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The RANGES system: structure, calculation procedure and application example / Bogdanovich A.Yu. // Hydrometeorological research and forecasts, 2025, no. 1 (395), pp. 37-50.

The RANGES computing system is described, which is intended for calculating the climatic area of distribution (CAD) of a natural phenomenon based on the climatic characteristics and parameters (climatic predictors) – hydrometeorological variables and indices calculated on their basis – that determine the formation of the CAD. The methodology of the system is based on a probabilistic Bayesian approach, which allows assessing the belonging of a geographic point to the CAD of the phenomenon under study. The system is implemented as a set of programs and is equipped with a user-friendly interface to automate the process of data entry, minimizing errors. The system maintains operation both with observational data and with data of global and regional models (in the present version of the system, these are the models of Marchuk Institute of Numerical Mathematics of the Russian Academy of Sciences and Voeikov Main Geophysical Observatory). The software package allows taking into account multiple climatic predictors to describe the conditions influencing a natural phenomenon. Based on the analysis of climatic predictors, the system provides probabilistic estimates of the belonging of geographic points to the CAD and ranks the estimates according to the IPCC methodology.

An example of using the RANGES system to calculate the dominant CDA in the warm season (defined as a period with a number of days with positive temperatures above 182) is given. Changes in the CDA for the base period (1990–1999) and for 2030–2039 and 2050–2059 under the RCP8.5 scenario are calculated. Shifts in the boundaries of the warm-season dominant CAD illustrating the impact of climate change are shown.

Keywords: climate, natural phenomenon, climatic area of distribution, computing system, application example

Tab. 2. Fig. 3. Ref. 15.