Spatial Analysis of Monthly and Seasonal Rainfall in Sri Lanka

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Climate change is a critical factor that effect on the variability of environment in many countries globally. Sri Lanka being a country where agricultural sector contributes to the highest proportion of its economy, it is very crucial to identify climatic changes in the growth of the sector. Water plays a major role in agriculture as Sri Lanka face to climatic changes over the time. It is important to manage water resource and changes in precipitation should be identified as a solution for the climatic changes in Sri Lanka. In this study, dense and homogeneous monthly rainfall data over a 10 years period from 2009 to 2018 were considered which is comprised of main 22 rain-gauge stations in Sri Lanka. The main objectives of this study are examining the existence of trends in monthly and seasonal distribution, identifying regional precipitation differences by the spatial interpolation of detected monthly trends and finding the most suitable interpolation technique out of six interpolation methods that were identified from the previous literature. Trend analysis was done by using Mann Kendell test which is non-parametric statistical test and ArcGIS 10.1 software was used for spatial interpolation in geostatistical techniques. Global Polynomial Interpolation, Local Polynomial Interpolation, Inverse Direct Method, Ordinary Kriging, Universal Kriging, Complete Regularized Spline interpolation methods were used to examine the changes in magnitude of unmeasured areas using monthly rainfall data. Root mean squared error (RMSE) value in cross validation is used to compare the identified interpolation techniques. Results exhibits that the positive trends are only shown during the months February, April, May and October which indicate that they are not prominent. Seven out of twelve months show a significant negative trend for 19 stations. For seasonal analysis southwest monsoon shows both positive and negative significant trends while first inter monsoon and Northeast monsoon indicate a negative trend. In conclusion, there were no prominent trends identified in both seasonal and monthly analysis and Kriging method was identified as the optimal algorithm with a minimum RMSE value for monthly spatial interpolation.

Keywords: ArcGIS, Precipitation, Trend analysis, Interpolation

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