Institute of Geography and Spatial Organization, Polish Academy of Sciences*

http://www.igipz.pan.pl/wydaw/GP.htm

Bibliography of Polish Geography since 1985

http://www.cbgios.pan.pl/bazy/bgp/english.html

Wieś i Rolnictwo

- Institute of Rural and Agricultural Development, Polish Academy of Sciences

http://www.irwirpan.waw.pl/

3.4 SOCIO

CEFMR Working Papers

- Central European Forum for Migration Research, Polish Academy of Sciences

http://www.cefmr.pan.pl/index.html

3.5 ENV

Polish journal of ecology

- Centre for Ecological Research, Polish Academy of Sciences

http://www.pol.j.ecol.cbe-pan.pl/

Polish journal of environmental studies

- Polish Academy of Sciences

http://www.pan.olsztyn.pl/pjoes/index.html

3.7 SCIENCE

Oceanologia

- Institute of Oceanology, Polish Academy of Sciences

http://www.iopan.gda.pl/editorial.html

4. GERMAN JOURNALS

4.1 GEOL-GEOPH

Geologische Rundschau (until 1999)

- Springer Verlag

http://www.springerlink.com

International Journal of Earth Sciences

- Springer Verlag

http://www.springerlink.com

4.2 GEOM

Zeitschrift für Geomorphologie

- Gebr. Borntraeger Verlagsbuchandlung

http://www.schweizerbart.de/j/zeitschrift-fuer-geomorphologie/

4.3 GEOGR

Geographische Zeitschrift

1 *- Deutsche Gesellschaft für Geographie*

2 http://www.geographie.de/

3 STANDORT - Zeitschrift für Angewandte Geographie

- Deutscher Verband für Angewandte Geographie

4 **http://www.geographie.de/dvag/standort/welcome.html**

5 Deutsche Gesellschaft für Geographie

http://www.geographie.de/dgfg/verbaende_e.htm http://www.geography-in-germany.de/

ERDE - Zeitschrift der Gesellschaft für Erdkunde zu Berlin

- Gesellschaft für Erdkunde zu Berlin

http://www.die-erde.de/

5. HUNGARIAN JOURNALS

5.1 GEOL-GEOPH

Acta Geodaetica et Geophysica Hungarica

- Geodetic and Geophysical Research Institute, Hungarian Academy of Sciences

http://www.akkrt.hu/main.php?folderID=1589&articleID=3914&ctag=articlelist&iid=1

5.3 GEOGR

Geographical Bulletin

- Geographical Research Institute, Hungarian Academy of Sciences

http://www.mtafki.hu/Ertesito_en.htm

5.4 SOCIO

Sociology

- Institute of Sociology, Hungarian Academy of Sciences

http://www.socio.mta.hu/06.htm

5.7 SCIENCE

Hungarian electronic journal of Sciences

http://hej.sze.hu/