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Analysis of projected climate change in the Carpathian Basin region based on Holdridge life zone system

Zoltán Szelepcsényi (1), Hajnalka Breuer (2), and Pál Sümegi (1)

(1) Department of Geology and Palaeontology, Institute of Geography and Geology, University of Szeged, Szeged, Hungary (szelepcsenyi@geo.u-szeged.hu), (2) Department of Meteorology, Institute of Geography and Earth Sciences, Eötvös Loránd University, Budapest, Hungary

Nowadays more and more environmental lobbyists believe that climate change must be demonstrated in a new form. The estimated temperature increase can be realized more easily, if the emphasis is on ecological effects of the predicted temperature. For this reason a bioclimatic classification method was used to analyse the projected changes for the Carpathian Basin region. We applied the Holdridge life zone system, which is relatively simple, so our results can be used to inform the population.

Holdridge developed a geometric model for climate classification which declares the relationship between classes (life zones) and climate indices (mean annual biotemperature, average total annual precipitation, potential evapotranspiration ratio). The necessary data for this study was derived from regional climate model (RCM) experiments of the ENSEMBLES project using the SRES A1B emission scenario. The temperature and precipitation data series were bias corrected for the selected RCM simulations. The target area of our investigations is the Carpathian Basin region.

Life zones maps were created using the selected RCM simulations and their ensemble mean for the periods: 1961–1990 (T1), 2021–2050 (T2), 2061–2090 (T3). The spatial distribution of life zones and their temporal changes were investigated. According to our results the spatial pattern of life zones changes significantly from T1 to T3. It is possible that some types of life zones (e.g. boreal rain forest) will disappear; and some types (e.g. warm temperate thorn steppe) will appear in the target area. We determined those RCM simulations which predicted the maximum and minimum changes of the spatial pattern of life zones. Maps of T1 were compared to maps of T3 using Cohen's Kappa coefficient. Furthermore, relative extents, vertical distribution patterns and mean centres of life zones have been analysed. These parameters were defined for each decade and also for T1, T2 and T3. The temporal changes of the decadal values were analysed with Mann-Kendall trend test. Overall, our results predict that the mean centres of life zones will shift towards north in most cases.

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