



Rainfall Characterization in the Ebro river basin (Spain) through the structure function

Jose Luis Valencia (1), Ana María Tarquis (2), Antonio Saa (2), and María Villeta (1)

(1) Universidad Complutense, Facultad de Estudios Estadísticos, Estadística e Investigación Operativa III, Madrid, Spain (joseval@estad.ucm.es), (2) CEIGRAM (Centre for Studies and Research on Agricultural and Environmental Risk Management). E.T.S. Ing. Agrónomos, Universidad Politécnica de Madrid. Ciudad Universitaria s.n. MADRID 28040, SPAIN.

Rainfall events present a high variability in time and intensity in Spain, mainly in the Mediterranean coast. These events have been studied in the present work through the multiscale turbulence formalism based on daily rainfall series recorded during 23 years at 265 meteorological stations at the Ebro River basin (Northeast Spain).

The Structure Function and two parameters derived from it, intermittency (μ_{int}) and multifractality (λ_{desv}), have been estimated for each station. These proposed indicators are pretty straightforward calculations, therefore they are advisable to use in a general way in the multifractal analysis.

A spatial study of these parameters has been carried on verifying the influence of different geographical features such as altitude, relative position in the river basin and proximity to the coast.

Finally, a principal components analysis based on the matrix correlation between intermittency and multifractality values has been applied pointing out a symmetry respect to the main axis of the river.

The results show that the space evolution of the multifractality parameter is symmetric with respect to the main axis of the river. The multifractality values grow as we head towards the east. Intermittency presents major irregularities, especially on the left side of the river (north) where it usually reaches higher values than in the south for similar multifractality values.

We have found a direct correlation between these two parameters. Depending on the watershed areas these relationships have different intensities. Therefore, the correlation is higher and more significant for those stations that are below 600 m. and non significant for those that are above 900 m. The highest values for the two parameters are close to the main channel and near the mouth of the river (areas with lower altitude).

On the other hand, the map based on the differences of clustering analysis points close to each other is due to the local aspect of rainfall distribution that is principally explained by the intermittency.