

## HYSTERESIS OF WATER-RETENTION CAPACITY OF SOIL: FUNCTIONAL DESCRIPTION AND VERIFICATION

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The paper considers the causes of hysteresis of the soil water-retention capacity. An explanation of the closed loop, which is formed by the main branches of drying and wetting, as well as open loops, which are formed with the participation of scanning hysteresis branches, is proposed. The problem of the artificial (methodical) «pump effect» is analyzed. This effect is possible when the parameters of the function of the soil water-retention capacity which are used to describe the hysteresis phenomenon are formal and have no physical meaning. Mathematical models describing this phenomenon are presented. They use three functions of soil water-retention capacity: (i) Van Genuchten function, (ii) improved Kosugi function, (iii) improved Haverkamp with co-authors function. The improvement of functions (ii) and (iii) is achieved by applying a physically interpreted additional additive parameter that takes into account the «air entrance» pressure for the drying branches and the «water entrance» pressure for the wetting branches of the soil water-retention capacity. The prospects of using hysteresis models for calculating precision irrigation rates in land reclamation agriculture are characterized. Using the Williams-Klout criterion, a comparative analysis of the presented hysteresis models was carried out regarding the error of the dot-approximation of experimental data on the main branches (for parameter identification), as well as regarding the error in estimating the scanning branches of water-retention capacity on the example of «4126 *Molonglo river sand*».

**Key words:** mathematical model, main and scanning branches of hysteresis, dot-approximation of experimental data, prediction, Williams-Klout criterion.



