



1 Droughts estimation and connected water management to assess their effects

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The drought phenomenon on the Balkan part of Europe is a specific feature for the geographical conditions. This phenomenon, although without a strict cyclicity, shows a repeatability at 15-25 year intervals with a persistency of about 12-15 years, with short term interruptions of about 1-3 years with rainfalls above the normal values (Adler and all, 1996). These interruptions do not modify the general features of the droughty periods. From the standpoint of the frequency of the droughty and excessively droughty periods, three long intervals can be mentioned when this occurred during the last century in a very severe way: 1894-1905, 1942-1953, 1981-1995 (Adler & all, 1998). It is a return period of 30-32 years. Between two very droughty periods are manifested alternant periods (not so long and not so severe):

-1929-1935 – alternant period, not so severe drought

-1942-1954 – severe drought

-1959-1966 - alternant period, not so severe drought

-1981-1995 – severe drought

-2002- 2003 – alternant period, not so severe drought in all Romania, but in South and for the Danube Basin. Even not being excessive drought (long periods with very low flows) during 2003 marked excessive low-flows values beginning with May, the record of minimum flow was during June –beginning of July, in special in western part, eastern and southern of Romania where discharges were 10 – 20 % of the normal

values. A loss of round 23 million Euro was produced with the main effects as:

The production of the hydro-power energy decreased at 25%

Nuclear power plant from Cernavoda was closed during July because of shortage of discharges on the Danube River

Water supply was decreased to the population and industry; some localities in south-eastern part of Romania distributed only during few hours drinking water.

The analyze of the time series of data shows that only in few cases the trends are statistically significant, as the level of significance adopted for the Mann test (Mann, 1945) has been 5% (in central part of the Carpathian arc). Nevertheless, a slight tendency towards a decrease was detected within all the time series from the gauge stations located in the southern and south-western side of the Carpathian Region, due to the very low amounts of precipitation during the last 16 years. During the interval 1982-1996 the annual precipitation amounts were by more than 50-70% below the monthly annual normal values

The most of the annual series of precipitation and discharges in the area of interest emphasized in general a decreasing trend and this trend does not characterized the repartition of water resources during all the seasons. The most affected by deficits was the wintertime (Figures 2, 3) with the great deficits after 1970 and especially during the years of the sub-series 1981-1995 interval.

Droughty phenomena is induced by a continuous risen-up of the atmospheric pressure which favoring the risen-up of the sun light and a diminishing of the anticyclone and consequently of the rain generated by them; the phenomena is specific to the entire Balkan space, determining a precipitation decreasing tendency; the maximum point change determine the beginning of the droughty period (they are significant from statistical point of view). Identifying the driving atmospheric phenomena, it would be risen a possibility in developing long time forecasts, using climatological information and forecast.

The special droughty conditions of the geographical space of Balkan area impose to find methods to optimize water management of the reservoirs (surface and groundwater). It was established a methods to forecast the probable time for accumulating different volumes, determining the optimum exploitation periods (accumulation / non-accumulation). Mean time accumulation curves of the different water volumes for a normal seasonal exploitation of a reservoir can give an information about the possibility to assure the needed water resources during a droughty period, to be able to optimize the exploitation of the existing reserve and will help in a better planning the water resources.