DOI: https://doi.org/10.37162/2618-9631-2022-3-144-160

Modelling upper-layer soil available water capacity by neural ordinary differential equations / Golov V.A., Bykov Ph.L. // Hydrometeorological Research and Forecasting, 2022, no. 3 (385), pp. 144-160.

The studies on applying the neural ordinary differential equations (ODE) to the problem of modeling soil available water capacity were performed. The modification of the neural ODE for the problem with additional external meteorological (precipitation, wind speed, air temperature, and dew point) and categorical (crop type, soil type, and prevalent land cover type) parameters was proposed. The experiments led to the conclusion that the models based on the neural ODE are promising for modeling such complex unclosed systems as water exchange in the upper 0-10 and 0-20 cm soil layers. The considered nonlinear models perform much better than linear ones: the mean absolute error (MAE) of the 10-day available water capacity forecast is equal to 3.20 and 5.53 mm in the 0-10 and 0-20 cm soil layers, respectively. The proposed approach is promising for modeling processes in the soil and making management decisions in the agro-industrial complex.

Keywords: available water capacity, neural differential equations, machine learning, neural networks

Tab. 3. Fig. 3. Ref. 17.