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Spatial distribution of the sinkhole and sinkhole affecting factors in the vicinity of Karapınar (Konya, Central Turkey)

OZDEMIR A.

Selcuk University, KONYA, TURKEY

There are several hundreds of sinkholes in the vicinity of Karapınar. Agricultural irrigation has accelerated the formation of sinkholes. About 20 big sinkholes occurred within the territory of the Obruk Plateau between 1970 and 2012. Formation of sinkholes is the most serious geological hazard in the study area, because they can damage engineering structures, settlement and agricultural areas. There is no study conducted on distribution of sinkholes in this region. In this study, spatial distribution of the sinkholes existing in the region and the factors affecting sinkhole formation were studied through the geographical information systems. In the study, first of all, 182 sinkholes, which had been formed in the region, were determined through a topographical map by examining the digital elevation model produced by using this map. Then, they were mapped after they had been checked through the field studies. On the other hand, topographic, geomorphologic, geologic and hydrogeological 30 factor maps, which were considered effective in sinkhole formation, were produced to investigate their relation with sinkholes. According to this investigation, it was determined that sinkhole formation around Karapınar has become more concentrated in the areas in which topographic elevation is low (972-1081 m). The sinkholes across the region have generally been formed as a result of dissolution of Neogene aged lacustrine Insuyu formation made of limestone and clayey limestone. Furthermore, sinkhole formation increases as drainage lines and faults become closer (<1000 m) and cover thickness decreases (<30 m). As a result, factors affecting sinkhole formation were identified. Injuries and property losses caused by sinkhole formation may be prevented or reduced by using sinkhole susceptibility and risk maps, which may be produced according to these factors.

River basins of Russian Plane: geomorphometrical analysis and geomorphological zoning

MALTSEV K., MALTSEV K., YERMOLAEV O.

Kazan Federal University, KAZAN, RUSSIAN FEDERATION

The article describes computer-aided delineation method for little river basin watersheds of Russian Plane. First, algorithm and vector planar map of basin's watersheds was created for this territory. The digital elevation model "GTOPO30" was used for creating 27630 river basins of 3-4 order. The average catchment area of these basins is 107 km²; minimum area - 1.4 km²; maximum area - 430 km². Estimating of model accuracy was accomplished. The geomorphometrical analysis was realized for every river basin. Elevation, slope, magnitude of average catchment area, plan and profile curvature was calculated.

Second, algorithm of computer-aided geomorphological zoning was developed for Russian Plane. The self-organizing map (kind of artificial neural network) was used for this task. The basins were used for zoning as operational-territorial units. The morphometric parameters of river basins were involved in this process as classification features. The main classification features were elevation and slope. The 225 initial classes were used for zoning. This count was reduced to 13 thematic classes at the last stage of classification.

The verification of computer-aided zoning map shows rather good coincidence with map, which was made earlier by traditional method.

The laws of "Horton-Rzhanitsin" were validated for rivers from different natural zones and morpho-genetic types of relief. The regularities between count of different orders water flows, average length and bifurcation coefficient were confirmed during of spatial analysis.

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