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农田墒情动态二区模拟模型

Dynamic two-zone balance model for simulating soil moisture

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英文关键词: [models](#) [soil moisture](#) [dynamics](#) [soil moisture prediction](#) [root extension](#)

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中文摘要:

为准确模拟土壤计划湿润层内墒情动态变化,基于土壤-植物-大气连续体物质能量运动及土壤水动力学的基本理论,考虑作物根系伸展和吸水特性,把土壤水分变化土层划分为随作物根系伸展而改变深度的包含主要根系的动态根区和无根系的储水区,构建了变根区墒情动态二区模型。模型根区深度随着作物根系伸展改变,以此准确表达土壤计划湿润层内墒情的动态变化;将储水区的土壤水分作为模型变量,计算根区下界面水分通量,由此间接地考虑了深层土壤水分对作物蒸发蒸腾量的影响。将模型拟合误差作为目标函数,采用自由搜索算法率定模型参数。应用建立的模型进行墒情模拟,模拟相对误差小于 $\pm 5\%$ 和 $\pm 10\%$ 所占的比例分别为49.09%和94.55%;经t检验和回归分析表明预测值和实测值相差不大,具有较好的一致性,决定系数为0.779,模型具有较高的模拟精度,能准确反映计划湿润层内墒情的变化。

英文摘要:

Based on the soil-plant-atmosphere continuum and soil water dynamics theory, considering crop root extension and root water uptake, a dynamic two-zone model was built, which divided the soil moisture changing layer into two zones, namely, the active root zone and moisture storage zone. In the active root zone, the variation of the dynamic soil moisture with the depth change of crop root zone was described. In the moisture storage zone, the water flux on lower boundary of the root zone which indirectly has effects on crop evapo-transpiration was analyzed. Using the soil moisture of the storage zone as the model variable, the simulation fitting error as objective function, the optimization model parameters were solved using Free Search method. A comparison between the simulation results of the dynamic two-zone model and the observed values showed that the proportion of relative errors less than $\pm 5\%$ is of 49.09% and $\pm 10\%$ of 94.55% respectively. The t test indicated that the predicted values and the observed values had good consistency. The regression analysis indicated that their correlation coefficient was 0.779. These results show that the model has a high simulative precision.

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