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Modelling distribution of daily mean values of cloudiness*

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The paper deals with cloudiness persistence based on the Zagreb-Grič observatory data. Autocorrelation within a series of daily mean cloudiness (dmc) has been indirectly analyzed by means of frequency distribution of total cloudiness (0–10) at observation times (7, 14, 21 hrs local time) and the dmc distribution. These distributions generally have a characteristic U, J or L form of beta distribution. The dmc empirical distributions, however, show considerable deviation from the theoretical ones, which is shown in the appearance of additional, more or less pronounced, maxima. Besides the form of cloudiness degree distribution at various terms, the basic characteristics and details of dmc distributions are influenced by autocorrelation values. These interdependencies have been studied by means of a model formulated by Gringorten for modelling conditional probabilities. On the basis of empirical cumulative frequencies, each degree of total cloudiness has been associated with a corresponding normal deviate interval. This transformation provides the determination of joint probabilities of individual total cloudiness degree couples by means of a bivariate normal distribution. Then, assuming this is the Marcov process, joint probabilities for 11^3 possible cloudiness degree combinations in three observation terms can be calculated. The values of these probabilities range from 10^{-7} to nearly 0.5. Theoretical frequencies of separate dmc classes are obtained by adding joint probabilities for corresponding combinations of term cloudiness observations. The autocorrelation coefficient, which is the only free model parameter, was determined in the way that dmc theoretical distributions should fit the empirical distributions in the best way.

Finally, there is a brief survey of application of the results to data control, interpolation od missing data, and verification of cloudiness forecasting.

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