

An Application of Equivalent Uniform Depth (EUD) of Precipitation Method to Investigate Spatial Distribution Patterns of Rainfall

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An Investigation of spatial variations of rainfall distribution is very important to predict the physical characteristics of watershed (catchment) and some important correlations among them. Therefore, the aim of this study was to apply Equivalent Uniform Depth of Precipitation Method in order to examine the actual patterns of spatial distribution of rainfall among sub-catchments of selected watershed by using the Thiessen Polygon (Voronoi Diagram or Dirichlet Tessellation) technique.

The selected catchment (Kukule) consists of three sub-catchments. It is also one of the major tributaries of the Kalu Ganga in Sri Lanka. According to the literature reviewed, there are three main ways in which EUD can be calculated for a watershed; Arithmetic Mean Method, Isohyetal Method, and the Thiessen Polygon Method. Ten rainfall gauging stations were observed for this study: eight out of these ten stations were located inside the catchment and two were outside (near) the catchment.

According to the non-uniform distribution of observed gauging stations and also, in order to achieve accurate assessment of spatial distribution patterns of rainfall within the catchment, the Thiessen Polygon Tessellation technique was applied to calculate the EUD. In order to adjust the non uniform rainfall gauging stations' distribution through the Thiessen Polygon Tessellation technique, a weighting factor was used for each gauging station. The weighting factor was based on the size of the area concerned, within the catchment that is closest to the gauging station being considered. Almost all those areas (ten polygons) were irregular polygons. The extents of all the irregular polygons were measured and weighted averages for all stations' rainfall were used to calculate the EUD. The spatial distribution of average rainfall in all irregular polygons was assumed to be similar with rainfall values of relevant gauging stations. ArcGIS 9.1 software was used to delineate the Thiessen Polygons.

According to the results, weighted rainfall values of catchment were ranged from 253.99mm to 522.12mm. Finally the catchment was classified into five weighted rainfall intensity classes; 'Least or Insignificant', 'Low', 'Moderate', 'High', and 'Very High'. The net EUD for the catchment was 3743.18mm. The analysis of the findings of the study revealed that the most effective EUD values were related to Wewagama and Koswatta sub-catchments and that the net EUD shows that the catchment belongs to the Wet Zone of Sri Lanka.

Keywords: Equivalent Uniform Depth (EUD), Thiessen Polygon Tessellation, rainfall, catchment (watershed)