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Estimations of flood's and rain's probabilities with the aid of generalization to Tchebysheff's and Kolmogorov's inequalities

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There is a problem of estimation of probability of floods and rains. It has been stated for any random value (aleatory variable)$\boldsymbol{\zeta}$, any function $\boldsymbol{\varphi(\zeta)}$ and any exponent (***m***) ***m***: (***m***>0 *or* ***m***<0) that

$$\frac{E\left[\left|\varphi(\zeta)\right|^m\right]-\left[\sup\limits_{\omega:|\zeta|<c}\left|\varphi(\zeta)\right|\right]^m}{\left[\sup\limits_{\omega\in\Omega}\left|\varphi(\zeta)\right|\right]^m-\left[\sup\limits_{\omega:|\zeta|<c}\left|\varphi(\zeta)\right|\right]^m}\le P\{|\zeta|\ge c\}\le\frac{E\left[\left|\varphi(\zeta)\right|^m\right]-\left[\inf\limits_{\omega\in\Omega}\left|\varphi(\zeta)\right|\right]^m}{\left[\inf\limits_{\omega:|\zeta|\ge c}\left|\varphi(\zeta)\right|\right]^m-\left[\inf\limits_{\omega\in\Omega}\left|\varphi(\zeta)\right|\right]^m}. \quad (1)$$

Inequality (1) is the connection of generalized Tchebysheff's inequality and generalized Kolmogorov's estimation. This expression has been used for point estimation to probability of floods in Neva River in S.-Petersburg and precipitation in Osaka under condition of unknown distribution function. The experimental data are shown by blue on two pictures. The results of point estimations are shown by red, yellow and violet.

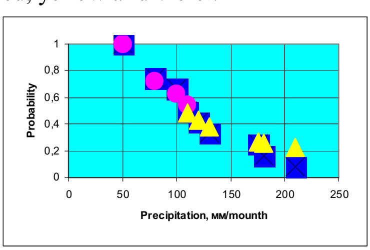

figure 1. Point estimation of precipitation in Osaka

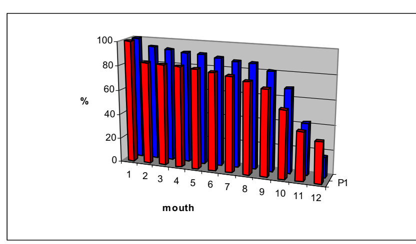

figure 2. Point Estimation of probability to Neva River flood in S.-Petersburg

All experimental data are fully corresponded to the stated inequality.

Keywords: precipitation; flood; probability; estimation

References

[1] N.V. Sokolov, *Doklady akademii nauk,*. **384**, 308 (2002).