THREE SYSTEMS OF SOIL HYDROPHYSICAL FUNCTIONS WITH COMMON SETS OF PARAMETERS: VERIFICATION AND COMPARISON USING DATA ON CLAY, LOAMY AND SANDY SOILS

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The paper considers three systems of functions that describe the water-retention capacity and hydraulic conductivity of soilы. The first system is formed by the functions of Van Genuchten and Mualem-Van Genuchten, the second system contains the improved functions of Kosugi and Mualem-Kosugi, the third system includes the improved Haverkamp function and the original function of the soil hydraulic conductivity. The functions of each system have common sets of parameters. In the first system the parameters are formal, the parameters of the second and the third systems have physical and statistical meaning. The parameters were identified by the method of dot approximation of data on the water-retention capacity of clay, loamy and sandy soils from the catalog of Mualem. Using the parameters, the ratios of the values of the hydraulic conductivity function to the filtration coefficient were calculated. The errors in the prediction of the relative hydraulic conductivity of all three soils were estimated based on the results of calculations and the data from the catalog of Mualem. A comparative analysis of the three systems was carried out on the basis of the obtained estimates using the Williams-Kloot criterion. The compared systems have commensurate inaccuracies in the dot approximation of experimental data on water-retention capacity with a confidence probability of 0,95. According to the prediction of the relative hydraulic conductivity, the following results were obtained: for clay and loamy soils, the errors of the second system were smaller than those of the third system, and the errors of the third system were smaller than those of the first system; for the sandy soil, the error of the second system were smaller than those of the first and third systems, the errors of the last two were commensurable. The second system was slightly more accurate than the third system in the prediction of the relative hydraulic conductivity, since the functions of the third system were continuous approximations of the functions of the second system.

Key words: soil hydrophysical functions, parameters, water retention capacity, moisture filtration coefficient, soil hydraulic conductivity.