Since Mediterranean environments are characterized by the irregularity of their climate and hydrological processes where, for instance, twice or even three times the average annual rainfall can be registered in a single torrential rainfall event, hydrological studies are increasing focusing on the analysis of actual rainfall events. Criteria to define a rainfall event are not yet clearly established in literature. Although we can find detailed, a posteriori, studies about specific torrential rainfall events related to floods in a given basin, detection of rainfall events with a hydrological meaning from daily rainfall records remains difficult and normally has been done with reference to floods events at catchment level.

This paper proposes criteria for selecting rainfall events with hydrological objectives. We consider not only events that can produce major floods but also those events around the run-off generation threshold which can also produce significant contributions to the subsurface flow. These criteria have been applied to the territory of the River Júcar Water Authority (43,000 km²), using daily data recorded by the Automatic Hydrological Information System (SAIH), and covering a 15 year period (1989-2003). A total of 347 events were identified and characterised by indicators of total rainfall duration, intensity and irregularity calculated over 15 regional units. The synoptic atmospheric situation responsible for each episode has also been taken into account in the analysis. Finally, a classification of the episodes has been obtained. The analysis shows a littoral-interior dichotomy. The largest number of events were recorded near the coast (except in one region), mostly in winter, with greatest volumes and high irregularity. In the interior the events were less intense and more frequent in summer. The orographic effect is important, not just in relation to altitude but also in relation to the orientation of the mountain ranges with respect to the wind direction.

**ABSTRACT**

**IDENTIFICATION OF MEDITERRANEAN RAINFALL EVENTS FOR HYDROLOGICAL ANALYSIS, CRITERIA AND CHARACTERIZATION**

HYDROLOGICAL ANALYSIS. CRITERIA AND CHARACTERIZATION

**OBJECTIVES**

1. Definition of criteria for selecting rainfall events with hydrological significance.
2. Characterization of the selected events.
3. Classification of the events. Typology of episodes.

**AREA OF STUDY AND DATA BASE**

- River Júcar Water Authority (CHU): 43,000 km²
- 131 rain gauges of SAIH (Automatic Hydrological Information System)
- Daily data

**METHODOLOGY**

**How to define a “rainfall event” for hydrological purposes?**

**What are we looking for?**

- A rainfall episode can last more than one day but produce a single hydrological event (runoff processes need time to infiltrate and saturate soil). We also should be able to discriminate various episodes, in the case of several days of uninterrupted rain, if they produce two or more hydrographs.

**What should we consider?**

- Episodes should have a certain areal extension (highly localised rainfall is not very likely to produce significant runoff). However, very intense precipitations (even when highly localised) should be considered, because they can exceed the initial capacity of soil infiltration.

**1. Selection of episodes**

**Definition of homogeneous units: zones**

- Average precipitation estimated in every zone from all the rain gauges
- Local average precipitation which have registered rainfall

**2. Characterization**

**QUALITATIVE INDICATORS**

- Location of the episode (number of days)
- Episode average precipitation estimated from all the rain gauges in the study area (CHU)
- Episode average precipitation registered in the zone with the most rainfall
- Maximum Local Average Precipitation (Pz-m) of all the episodes
- Local Intensity Index, the number of episodes for which the Local Average precipitation (Pz-m) is more than 40 mm/day

**3. Classification**

**Two step cluster analysis has been applied in order to classify the episodes combining qualitative indicators and Pz-m**

**QUALITATIVE INDICATORS defined for every episode**

- Wind direction
- Pressure systems at surface and 500 HPa obtained from synoptic maps
- Presence of rain-producing elements (e.g. cold fronts)
- Localized area of the episode

**RESULTS**

**AROUND THE EPISODES DURATION**

**SPATIAL DISTRIBUTION**

- The highest number of episodes are in the littoral area (except Alicante)
- The highest intensity of episodes were registered in Gandia and Catarroja, whilst the lowest values appeared in Cortes de Pallars and Alcoi. The mountain zones presented intermediate values.

- The episodes are more irregular in the coastal zones (except Alicante)
- The highest local intensity was registered in Gandia (86), followed by Catarroja (41). The LLI of Alicante and Catarroja were zero.

**INLAND-LITTORAL DICHOTOMY**

In winter, the rainfall is more significant around the coast whilst in summer the focus is in the interior. April and October are transition months.

In the littoral occurred the most torrential, intense and irregular episodes, linked to westerly winds. Epidemics which were more regular and less intense, linked to westerly winds.

**Cluster-analysis: 3 groups**

**Cluster 1**
- Episodes associated with torrential winds
- Extremes with most rain (Pc around 35-60 mm)
- Cold cuts of low pressure fronts
- Anticyclonic or low pressure system at surface
- Easiness winds (NE and E)
- No interfering conditions at sea level

**Cluster 2**
- Episodes associated with moderate winds
- Extremes with moderate rain (Pc around 25 mm)
- Low level trough outlet
- Weakly winds (W and NW)
- Intervening conditions at sea level

**Cluster 3**
- No predominant wind direction
- Zonal circulation at upper level
- Variable conditions at low level
- Variable wind direction
- No interfering conditions at ground level