

Abstract:

The knowledge of spatial variability of rainfall is a key issue for regionalization in hydro-climatic studies. The purpose of this study was to analysis the spatial variability of monthly and annual rainfall and to determine the best method of spatial interpolation in Sistan and Baluchistan province. The choice of interpolation method depends on data type, desired accuracy, area of interest, computation capacity, and the spatial scale used. Hence, different interpolation methods, including geostatistical based methods (OK, SK, Sklm, KED, UK and COK), univariate deterministic methods (IDW, LPI, GPI and RBF) and techniques based on regression analysis were compared for this purpose. The primary variable was rainfall data collected from 50 rainfall stations over the same period of 25 years (1988-2012). Secondary data including the height, distance to sea, latitude and longitude were used as covariates in the multivariate methods. Cross validation method was used to evaluate the performance of various interpolation methods. The comparison criteria used were including the root mean square error (RMSE), the mean bias error (MBE) and the coefficient of determination (r^2). The cross validation results showed that the best method for rainfall estimation was linear regression based on rainfall- height relationship for April, KED for May, UK for June and September, RBF for July, August, October, December, January, February and annual rainfall and SK for November and March. LPI and GPI methods did not perform well in any of the periods studied. Using height as covariate have improved the estimation results only for April and May. However, the distance to sea did not improve the results in any case. The reasons for little improvement of the rainfall estimation through the multivariate methods could be the complex topography, low density of meteorological stations, low correlation between rainfall and covariates and no strong spatial correlation of covariates. The advantage of geostatistical approaches is to provide the maps of the estimation error. According to the estimation error maps, the highest

estimation errors were seen in the area with a low density of stations and boundaries of the province.

Keywords: Rainfall, Interpolation, Kriging, Regression, Multivariate approaches, Digital Elevation Model, Distance to sea, Sistan and Baluchestan



University of Zabol
Graduate school
College of Water and Soil
Department of Water Engineering

**The Thesis Submitted for the Degree of Master of Science
(in the field of Water Resources Engineering)**

**Assessment of Regression Based and
Geostatistical Interpolation Techniques
for Determining the Spatial Distribution
of Monthly and Annual Rainfall in
Sistan and Baluchestan Province**

Supervisors:
Dr. M. Delbari
Dr. P. Hagheghatju

Advisor:
M. Amiri

By:
O.Podineh

2014