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GEOGRAPHICAL SPECIFICITY OF THE RIVER'S REGIME IN BULGARIA

Abstract: This paper presents the types of river regime based on the three characteristics and two categories. The types are isolated from the number of cases with a high water and low water phases. The subtypes were detached from the duration of a high water and low water phases. There are three types (and seven subtypes) of river regime in Bulgaria. Mildness-Continental type is with spring high water phase, summer-autumn low water phase and transitional water during winter. Continental-Mediterranean type is with winter-spring high water phase and summer-autumn phase of low flow. Transitional type is with spring-summer high water phase and increase in flow during November and December, steady low water phase from July (August) until October and with the winter low water phase.

Key words: river regime, mildness-continental type, continental-Mediterranean type, transitional type

Introduction

The geographical position of Bulgaria in the most southern parts of the mildness-continental zone and in the transition zone between the temperate and subtropical climate, prerequisite the procedure of three types of climate – temperate, transitional, and subtropical (Velev, 1990), which change in sequence from north to south. The presence of mountainous terrain causes changes of climate conditions with the raising of attitude. The width zonality and the circles of elevation of nature zones are disturbed in the karst regions. That is why on the territory of the country the river regime characterises with certain geographical regularity, regional features and local specificity. Geographical regularities have very well displayed seasons of flow dynamics and the regional features and local specificity - respectively in time occurrence and the durability of flow phases. For their disclosure has been made the typisation of river regime based on the number of flow phases, the periods of occurrence and the durability of low water and high water periods (determined from the monthly distribution of flow for the perennial period). The taxonomic structure includes two categories – type and subtype. The types of water regimes are identified from the number of flow phases. They are the basis to outline the three major hydrological regions, the name of which is taken from the types of precipitation regimes – mildness-continental, continental-Mediterranean and transitional proposed by Velev (1990). Each type of river regime has subtypes, which show the durability of flow phases. The subtypes outline hydrological regions.

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Types of river regime and hydrological regions

Mildness-Continental type of river regime

In the Mildness-continental type of river regime observes three types flow phases - spring high water, summer-autumn low water and transitional water during winter (fig. 1). This type includes all river basins from the North Bulgaria, as well as the basins of the rivers from Srednogorie. The period of high water is from February (March) until June (July). This type is distinguished by the big fluctuations of the initial and final dates through the years, respectively the durability and the volume of the water discharge. The precipitation and the snow feed for the downstream – the influence of the tributaries is the main reason that the discharge hydrograph has very complicated configuration, stretched in time, usually with the prolonged fall. The high water period is with the highest peak prevailing in March. In the mountainous parts of the basins of rivers Vit, Osym, Jantra and Beli Lom water discharges are largest in May. The exceptions from the indicated regularities are the rivers Elisejska and Dzulunica from the Jantra river basin, the period of high water has its peak in February.

The phase of low flow is from July (August) until October. Its beginning is not always clearly expressed in this type of river regime. In the perennial plan water volumes in low water period fluctuate in comparatively narrow borders, but during the years have been observed cases of considerable raise of water level. The line outlining the period of low water is at the low range from August until October. The first case is typical for plane and hilly basins, and the second - for mountain basins. With low water in August are the rivers from the basins of river Iskyr and west from it. In the basins of rivers Vit, Osym and Jantra the smallest water discharges are transferred in October. The exception is river Jantra, where the flow is lowest in September.

The transitional phase is recorded in the period November-January or November-February. The duration of this phase is three months in the river basins with average altitude 1500-1600 meters and four months in the mountainous basins. Their configuration is characterized most often with a raising line and rarely – with almost straight line.

In the Mildness-continental type of river regime are outlined three subtypes, which separate two hydrological districts. The first subtype – with the duration of high water, low water and the transitional phase, lasts four months, refers to the tributaries of river Iskyr, the rivers from Srednogorie (Strjama, Ochushnica, Leshnica, Gjurlja), river basins of the rivers of Zapadni Rodopi and others (fig. 1). The most characteristic feature of river regime in the indicated river basins is very well expressed seasonality – the time occurrence of the three flow phases is consistent with the adopted seasonal differentiation of the hydrological year.

In the second hydrological region, the river regime is with high water periods of five months, but with a different beginning (fig. 1). The high water phase begins in February (March) in almost all river basins from Northern Bulgaria, in Kraishte and Srednogorie. The occurrence afterwards of a state of low water lasts four months – from July (August)

to October, and its precede transitional phase is with duration of three months. One month later – in March – begins the high water phase in alpine river basins in the region of Stara Planina (rivers Beli and Cherni Vit, Beli and Cherni Osym and others), in the upper basin of river Topolnica (Topolnica-Koprivchica), and in some of its tributaries – Medetska, Cyrkvishtenska reka, Bunovska reka. The low water phase in these basins is shorter, and the transitional phase lasts from November to February.

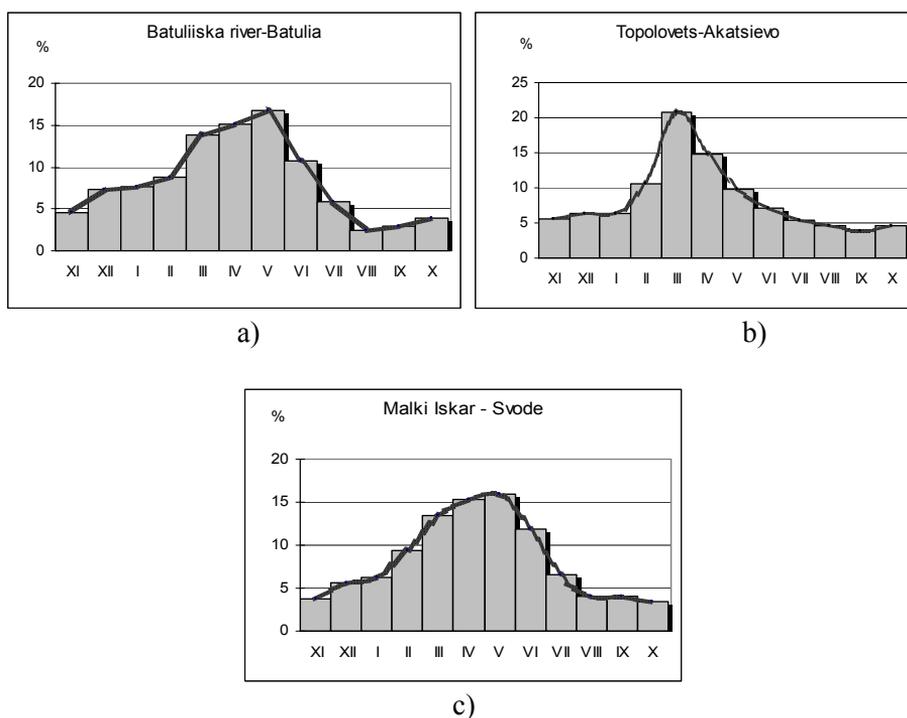


Fig. 1 Mildness-continental type of river regime: a) I subtype; b) II subtype; c) III subtype

The third subtype is with the duration of high water six months (March - July), of low water – tree months (August-October) and of transitional phase - tree months (November - January).

Region with the Continental-Mediterranean type of river regime

In the region with the Continental-Mediterranean type of river regime is observed prolonged a winter-spring phase of high water and summer-autumn phase of low water (fig. 2). With one high water and low water phase are the rivers with the flow into Black Sea with the exception of Provadijska and Batowva river, river Marica behind Plovdiv, rivers from the river system of Arda and Tundza and others. The high water phase begins in November and last until May (June). Its characteristic feature is a rash outline on the

hydrograph – reflection from one high peak and short-lived waves with large volumes. The last one is a consequence of intensive rainfall and high amounts of precipitation in autumn and winter. The hydrograph of the high water phase is asymmetric – with rapid raise and durability, and comparatively smooth fall (river Arda-Rudozem, Fakijska river and others). Its peak is in February (for the most rivers) and in March (in the river basin of Kamchia and river Tundza). The low water phase is from June (July) until October, as it starts sooner in the rivers from the Sakar and Strandza region. In all other river basins it starts in July. During the low water period water volumes are insignificant - lowest in August and September.

In this hydrological region are identified two hydrological districts. The first district includes rivers with high waters from November until May (with the duration of high water period seven months) and with low water period from June until October. With this type of water regime are the rivers Fakijska, Veleka, Ropotamo and Mladezka. In the second hydrological district the river basins are characterized with a high water period from November until June, and a low water period from July until October.

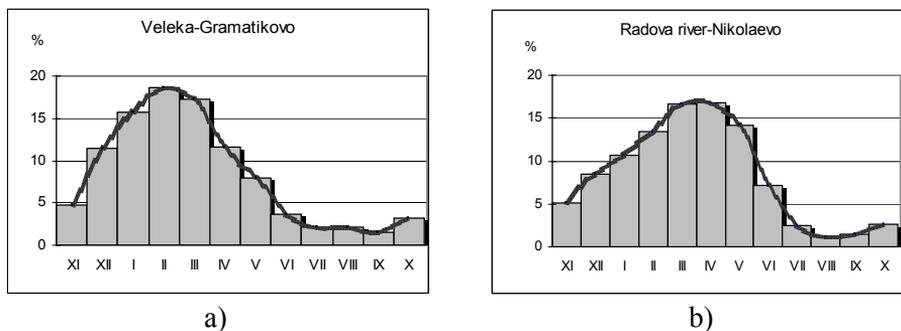


Fig. 2 Continental-Mediterranean type of river regime: a) I subtype; b) II subtype;

Region with transitional type of water regime

In the region with transitional type of water regime the flow dynamics distinguishes with two high water and two low water phases (fig. 3). The configuration of internal year allocation is characterized with clearly expressed period of high water from March (April) until June (July), a stable period of low water from July (August) until October, almost annual flow rising in November or December, and a reduction in January-February (March). This configuration is typical for the river basins developed above the attitude of 1500-1600 meters in the Rila, Pirin Western Stara Planina (northern mountainsides), Osogovo, Western Rodopi. More durable and stable is the high water phases in alpine rivers in spring. The accumulation of considerable snow resources in the catchments areas is the reason that the high water period is clearly expressed with small fluctuations in time (beginning, end, duration) and the quantitative (volume) parameters. It displays every year through the period March (April) – June (July) and has almost symmetrical uplift and fall. The volumes are largest in April and rarely in May. The

raisings of the flow in November and December in some years could be taken as a high water phase, but in perennial plan they are insignificant and slightly expressed in the hydrograph. Autumn-winter period of high water is with insignificant water volumes. The specific feature of this type of water regime is clearly outlined low water states during summer-autumn months, and winter hydrological season. Their quality exactness is demonstrated clearly with the smooth course in the hydrograph. The summer-autumn period of low water is with duration of four months – from August until October, but in some river basins (Marica – 1900, Ibyr, Kostenceka river, Chairska, Mursalenska Bistrica, Cherni Iskyr, Demjanica) is shorter with one month and appears in the period August-October. The second low water phase occurs in January and February or from January until March. The winter high water phase is with duration of three months for the rivers in Rila and Pirin, and with the two months mainly for the river basins from the northern mountainsides of the western parts of Stara Planina, western Rodopi, Osogovo. To the characteristic features of low water phases corresponds the frequent procedure during the years of consecutive occurrences of summer and winter high water phases. The exceptions are only the river basins with attitude above 2000 m, at which the lowest water volumes are registered in February.

As for the durability of high and low water states in the transitional type of river regime they also differentiate in three types, and respectively three hydrological districts. In the first hydrological district the flow regime is with high water phases during April-March and November-December and low water from July until October and in the January-March period (fig. 3).

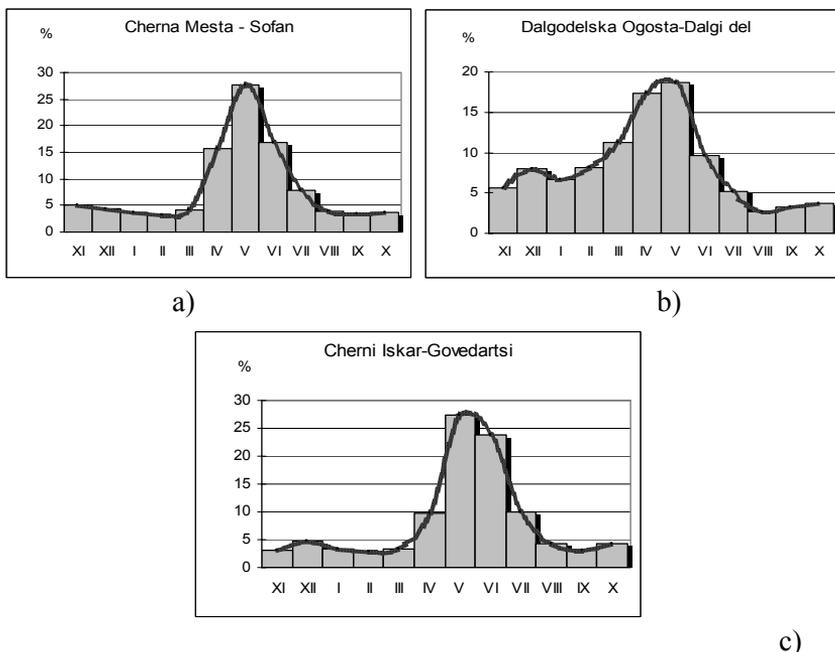


Fig. 3 Transitional type of river regime: a) I subtype; b) II subtype; c) III subtype

In the second hydrological region low and high water phases are with duration of six months, but here we distinguish two cases. The first case applies to river regimes with a high water phase from March to June and also in November and December, and a low water phase from July until October and in the January-February period. With the same configuration of internal year course of flow are the basins of the rivers in Rila, Western Stara planina and Western Rodopi. The spring-summer high water phase there begins in April and ends in July. The risings through winter period are also in November-December. The low water phase is from August until October and from January until March.

In the third hydrological region the river regime is characterized with a high water phase from February (March) until June (July) – with a total duration of seven months and raisings of the flow volumes in November-December. In the river from the Mesta river basin the high water period is observed from February until June and also in the November-December period. The low water phase is from July until October, and the decline of water level in the winter is in January. The raisings of the flow are registered in November and December. The low water states are observed in August-October and in January and February.

In a variety of river sections the river regime is under the influence not only of the complex environmental conditions, but from the different in direction and stage economic activities. Particularly significant over the natural course of the flows are regulating facilities and most of all large in volume dams. In this case in the distribution of the flow through the year and the configuration of the hydrograph remains fairly consistent, but flow phases are not clearly outlined. In the high water phase rarely high waves can be found, and the low water phase is with the largest volumes and with considerable fluctuations. These peculiarities of the flow regime can be classified as nature-anthropogenic. It includes river sections of river Iskyr behind dam “Iskyr”, river Tundza behind dam “Koprinka” and others.

Conclusion

In the territory of the country are identified three hydrological regions and seven hydrological districts. In the region with the Mildness-continental type of river regimes are observed three flow phases (spring high water, summer-autumn low water and the transitional phase), in the region with Continental-Mediterranean type of river regimes – two flow phases (prolonged winter-spring high water phase and summer-autumn low flow), and in the region with the transitional type of water regimes – four flow phases (high water phase from March/April until June/July, lasting low water phase from July/August until October, and almost every year increasing of flow in November or December and declining in January-February/March).

References

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