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Average nearest-neighbor distance in a raingauge network. Analytical and practical examples.

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The motivation for the research came from the interpolation of precipitation, but the content of the paper deals with estimating the average nearest and n-th neighbor distance in a general 2-D point pattern (in our case that is a raingauge network). Research was carried out to find the relationship between total number of raingauges, area size and shape of domain on one side and average distance to the n-th neighbor on the other. Other authors have shown that when homogeneity and infinite domain is assumed, an analytical formula can be obtained and this procedure is repeated in the paper. For a circular domain, one gets a 1st neighbor formula, given by an integral which has to be integrated numerically. For all further-away neighbors and other domain shapes the best way seems to be a computer program using a random number generator. Test were performed using other domain shapes and the results show that the average distance to the nearest neighbor is always larger in a limited than in an infinite domain. The size of difference depends on the total number of raingauges in domain and on the fact how "one-dimensional" is the shape of domain. The length of border by itself does not inherently influence the size difference. However the difference is small in total number of raingauges is large and therefore the more simple infinite domain equation can usually be used. For any tested domain the difference was less than 10% if the number of raingauges was larger than 100.