COURBE REGIONALE D'INDICE DE CRUE BASEE SUR LA CLASSIFICATION HYDRO –GEOMORPHOLOGIQUE

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ABSTRACT

Regional frequency approaches are frequently proposed in order to estimate runoff quantiles for non-gauged catchments. Partitioning methods such as cluster analysis are often applied in order to regionalize catchments.

This study presents an investigation based on the moving average clustering method related to watershed Hydro-geomorphic descriptors and aims to construct mean regional frequency curves for specific maximum discharges, using Hydro-geomorphic descriptors for cluster analysis.

The delineation pooling groups (regions) is based on distances calculated between sites in multidimensional space: hydrological, physiographical and geomorphological characteristics.

Resulting clusters are then checked for hydrological homogeny using the test of Hosking and Wallis (1997, 2007) based on L-moments estimates. This test is based on the maximum specific discharges observed quantiles. Afterwards, an index flood curve is constructed for each homogeny cluster. Respectively, GEV, Weibull and Log-Normal regional curves are also fitted in order to estimate regional maximum flood frequencies curves.

We consider in this work twenty (20) catchments situated in the Tunisian ridge, monitored since 1992. Latitudes vary from 35°N to 37°N and longitudes from 8°E to 11°E; areas range between 1 km2 and 10 km2. These catchments are located in a semi-arid zone; with annual average rainfall fluctuating between 280 mm and 500 mm. The relief is moderately high to-high for the majority of the basins, which helps rapid runoff. These catchments are little permeable to impermeable. The rain gauge network consists of 20 gauges. Observed hyetographs are divided in five (5) minutes time interval.

The delineation of regions in multidimensional space involves hydrological, physiographical and geomorphological characteristics. These characteristics are: area, perimeter, maximum altitude, minimum altitude, specific height, global slope index, equivalent rectangle length, equivalent rectangle width, Gravellus index, the percentage of pasture land ; the percentage of forest cover , the percentage of cereal culture area, the percentage of arboriculture area and the percentage of area affected by anti-erosive practices, specific maximum discharge, runoff volume, time to peak, base time, infiltration index and runoff coefficient.

Due to the large difference in parameters range, a standardisation approach is initially applied to parameters values. After achieving classification, two clusters have been identified as acceptably homogeneous (regions).

Length series of maximum specific discharges observed quantiles (Qmax sp) related to all watersheds are reported in Figure 1 with watersheds names in abscises. Qmax specific index is defined as the ratio:" Qmax sp/mean(Qmax sp)".

For this index, the sample Hazen frequency related to each region is skilled and compared to common statistical distributions.

In order to define the best fitting regional curve Several statistical distributions are skilled (GEV, Weibull, Log-Normal...). Therefore the root mean squared errors (RMSE), mean errors, are calculated. Regional Weibull curve is defined as best fit for standardized maximum specific discharges, for the first homogeny region (Figure 2). However regional Log-Normal curve is better fitted for the second region (Figure 3). This result will be helpful in case of ungauged or poorly gauged basins. It remains a primarily study and we will investigate in more clustering methods and characteristics including other soil properties parameters.

Key words: clustering, regionalization, homogeneous region, Hosking and Wallis test, ungauged, frequency distribution, Kendall Tau

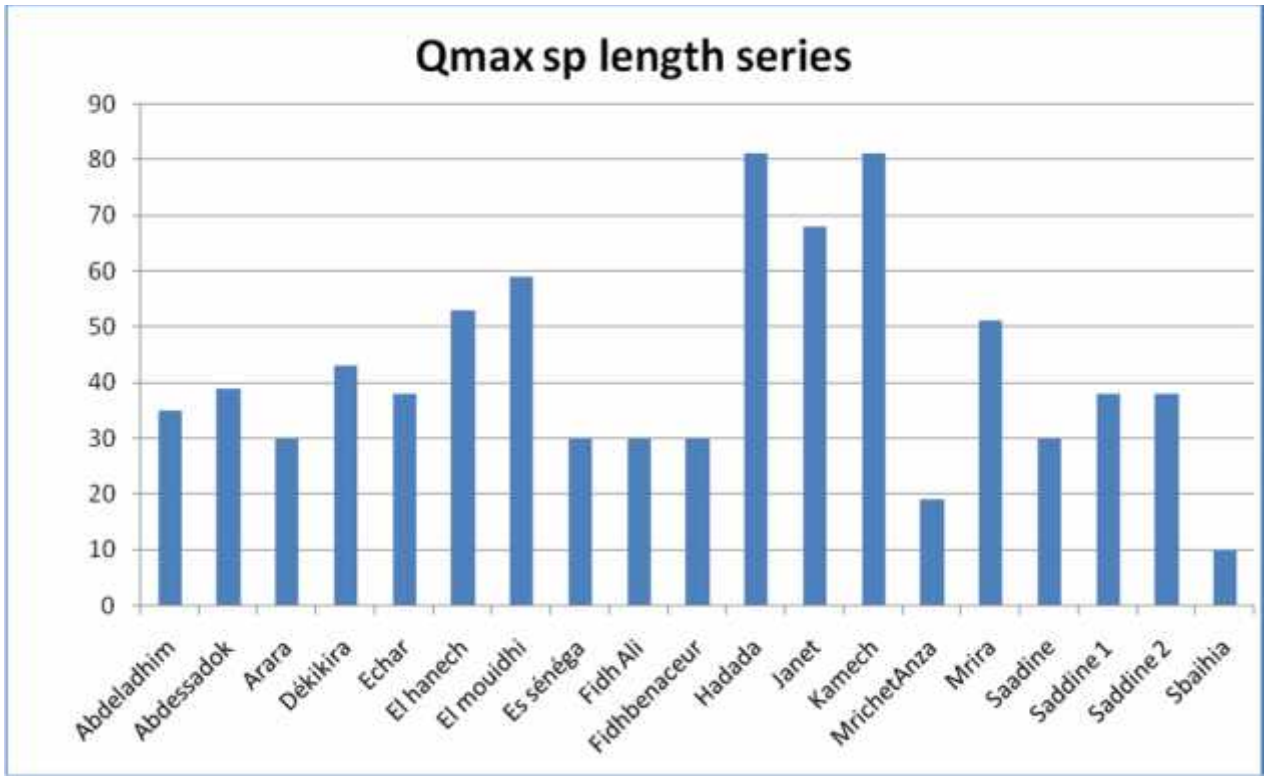

Figure1: maximum Specific discharge data

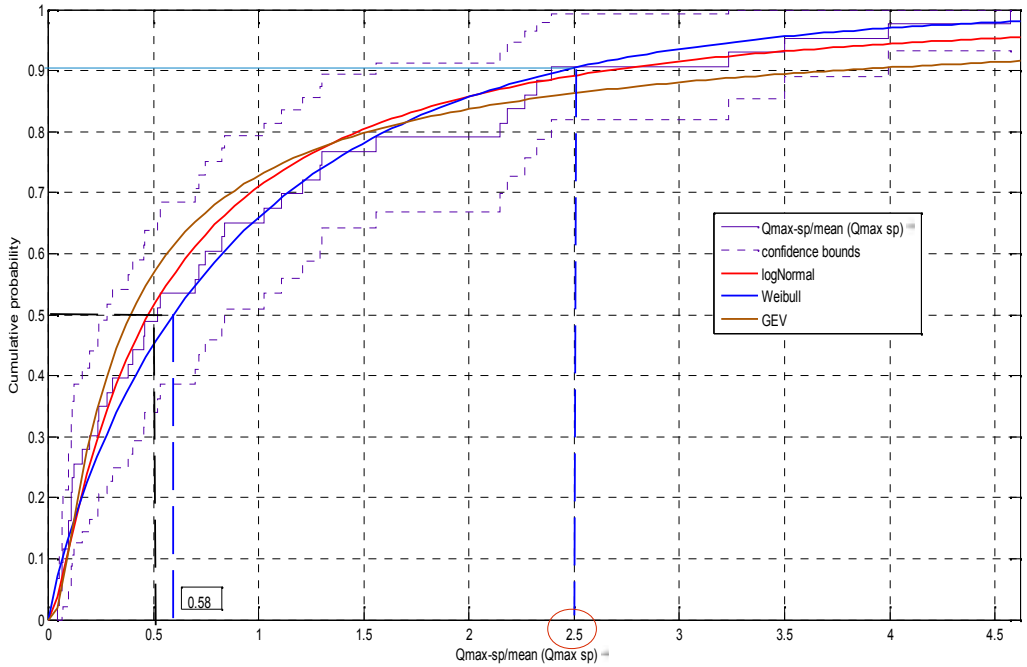

Figure 2: Regional **Qmax** specific index curve fitting , region1

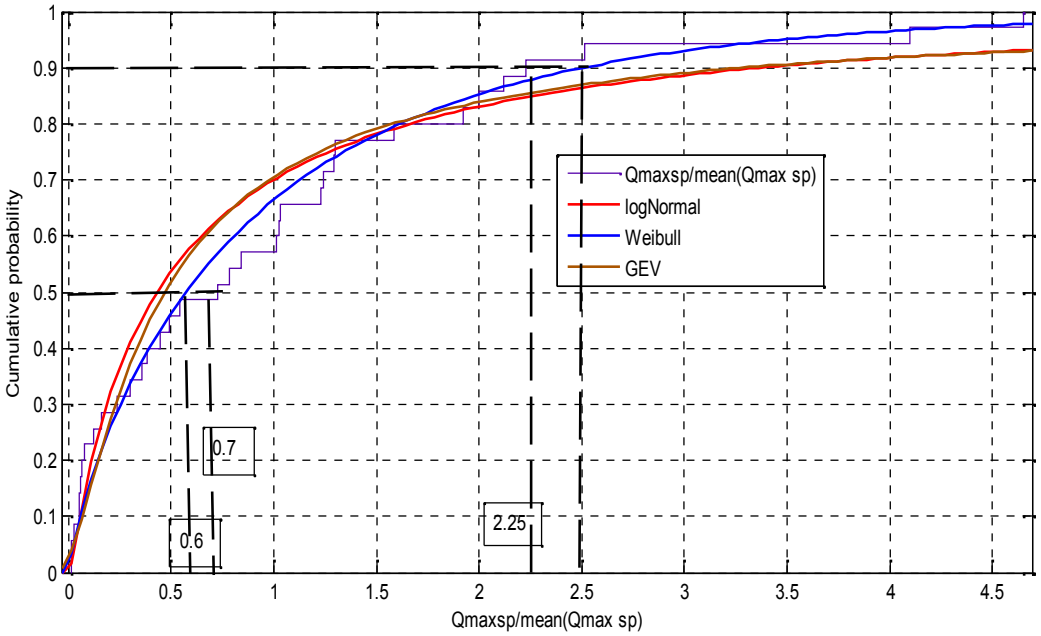

Figure 3: Regional **Qmax** specific index curve fitting , region2

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