

FREQUENCY AND EVOLUTION OF DRY SQUALLS AT THE GUADALENTIN BASIN RIVER (SOUTHEAST OF SPAIN)

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In the present work some considerations are exposed on the possible recent variations in the evolution of dry squalls in the basin of the Guadalentin river, tributary to the Segura river (South-east of Spain).

There does not exist a global clear trend in the studied period (1950-2004), though it is possible to observe manifestations of undoubted significance for the social perception of the agronomic droughts in the analyzed sector.

TERRITORIAL CONTEXT AND METHODOLOGY APPROACH

The studies about dry and humid periods have been increased in Spain from the eighties of the previous century; specially focus on the east and Southern part of the Iberian Peninsula (Martín Vide, 1981; Raso Nadal, 1982; Conesa García and Martín Vide, 1993; Martín Vide and Gómez, 1999; among others). The dry periods are expressed as one of the climatic facts that determine the Mediterranean atmosphere, and its importance is substantial in the operation of many ecosystems, when generating great alterations in the water availability within a field which have semi-arid features like the one which has been studied.

The area of work selected, the Guadalentin river basin, 3,300 km² approximately, with an annual average precipitation inferior to 350 mm as a whole, constitutes one of the areas, together with the rest of south east Spanish peninsular territories, most exposed to the droughts natural risk.

It is understood as a dry squall, a backslider state in certain types of climate, the case of the Mediterranean, characterized by a certain number of days without an appreciable precipitation (≤ 0.1 mm) (Luengo *et al.*, 2002). It turns out, therefore, that the dry periods are a meteorological product, a component of a physical concept of drought for whose characterization they have a great importance. Indeed, the frequency and seasonal distribution of these sequences of rain absence, as well as their duration and coincidence or not with elevated thermal registries; considerably clarify the basic concept of diminution of the contributions considered as «normal».

Also, of course, they have a great incidence on certain ecosystems that show water stress due to the high temperatures and discharge evapotranspiration.

The coincidence of this phenomenon with the different stages of the agricultural practice in irrigated lands, characteristic of most of the studied sector, grants to dry periods a great capacity to influence the normal rate of development of the crop, and even interrupt it, with this they acquire interest regarding to the assessment of the drought as a risk, when becoming an important element in the social perception of the phenomenon.

For the execution of the this study, four observatories have been selected which are connected to the National Institute of Meteorology network (INM), taking care of the space representativeness of them and the availability of a series of data which is expanded and continued. The observation period is 55 years for three of the four weather stations (Murcia/Alcantarilla, Alhama «Huerta Española and Lorca «CHS»), that is, about 20,089 days. The fourth used observatory is located in the head of the Guadalentin river basin (Topares). This one began to lend data in 1965, so that the analyzed period is inferior (40 years, 14,608 days). Nevertheless, attending to an extended social valuation —not scientist— in order to consider an increase of the droughts intensity in the area over the last years, it has been divided, with the purpose to establish comparisons, the complete series in two periods: one included between 1950 and 1974 and another one between 1975 and 2004. This way, we expect to verify the hypothetical variations in the behavior of dry periods as a component of the drought phenomenon and its participation in the subjective valuation on the part of the population affected with its intensity.

NUMBER OF DRY DAYS AND LENGTH OF CONTINUED PERIODS WITHOUT PRECIPITATIONS

The number of dry days (precipitation ≤ 0.1 mm) is high. In Murcia/Alcantarilla station 17,305 days are exceeded with nonexistent or negligible precipitation, more than 86.1% of the total of days of observation. The Alhama observatory «Huerta Española» have similar numbers, exceed the 17,504 dry days, that suppose over 87.2% of the examined total days. But the weather stations of Lorca «CHS» and Vélez Blanco «Topares» are those that have a greater number of days with no rainfall or without effective cloudiness; the 17,958 days with null or imperceptible precipitation in the first one are exceeded (over 89.4% of the total of contemplated days) and 13,198 days are exceeded in the second one (90.3%).

When distributing the amount of observed total dry days between the number of years of study, the average of dry days per year in the different analyzed stations is obtained. On this way an average of 315 days without appreciable rainfall in the observatory of Murcia is noted, 319 in Alhama «Huerta Española», 327 in Lorca «CHS » and about 330 in Topares.

In general, the volume of precipitations get higher as long as the depressed areas are left and we move upward to high northwestern lands and head lands of Guadalentin. However, this fact does not correspond with some of the considered values of dry days per year and total of days without appreciable rainfall, so that observatories with a greater annual precipitation average (Topares) have equal or greater number of days without rainfall, in spite of its location which is to greater altitude than other stations located in the coastal depression (Murcia/Alcantarilla). In the analysis of the daily structure of the pluviometers droughts, the study of the length of dry sequences is a present question of great interest.

The practical precipitation absence during two months continued is very common in almost all the investigated territory and throughout any season of the year.

In general, all the river basin participates in extensive successions of dry days, with average sequences that exceed, the twenty days continuous without rains, although until now it has been commenting, are the most southern sectors (observatories of Topares and Lorca) those that show a greater danger when series of continuous days without precipitation take place.

The maximum dry periods average ascend until the 88 days for the observatory of Lorca and the 97 are exceeded in Topares, although they are not rare sequences of up to four and five months without appreciable precipitation. On the other hand, they are the mountainous sectors of Espuña mountain range, next to territories of the Low Guadalentin, those that have lower average values maximum. Between these extreme categories the sectors of the river basin of Lorca are located (Doña Inés, Zarzadilla de Totana), surrounded by mountainous tops.

As a summary we have the following dry periods zoning for the river basin of Guadalentin:

- More northeastern sector of Guadalentin valley —Murcia/Alcantarilla— and Espuña mountain range. These territories show the less continuous dry sequences in the time. The geographic factors of altitude and latitude are those that seem to determine this smaller incidence of the studied phenomenon. It does not imply, nevertheless, that their vulnerability is also smaller; on the contrary, this one is very superior in sectors of greater altitude, thanks to the hydraulic work, deficiency of storage and distribution of resources and minor social and agricultural organization in view of the pluviometer shortage.
- Sectors next to the nuclei of Lorca and Puerto Lunbreras —South and center of the valley—. They are the zones with greater physical danger as far as continued days without precipitation.
- Enclaves located in the high river basin of the Guadalentin —Doña Inés, Zarzadilla de Totana, Valdeinfierno—. These areas show intermediate values.

EVOLUTION OF THE NUMBER OF DAYS WITHOUT PRECIPITATION AND DRY PERIODS

Exists a global increase of dry periods in all the observatories from the first quinquennium of the Nineties. This increase, even being inferior to the registered one in other previous stages, is significant when taking place in the context of generalized droughts and difficulties in the supplying of the irrigable of the Segura river basin, increasing without a doubt the social valuation of the critic period with respect to the availability of hydric resources in this scope.

They seem to insinuate itself, however, two different stages: a first stage from XX century and to the first lustrum of the Seventies, where the tendency observed is that the days with rain increase; and a second one where the number of dry days have an ascending line from 1975, with the exception that offers the quinquennium of 1985-89. From the nineties in the past XX century an accelerated increase is made patent of the number of days without precipitation in the observatories located in the Guadalentin valley (Murcia/Alcantarilla and Lorca).

AS A CONCLUSION

Both periods with greater agronomic value for the culture of dry land as far as accumulated precipitation, whenever rains descend well distributed throughout the station, are the autumn and the spring time. During the autumnal season a reduction of the average number of dry periods is observed, which is able to cause a motivation in the farmer of dry land when extending his farming. Nevertheless, during spring time, the most constants dry periods are increased in all the analyzed observatories, with the exception of Lorca, which even generates little yields and harvests loss when the fruit is not growing because of the lack of water. In this way, the expectations generated during the sowing season are seeing changes in spring time, when there is no other remedy to save the harvest.

Possibly, a reinforcement of these continued periods without precipitation during the key season for the development of the plantations and agricultural practice yields could increase physical perception of the drought phenomenon. The strong seasonal dependency of the dry land extends the effects of these oscillations, comparatively perceived as more serious based on the rapidity and intensity with which it has been tried to deseasonalizing the cultivation in irrigated land. Also, this increase in the perception can reside in the increase of the number of dry days from the Nineties, in spite of the existence of previous stages with a greater number of days without precipitation, or it can be due to greater sensitivity that recent investigations about climatic change have provoked on these subjects.