

EXTREME RAINFALL ESTIMATES USING THE STATION-YEAR METHOD IN CHELIFF BASIN, ALGERIA

Benhattab karima⁽¹⁾ ; Bouvier Christophe⁽²⁾; Meddi Mohamed⁽³⁾

(¹)benhattabhaseni@yahoo.fr , (²)bouvier@msem.univ-montp2, (³)mmeddi@yahoo.fr



! Introduction & Aim

The pooled station-year method showed potential in giving accurate estimates of quantiles for ungauged or gauged sites with limited data within a homogeneous region (Buishand, T.A., 1991).

The **main focus** of this study is:

1. Implementation of this method over Cheliff basin for daily maximum rainfall distributions to obtain extreme rainfall for return periods between **10** and **100 years** or more.
2. Influence of the **spatial dependence** (redundancy and correlation distance) on the pooled station-year distributions.

! Study area and dataset

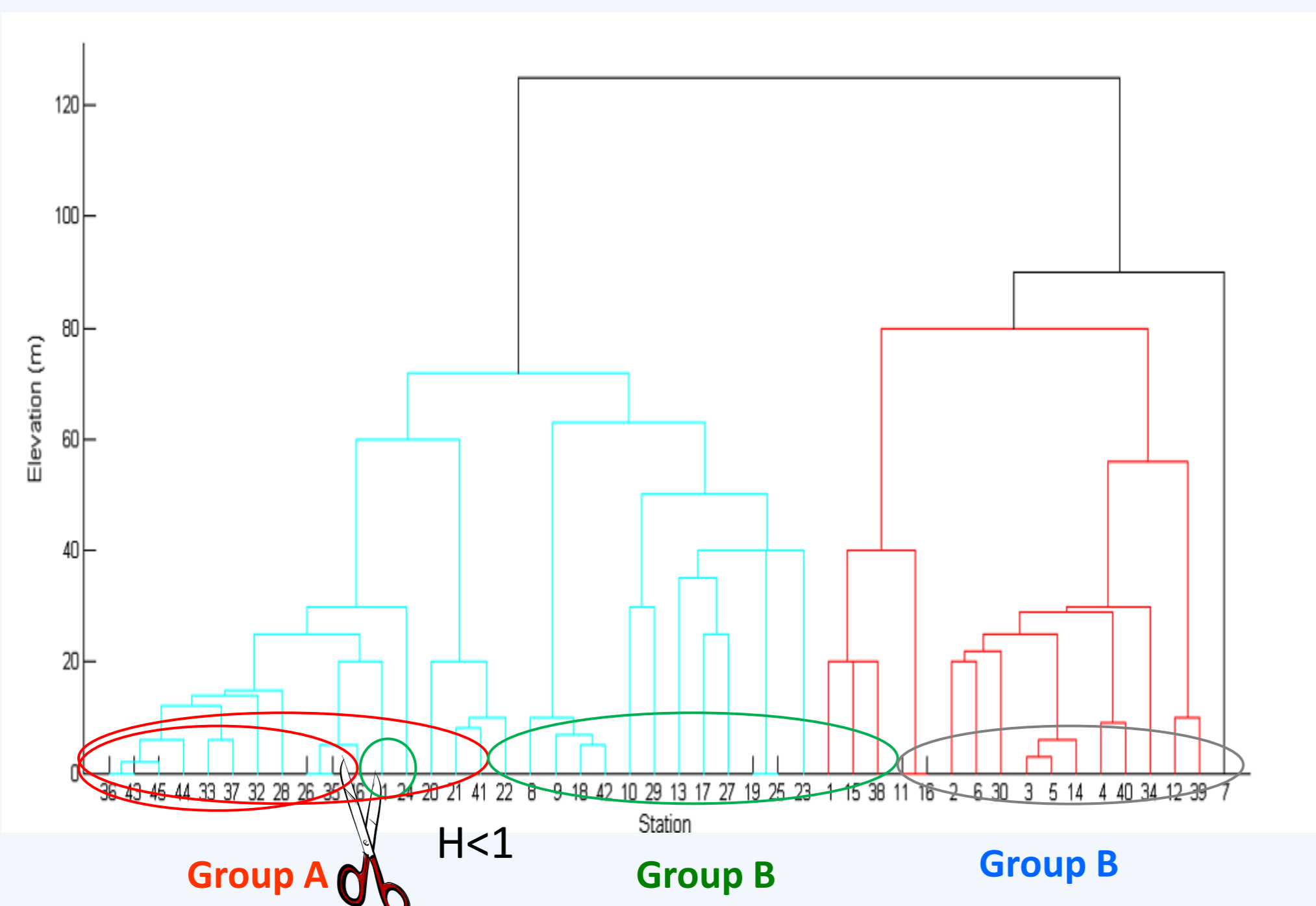
Located in the northwest of Algeria, Cheliff Basin has an area of **43750 km²** cf section below. The basin includes four regions: Mountains of Dahra (700 to 1580 m. asl) in the North, Ouarsenis in the South (almost 2000 meters of altitude), Cheliff valley in the center and a coastal area.

The climate of Cheliff can be called **semi-arid Mediterranean** (Gomer, 1994).

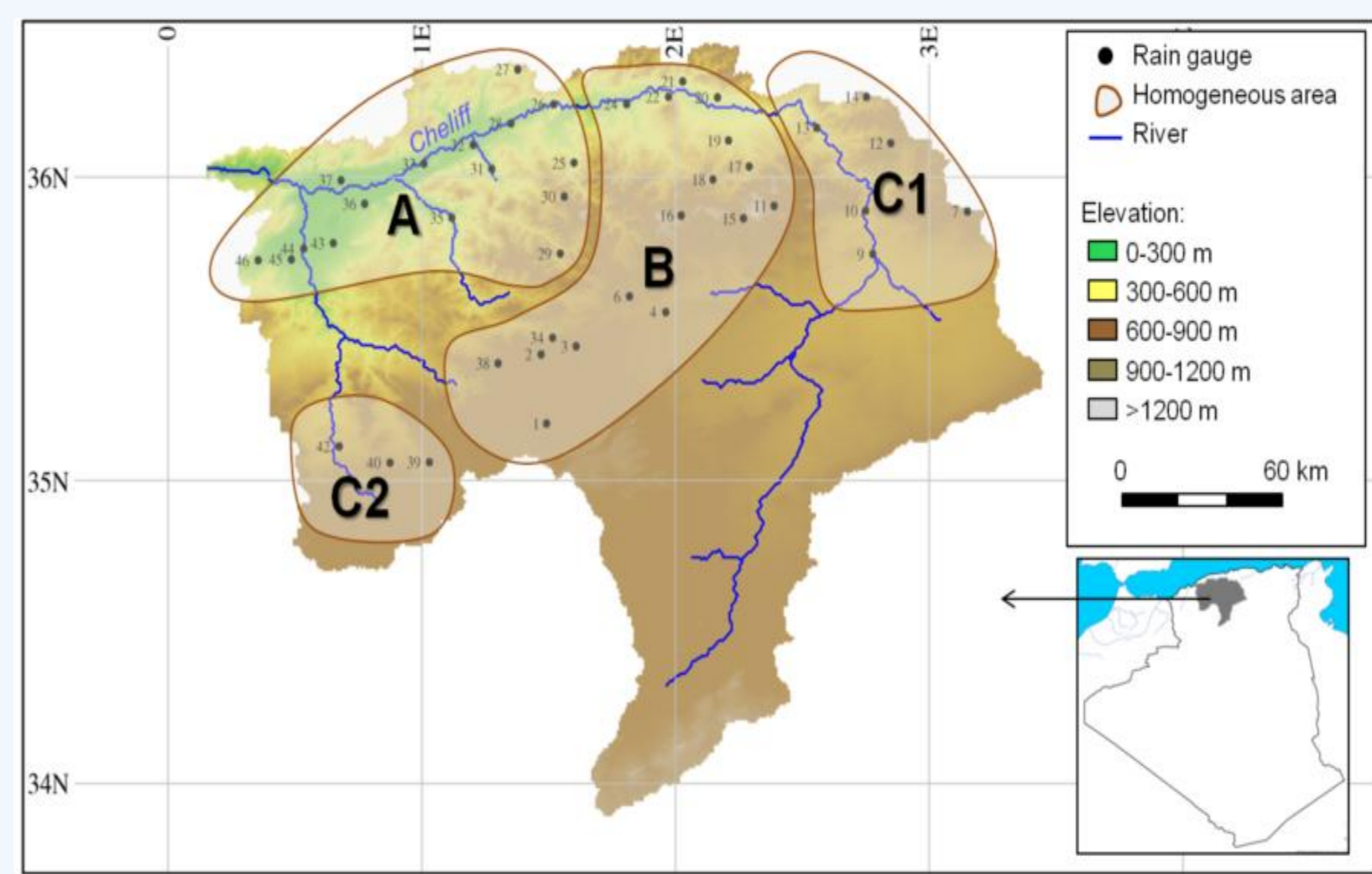
The data used in this study are the daily precipitation observed at **46 rainfall stations**, which had a common period operating from **1968 to 2004**. The annual rainfall varies from 154 to 600 mm.

! Regional frequency analysis methodology

Step 1: Delineation of homogeneous groups



Dendrogram presenting clusters of rainfall originated in Cheliff basin using the statistic **H** (heterogeneity measure) suggested by Hosking and Wallis (1997).

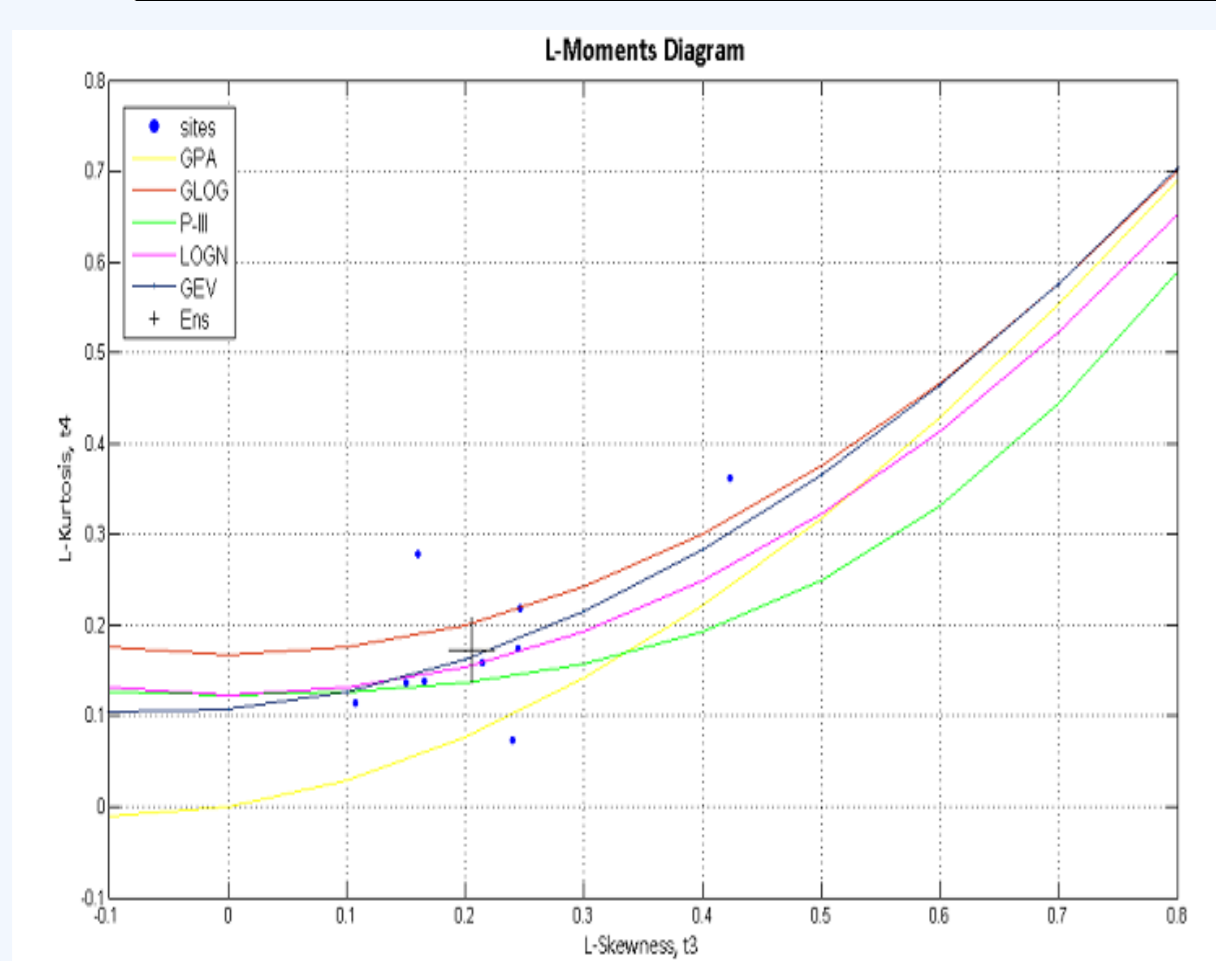


Results of homogenous regions for daily precipitation in the Cheliff Basin, using L-Moments approach. The stations located in the valleys correspond to the group **A** (downstream valley) or **C** (upstream valleys) whereas stations located on the hillslopes correspond to the group **B**.

Step 2: Estimation of the regional frequency distribution

Statistical characteristics of the three homogeneous groups, parameters of GEV distribution and values of Z statistic .

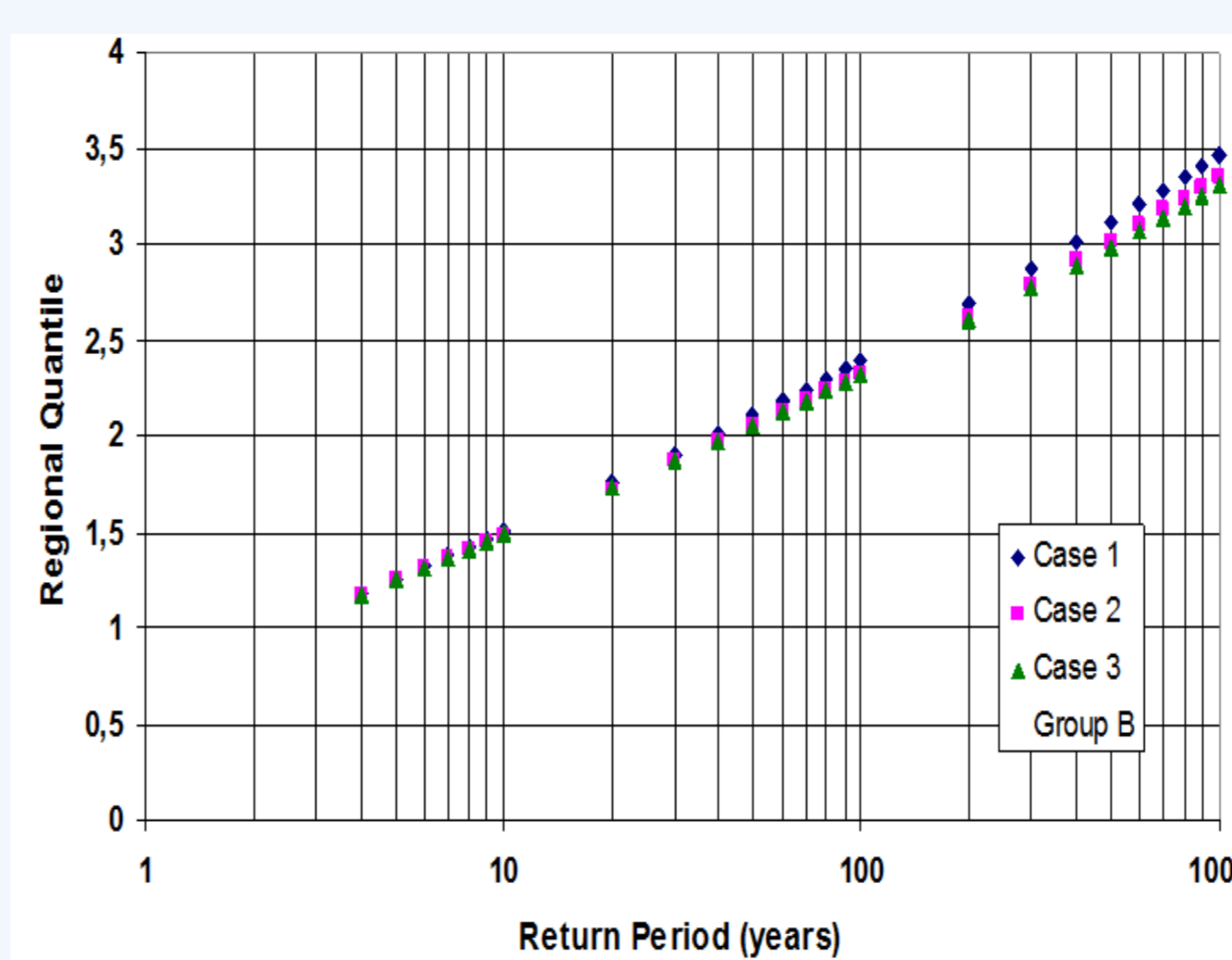
Groups	N	l_1	τ	τ_3	τ_4	k	α	ξ	Zdist
A	17	41,81	0,21	0,3	0,2	-0,13	0,29	0,79	0,51
B	16	35,19	0,20	0,25	0,18	-0,09	0,28	0,81	0,98
C	9	36,02	0,22	0,20	0,14	-0,04	0,30	0,81	-0,84



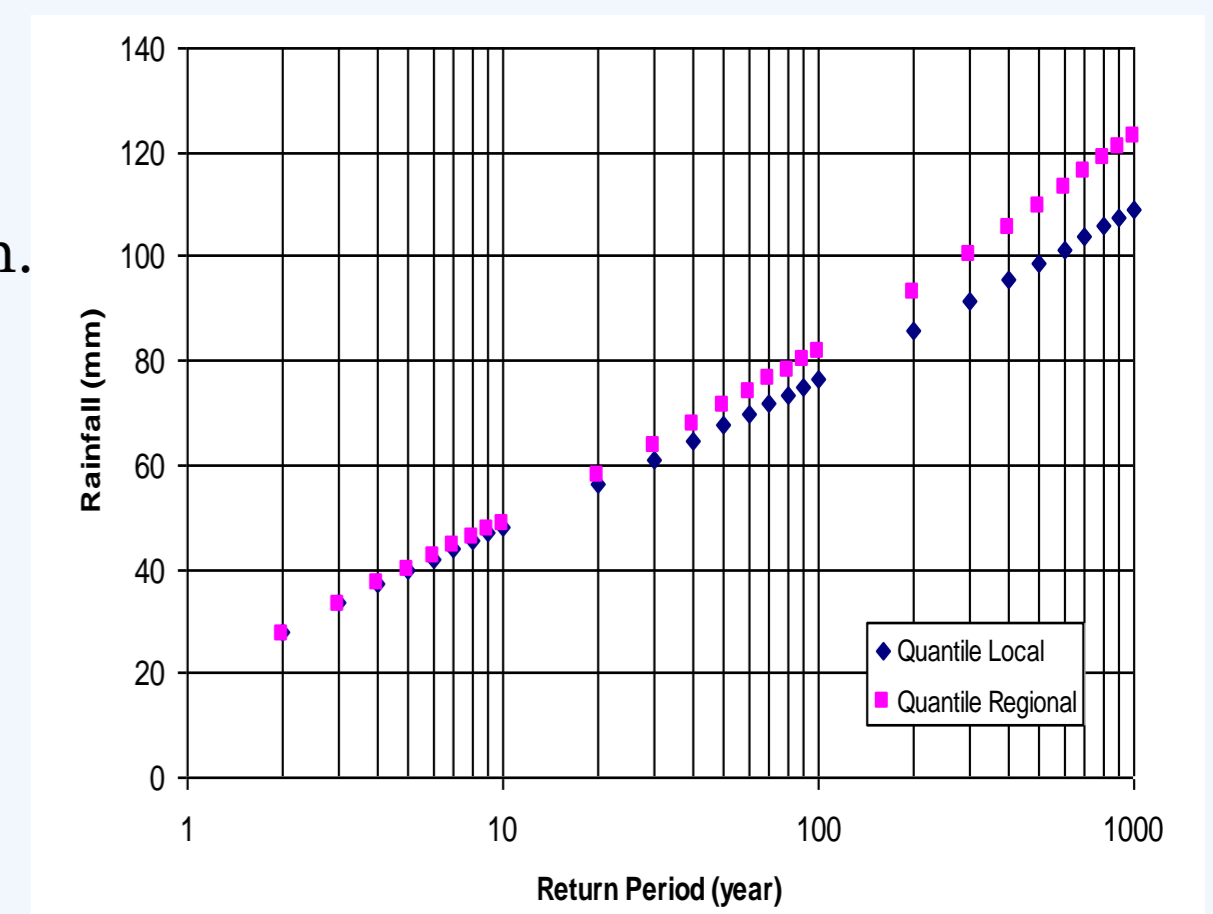
Graphs of L-skewness vs. L-kurtosis distributions with regional τ_3 and τ_4 values plotted to examine total proximity for each distribution to the regional values for group C.

Step 3: Estimation of precipitation quantiles and Effect of spatial dependence

At-site and regional cumulative distribution functions (CDF) for El Hmadna village station.



The effect of independence spatial on the growth curve within each homogeneous groups.



Case 1 : Regional growth curve with redundancy and without correlation distance (all the data).

Case 2 : Regional growth curve without redundancy or correlation distance.

Case 3 : Regional growth curve without redundancy and with correlation distance.

! Conclusion

- The modified pooled station-year method showed potential in giving accurate estimates of quantiles for sites characterized by a short sample length within a homogeneous region.
- The pooled station-year distributions were shown to be little sensitive on spatial dependence effects.

! References

- Buishand, T.A., (1991). Extreme rainfall estimation by combining data from several sites. Hydrological Sciences Journal 36 (4), 345–365.
- Gomer, D.,(1994). Ecoulement et érosion dans des petits bassins versants à sols marneux sous climat semi-aride méditerranéen. Bassin de la Mina. Thèse Université de Karlsruhe. Allemagne.137 p.
- Hosking, J.R.M., Wallis, J.R., (1997). Regional Frequency Analysis. Cambridge University Press, p. 224.

