



Spatial variation of the scaling structure of short-term rainfall over Portugal

M. I. P. de Lima (1,2), M. F. E. S. Coelho (3), J. L. M. P. de Lima (1,4)

(1) Institute of Marine Research - Coimbra Interdisciplinary Centre, Portugal, (2) Forestry Department, ESAC/Polytechnic Institute of Coimbra, Portugal (iplima@esac.pt), (3) Institute of Meteorology, Portugal, (4) Department of Civil Engineering, University of Coimbra, Portugal

The spatial and temporal structure of rain, which typically exhibits extreme variability, is a core issue in studies that span a variety of research areas, e.g. hydrology, hydraulics, environment, energy, economics, society. The interest in rain can demand its study and characterization at a variety of space- and time-scales. Different tools and methodologies are used for this purpose, which are usually complementary.

Mainland Portugal is located in the transitional region between the sub-tropical anticyclone and the sub-polar depression zones. The spatial distribution of precipitation over the territory and its seasonal variability are due to the characteristics of the global circulation. One specific feature is the Atlantic origin of many synoptic disturbances, e.g. seasonal movements of the Azores high pressure system, in the context of the regional geography (e.g. latitude, orography, oceanic and continental influences). Although the variation in climate factors is fairly small, it is sufficient to justify significant variations in precipitation. Compared with the northern region of Portugal, the southern region is warmer and drier; there the climate is semi-arid, and the region is well-known for its vulnerability to climate variability. Two storm types dominate the occurrence of rainfall in mainland Portugal: convective storms and frontal storms. Convective storms are typical during the summer and in early and mid autumn, and are more frequent in the southern regions; frontal storms occur principally in the winter season, and affect the northern regions more.

In this work we discuss results of scale-invariant analyses of the temporal structure of rain from several locations in mainland Portugal. The aim was to investigate the statistical signature of rain events of different origins, resulting from the large number of mechanisms and factors affecting the rainfall climate over Portugal. The study uses hourly rainfall time series covering periods of about 30 years. Relevant scaling ranges are identified and characterized. These are important features for time-downscaling issues in places where point-rainfall data is typically available at daily resolution. This study complements previous rainfall studies in the region and contributes to the clarification of the small-scale behaviour and statistics of this process.