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Late Pleistocene and Holocene climatic variability in the Carpathian-Balkan region. Abstracts volume



**Late Pleistocene and Holocene Climatic Variability
in the Carpathian-Balkan Region**

ABSTRACTS VOLUME



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Land surface water balance east of the Romanian Carpathians

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The aim of this study is to investigate the land surface water balance on the territory between Eastern Carpathians peaks and Nistru river on a surface of 80.128 km², in the last 53 years (1961-2012). We used data from 11 weather stations from Romania and 14 weather stations from the Republic of Moldova. The water balance was computed based on the difference between precipitation amounts recorded in a weather station in a certain time frame and reference evapotranspiration (ET₀), computed based on the FAO Penman - Monteith formula.

Analyzing the annual values of water balance we found that this are positive just in the Carpathian territory and in the eastern Subcarpathians (774,4 mm at Iezer, in north-western Eastern Carpathians; 149,1 mm at Poiana Stampei) and negative in the rest of the studied territory (-398,4 mm at Cahul, in south-west of Republic of Moldova).

Water deficit is increasingly high on the one hand as we depart from the Carpathians to the east and from north to south of the studied area, reaching its maximum in the southeast.

We found that during winter the water excess is typical for the entire studied area, in spring, summer and autumn the water deficit characterizes the most part of the studied territory, except from the Carpathian and Subcarpathian area. In summer the deficit is the highest, except from the mountain and Subcarpathian area, where in all months of the year the water excess appears, the water deficit characterizes the lower areas (plateau areas) from March to October.

During March - October time frame, the highest values of water deficit is recorded in August (69.9% from stations), followed by July (21.7%) and May (8.7%). Winter wheat crop is not affected by the hydric deficit just in Suceava Plateau, where in October - June time frame, the balance is excessive, but maize crop is affected in different degrees in Moldavian Plateau, where the water deficit values ranged between -42.8 mm at Radauti and -448 mm at Cahul.

In November - February time frame the hydric excess contributes to partial restoration of ground water reserves.

Water balance trends determined through Mann - Kendall test and *T* - test show that in the last 53 years in 83% (Mann-Kendall test and Sen's slope estimator), respectively in 80% (linear regression tested for significance with *T* test) of the stations where it has been computed, the water balance was negative, and Sen's slope varied from -0,12 mm/year at Ribnita (determined through Mann-Kendall test); -0.05 mm/year at Dubasari (*T*-test) and -6.73 mm/year at Iezer (Mann - Kendall test), respectively -3.19 mm/year at Cahul (*T*-test).

The nonparametric methods (Mann - Kendall and Sen's slope estimator) indicate that the annual values of water deficit are statistically significant at 0,05 α level, at Cahul and Iezer weather

stations, while the parametric method (*T* - test) indicates the Comrat and Cahul weather stations. The results indicate that the water deficit at the above mentioned weather stations is increased.

The Comrat - Cahul area is where the emphasis of dryness is the most obvious and statistically representative.

Analyzing by seasons, winter, spring and summer water deficit values were characterized by negative slopes, while autumn by negative slopes.

In most locations, in January - August time frame and in November, the water balance trends were negative.

In February - March time frame, July - August time frame and May we found that in some locations Sen's slopes are negative and statistically significant (12% of locations in February, 24% in March, 12% in July, 4% in August, May and November according to Mann - Kendall test; 20% in February, 16% in March, 4% in July, August, May and November based on *T* - test) indicating a real worsening of hydric balance.

Thus we note an increase in dryness in the last 53 years in the months of July - August and February - March, probably in the near future will become increasingly obvious. Signs of this phenomenon but attenuated appear in May and November.

In October, Sen's slope values are positive at all stations (68% of them according to Mann - Kendall and 56% based on *T* - test), they were statistically significant, which enables us to consider that in the last 53 years this month's hydric balance has improved.

If the evolution of the Carpathian area by a hydric balance deficit with less clarity emerged in the last 53 years, the Moldavian Plateau, on both sides of the Prut river the areas and months characterized by a deficit balance are becoming larger and more frequent.

Homogeneity tests (PET, SNH, BHR) show emphasis of the water deficit at Cahul and Comrat after 1980, respectively 1990.

Perhaps if evolving regional climate patterns will continue, this phenomenon will extend to the north and west adversely affecting primarily the agricultural sector.