Monte Carlo simulation of air temperature, pressure and relative humidity joint non-stationary time-series

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A stochastic model of air temperature, relative humidity and atmospheric pressure joint time-series is presented. The model is based on long-term observations at meteorological stations, where weather elements were measured every 3 hours. Month-long time-series are considered as a periodically correlated random process, the period of which is equal to 1 day. To describe the correlation structure of time-series, sample correlation matrices are used. Instead of sample one-dimensional distributions mixtures of Gaussian, beta and gamma-distributions are used. Parameters of the mixtures are time-dependent periodic functions whose values ​​are determined from real data. On the basis of simulated trajectories, some statistical properties of rare meteorological events were studied.

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