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研究论文

黄土高原小流域土壤容重及水分空间变异特征

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摘要 在黄土高原小流域尺度上，地形和土地利用是影响土壤变异的重要因素。在横山县朱家沟小流域采集了82个样点，选取土壤容重和水分作为研究对象，分析比较不同土地利用及不同景观位置下二者的变异及分布特征；分析了土壤容重和水分与地形因素的关系并利用地形与土地利用信息进行了回归分析。结果表明，不同土地利用类型之间，土壤容重变异较小，其大小次序为：灌木林地>荒草地>梯田>坝地>林地>坡耕地；土壤水分变化相对较大，大小次序为：坝地>荒草地>灌木林地>坡耕地>林地>梯田。在不同景观位置，土壤容重大小变化表现为：坡顶>沟平地>坡下>坡上>坡中；土壤水分大小变化为：沟平地>坡中>坡下>坡上>坡顶。基于数字地形分析技术，提取相关地形指数，与土壤容重和水分进行相关分析并进行多元回归分析，结果表明：土壤容重与复合地形指数CTI正相关；土壤水分与高程呈现负相关关系，和剖面曲率正相关。建立了多元线性回归模型，结果发现模型对土壤容重预测结果比较理想，但对于土壤水分的预测存在较大的平滑效应，残差较大，须进一步探讨。

关键词 土壤容重及水分； 空间变异；地形因子； 回归分析

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Spatial variability of bulk density and soil water in a small catchment of the Loess Plateau

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Abstract Topography and land use types are key factors which affect soil properties variability on catchment scale in the loess hilly area. Spatial variation of bulk density and soil water were analyzed according to different land use types and different landscape positions, based on data from 82 points in Zhujiagou catchment in Hengshan county. Correlation analyses were carried out between bulk density, soil water and terrain attributes. Finally, terrain attributes and land use types were used to predict bulk density and soil water spatial distribution by multiple-linear regression analysis. There is little difference in bulk density among different land use types, but there is a tendency: shrub land>grassland>terrace farmland>check-dam farmland>woodland>slope farmland. For soil water content, that the tendency is: check-dam farmland>grassland>shrub land>slope farmland>woodland>terrace farmland. The bulk density series for bulk density according to landscape position is: crest>flat>lower slope>upper slope>middle slope. For soil water content the positions order is: flat>middle slope>lower slope>upper slope>crest. Correlation analyses were carried out between bulk density, soil water and terrain indices. It was found that there is positive correlation between bulk density and compound topographic index (CTI); There is a strong negative correlation between soil water and elevation, and a positive correlation between soil water and profile curvature (Kv). The regression model is precise for the soil bulk density, but the variation is rather large and there is a more smoothing effect on the predicted values for soil water.

Key words bulk density and soil water _ spatial variation _ terrain attributes _ regression analysis

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