

**Authors:** Jan GELETIČ, Michal LEHNERT

**Title:** GIS-based delineation of local climate zones: The case of medium-sized Central European cities.

**Abstract:** Stewart and Oke (2012) recently proposed the concept of Local Climate Zones (LCZ) to describe the siting of urban meteorological stations and to improve the presentation of results amongst researchers. There is now a concerted effort, however, within the field of urban climate studies to map the LCZs across entire cities, providing a means to compare the internal structure of urban areas in a standardized way and to enable the comparison of cities. We designed a new GIS-based LCZ mapping method for Central European cities and compiled LCZ maps for three selected medium-sized Central European cities: Brno, Hradec Králové, and Olomouc (Czech Republic). The method is based on measurable physical properties and a clearly defined decision-making algorithm. Our analysis shows that the decision-making algorithm for defining the percentage coverage for individual LCZs showed good agreement (in 79 – 89% of cases) with areas defined on the basis of expert knowledge. When the distribution of LCZs on the basis of our method and the method of Bechtel and Daneke (2012) was compared, the results were broadly similar; however, considerable differences occurred for LCZs 3, 5, 10, D, and E. It seems that Central European cities show a typical spatial pattern of LCZ distribution but that rural settlements in the region also regularly form areas of built-type LCZ classes. The delineation and description of the spatial distribution of LCZs is an important step towards the study of urban climates in a regional setting.

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**Authors:** Zdeněk PŘIBYLA, Tomáš GALIA, Jan HRADECKÝ

**Title:** Biogeomorphological effects of leaf accumulations in stepped-bed channels: Exploratory study, Moravskoslezské Beskydy Mountains, Czech Republic.

**Abstract:** The stepped-bed system, with a step-like longitudinal profile, is typical morphology in steep headwater streams. These systems are created by a series of coarse sediments or instream wood (steps with supercritical flows) interspaced with finer material (forming pools with subcritical flows). In the case of well-developed steps and pools, the resulting channel-reach morphology is referred to as “step-pool” morphology. In this study, we identify a previously undescribed type of step-pool formation, the “foliated step-pool”, in the high-gradient Stoligy Stream of the Moravskoslezské Beskydy Mountains. The defining feature of this formation is the significant presence of leaves in the step structure. The geometry of the steps and pools was measured and the parameters that characterise the distribution, amount and function of leaves acting in these areas were defined. Statistical results showed differences between non-foliated and foliated step-pool formations, in which the latter showed a significant increase in storage level, influencing the channel’s hydrodynamics. Particle-size analyses demonstrated that foliated step-pool formations had finer sediment in the pools, which indicates that there are differences in sediment transport processes between foliated and non-foliated formations. These results offer new insights into stepped-bed and step-pool morphology, providing directions for further research on small streams in deciduous forested regions.

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**Authors:** Václav ŠKARPICH, Matěj HORÁČEK, Tomáš GALIA, Veronika KAPUSTOVÁ, Vladimír ŠALA

**Title:** The effects of river patterns on riparian vegetation: A comparison of anabranching and single-thread incised channels.

**Abstract:** Riparian vegetation reflects the current conditions and the dynamics of streams. The floodplain vegetation along the watercourse of the Morávka River was subject to study in this project. In some reaches, the river has the natural character of an anabranching gravel-bed stream; in contrast, other Morávka R. reaches are incised into the bedrock. These cases were used to assess potential changes in vegetation conditions as evidence of negative processes taking place in the gravel-bed streams of the Beskydy Mts. The results demonstrate a higher biodiversity in the floodplain along the anabranching river channel. In contrast, the floodplain along the incised river channel shows low biodiversity values. Redundancy analysis was used to determine the relationships between plant species composition, distance from the main channel and relative elevation from the mean water level of the main channel. In addition, the results show a higher degree of change in plant species composition on the floodplain along the incised river channel. The analysis of floodplain groundwater fluctuations shows a decreasing trend in the annual maximum groundwater level.

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**Authors:** Miloš RUSNÁK, Milan LEHOTSKÝ, Anna KIDOVÁ

**Title:** Channel migration inferred from aerial photographs, its timing and environmental consequences as responses to floods: A case study of the meandering Topľa River, Slovak Carpathians.

**Abstract:** The bank erosion area, rate of bank retreat and overall geomorphological and financial effects of channel migration due to recent flood events (over the time span 1987–2009) are identified using remotely sensed data and GIS. A 39 km-long reach of the meandering, gravel bed Topľa River (Flysč Slovak Carpathians) was selected as the study area. Based on the analysis of culmination discharges, two different flood periods are identified. The first one (1987–2002) is characterised by the dominance of low magnitude flood events, compared to the second one (2002–2009) with higher magnitude floods. Aerial photographs from 2002 and 2009 were chosen as a way to capture the morphological changes that occurred after the flood periods, while those from 1987 served as the reference point. In total, an area of 85.2 ha was eroded and 60.1 ha were deposited. The average channel shift per year doubled from 0.8 m/year (1987–2002) to 1.6 m/year (2002–2009). The most eroded land cover category in the riparian zone is floodplain forest, followed by arable land, grasslands and pastures and shrubs. From an economic point of view, the eroded floodplain with arable land and grassland (€ 29,924.02 in total) is a negative consequence of channel migration.

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**Authors:** Zdena KRNÁČOVÁ, Juraj HREŠKO, Miriam VLACHOVIČOVÁ

**Title:** An evaluation of soil retention potential as an important factor of water balance in the landscape.

**Abstract:** The ability of soil to retain water in its profile is one of the most important soil functions. It is expressed as the water storage capacity or retention capacity of the soil, and it is primarily affected by the physical properties of the soil. Given the fact that the direct measurement of hydrological data for the soil is very difficult in terms of capacity, statistically expressed pedotransfer functions (PTF) are currently used for the indirect estimation of

hydrolimits. The data most commonly used for the PTF are easy-to-measure and usually readily available soil data on particle size, bulk density, organic carbon and morphometric parameters of the environment (e.g., slope of the relief, etc.). The listed pedotransfer functions are deficient for the complex evaluation of soil cover; given disagreements about the attributes, they cannot be directly used for the vector database of classified soil-ecological units in the Slovak Republic. Therefore, we have created a model of an algorithm from selected parameters compatible with the vector database of classified soil-ecological units, which also allows for the spatial distribution of the cumulative coefficient of water retention capacity (CWRC) for the soils of the SR. The results of this evaluation are presented using case studies of the areas of Levoča and Hriňová.

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**Authors:** Łukasz SARNOWSKI, Zbigniew PODGÓRSKI, Dariusz BRYKAŁA

**Title:** Planning a greenway based on an evaluation of visual landscape attractiveness.

**Abstract:** The potential for using a standardized landscape evaluation method for planning a greenway in a young glacial area in northern Poland is evaluated in this paper. In the evaluation of visual landscape attractiveness (VLA), we took into account not only its natural but also its cultural components. The cultural components were divided into two groups, i.e. increasing and decreasing VLA scores. The sources of data needed for the evaluation included a Vector Smart Map level 2 (VMap L2), aerial photographs and a field survey. The newly-designated greenway links two landscape parks (which play the role of greenspaces) and runs along numerous lakes, forests, rivers, and objects of cultural heritage. The greenway is composed of existing local roads, allowing a more optimal utilization of natural and cultural resources of the landscape, primarily those located between the selected greenspaces. Using this application, the idea of sustainable development can be implemented, and the overlapping protected areas will not be subject to devitalization. The VLA method can facilitate multiple greenway designations in other areas.

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