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山西芦芽山林线附近土壤水分空间分布特征及其影响因素

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Spatial Distribution of Soil Water Content and Its Influential Factors in Transition Zone Along the Treeline of Luya Mountain,Shanxi Province

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摘要 于2008年植被生长季，在芦芽山荷叶坪亚高山草甸及森林—草甸过渡带内布设观测样带，应用FDR土壤剖面水分测量仪测量10～40cm深度土壤含水量，并分析其空间分布特征和影响因素。结果表明：（1）根据所处位置及地上植被状况可将样带分为林地样带和草甸样带，林地样带土壤含水量随深度增加呈先升高后降低的变化趋势，草甸样带则恰好相反。（2）10和40cm深度为土壤含水量稳定层，20和30cm深度为活跃层，且林地样带10cm深度土壤含水量小于草甸样带，20、30和40cm深度土壤含水量则大于草甸样带。（3）降雨发生后，阴坡上部树岛样带土壤含水量增幅最大，阳坡上、中、下部草甸样带土壤含水量增幅也较大；不同土层深度比较而言，10cm深度土壤含水量增幅最大，20、30和40cm深度土壤含水量增幅较为接近，土壤含水量对降雨的响应存在1～2d的时滞。（4）10、20和30cm土壤含水量变化值与坡度显著正相关，30、40cm土壤含水量变化值与初始土壤含水量呈显著负相关，20、30cm土壤含水量变化值与地形湿度指数呈显著负相关。研究区内土壤含水量空间分布格局及其动态变化受植被和降雨影响显著，初始土壤含水量、坡度以及地形湿度指数对其也有一定影响。

关键词： 土壤含水量 林线 芦芽山 环境因子

Abstract： The objectives of this study are to investigate spatial distribution of soil moisture during the tree growing season,and analyze its influencing factors.Water contents in soil profiles were measured and its environmental and topographic factors analyzed in July and August 2008.The 18 monitored points were divided into 6 sections,where spatial distribution of soil moisture,relationship between soil water content and vegetation,topographic factors and initial soil moisture were analyzed.Soil moistures were measured using frequency domain reflectometry(FDR),air temperatures and raninfalls were measured using the automatic weather stations,the topographic wetness index(I_{TW})and slope were woked out from DEM.The data were analyzed using SPPS 13.0 software.Soil water content increased with increasing soil depth in the 10-30 cm soil layer in the forest section,and decreased in soils at 40 cm in depth,and an opposite trent was found in the meadow section.The soil water contents in soils at 10 and 40 cm in depthe were relatively stable and at 20 and 30 cm in depth quite active.The soil water contents in soils at 20,30 and 40 cm in depth were higher in the forest section than in the meadow section,with the maximum difference being 40.47%,whereas at 10 cm in it was higher in the meadow section than in forest section.Soil mosture in all the sections was significantly affected by rainfall,peaking in 1-2 d after the rainfall event.The largest increase in soil moisture was found on the top of shady slopes and in the 10 cm soil layer,and a larger increase in soil moisture on sunny meadow slopes and in the 20-40 cm soil layer.The variation of soil moisture during the observation period was significantly related to slope in the 10-30 cm soil layer and negatively related to I_{TW} in soils at 30 and 40 cm in depthe,and negatively related with initial soil moisture in soils at 20 and 30 cm in depth.The findings show that,the temporal and spatial variation of soil water content was significantly affected by vegetation and rainfall.In some areas the variation of soil water content was affected not only by rainfall and vegetation,but also by initial soil moisture,slope and I_{TW}.

Keywords： treeline soil water content Luya mountain environmental factor

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