Distance measures for hydrological data having a support.

L. Gottschalk (1) and E. Leblois (2)

(1) University of Oslo, Department of Geosciences, Oslo 3, Norway (lars.gottschalk@geo.uio.no, +47 22854215), (2) Cemagref, 3 bis quai Chauveau, CP 220, F-69336 Lyon Cedex 09, France

Covariances, correlations as well as semivariograms are commonly represented as functions of distance. How can distance between data having a support (e.g. runoff data from a drainage basin area) be uniquely defined? There are several possible alternatives. The most frequently used is the Euclidian distance between centres of gravity. The Matèrn formulation of the covariance function for data having a support is exploited in this paper. The interest is especially devoted to the determination of the density function of all possible distances between/within line segments or areas and to what extent the expected value of this distribution (called Ghosh distance) might be a proper distance measure. The Ghosh distance appears in the approximate estimation by a truncated Taylor expansion of the correlation/covariance for data with a support (with truncation after the first term). This distance is not zero for the distance for a basin with itself and thus accounting for the averaging effect for the variance of basin runoff. Distance density functions are developed for simple geometries, which eventually can approximately describe a real basin. Ghosh-distances within drainage basins as a function of the areas for the Glomma River basin in Norway, Moselle River basin in France and for all basins in Costa Rica are compared with these simplified geometries. The Ghosh distance and the distance between centres of gravity are compared for the same three sets of empirical data. The explanation to the different performances revealed is first of all to be found in the existence of nested basins, which are relatively many in case of the Glomma and the Moselle and few for Costa Rica.