

Glacier regime of the Drakhtik River (Lake Sevan basin) in the conditions of climate change

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ABSTRACT

Formulation of the problem. River ice plays a significant role in biological, chemical, and physical processes occurring in freshwater bodies of temperate latitudes. In high latitudes and at high elevations, one of the main factors controlling hydrological and biogeochemical processes is river and lake ice formation and breakup. In the context of contemporary climate change, the importance of systematic studies of river ice regimes has increased.

The aim of the study is to investigate the ice regime of the Drakhtik River and to analyze and evaluate the patterns of temporal distribution and changes in ice phenomena.

Methods. The study is based on observational data on the water and ice regime of the Drakhtik River, as well as data on air and water temperature and atmospheric precipitation.

Results. The paper presents the results of a study of the spatio-temporal features of the ice regime of the Drakhtik River, which belongs to the Lake Sevan basin. The research is based on long-term meteorological, climatic, and hydrological observations for the period 1956–1957 to 2024–2025, obtained from the Center for Hydrometeorology and Monitoring of the Ministry of Environment of the Republic of Armenia for the Drakhtik River near the Drakhtik settlement.

The temporal analysis of ice regime characteristics indicates a tendency toward a reduction in the duration and intensity of ice cover. A decrease in both the duration of ice phenomena and the period of stable ice cover has been recorded. At the studied hydrological stations, the dates of freeze-up and ice breakup remain relatively stable. A clear relationship between air temperature fluctuations and ice formation parameters was identified, particularly during the winter period. Ice growth throughout the winter depends on hydrometeorological conditions – air temperature, amount of precipitation, thickness of snow cover on ice, its density, etc. Ice growth in the studied area occurs throughout the winter until the river opens up. Over the studied time interval, the maximum ice thickness has a decreasing trend at the studied posts – k linear trend coefficient thickness of ice makes up - 3.4 cm/10 years. The thickness of the snow cover on the ice also has a downward trend. The maximum thickness of the snow cover on the ice was 23–24 cm.

Changes in river ice phenomena are directly related to climatic dynamics, primarily air temperature. Under current climatic conditions, freeze-up dates tend to shift to later periods, while ice breakup dates occur earlier, resulting in a shorter ice-cover duration. The maximum ice thickness shows a consistent decreasing trend, similar to that observed on other rivers. Snow depth on the ice also tends to decrease.

Keywords: *ice phenomena, air temperature, freezing, ice cover, precipitation, water level, discharge, Drakhtik River.*

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Problem description. River ice plays a significant role in biological, chemical, and physical processes occurring in freshwater bodies of temperate latitudes [17]. In high latitudes and at high elevations [16], one of the main factors controlling hydrological and biogeochemical processes is river and lake ice formation and breakup. In the context of contemporary climate change, the importance of systematic studies of river ice regimes has increased [5–12]. Many types of economic activity are associated with the timing and duration of ice phenomena - navigation conditions, normal functioning of hydraulic structures, organization of crossings. Features of the

ice regime of rivers are a significant component of the rational use of transport infrastructure and, as a consequence, the socio-economic development of territories.

The ice factor plays a significant role in changing the winter water content of rivers. Research carried out in different river basins, showed that the change in winter river water content plays a significant role the combination of temperature and ice plays a role conditions. Ice cover regulates the participation of groundwater at different drainage levels in the formation of river runoff. With global warming, the regulating role of ice cover is decreasing. A de-

crease in groundwater reserves in river basins will lead to a decrease in their regulating role in river runoff and an increase in the frequency of occurrence of extremely low water content [5].

All rivers are divided into three large groups according to the nature of their ice regime: freezing, with unstable ice cover and non-freezing. Rivers of the middle latitudes usually freeze in winter. Three characteristic periods are distinguished on freezing rivers: 1) freezing (autumn ice phenomena); 2) freeze-up; 3) breaking up (spring ice phenomena).

The aim of the work is to study the ice regime of the Drakhtik River flowing into Lake Sevan, to identify, analyze and evaluate the patterns of temporal distribution and changes in ice phenomena. For this purpose, the following tasks were set and solved in the work: collection, processing and analysis of actual observation data for the studied rivers and; analysis and evaluation of the features of the formation of ice phenomena; evaluation of patterns of temporal changes taking into account weather and climatic conditions and physical and geographical factors of

the catchment area.

Research on the ice regime in modern climatic conditions is reflected in the works [5-12] and shows that the increase in winter temperature is manifested, in particular, in the softening of the ice regime of rivers and lakes. It should be noted that the ice regime of the rivers of the Republic of Armenia, including the territory under study, has been studied rather poorly.

The area adjacent to the Drakhtik River valley is mountainous and heavily rugged (Fig. 1). The river valley is trough-shaped with steep, high slopes composed of volcanic rocks, covered in places with alpine meadows. The river bed in the area of the post is straight, composed of cobblestones, gravel, pebbles, sand. The banks are flat, low, floodable. Mudflows often pass along the river. The water measuring rod post (Drakhtik) is located on the left bank of the river, equipped with a rod. In winter, there are banks and ice on the river. The zero height of the post is 1920.92 m BS. The water temperature is measured at the water post on the left bank.

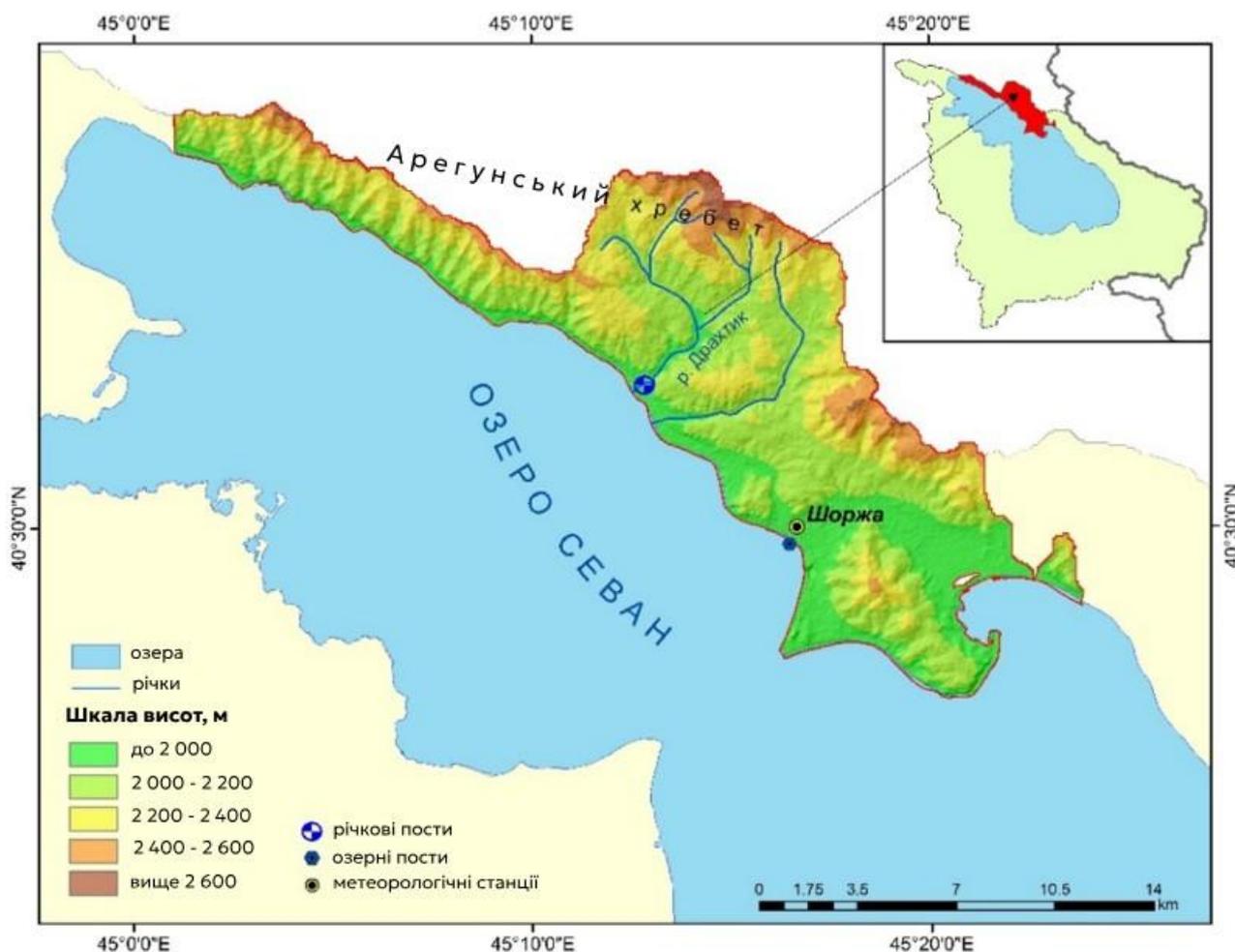


Fig. 1. Map-scheme of the hydrographic network of the river basin Drakhtik

The Drakhtik River originates mainly from the highlands and has a large slope. The average slope of the Drakhtik River from a remote point is 51 %, and

the average slope of the catchment area is 24.6 %. The catchment area for the Drakhtik post is 39.2 km², average altitude – 2,270 m. Degree of forestation

and lake coverage pool a r. Drakhtik 0 %, ploughing is insignificant : it does not exceed 35% (table 1). In particular, tributaries of Lake Sevan (River Drakhtik),

flowing down from steep and relatively short slopes of the Aeguniysky ridges, are characterized by small values of the sinuosity coefficient.

Table 1

Main hydrographic characteristics of the catchment area of the rivers and Drakhtik

Distance from mouth, km	Distance from the hydrometric section to the most remote point of the river system, km	Average slope of the river from a distant point, ‰	Main characteristics of the catchment area				
			average height, m	average slope, ‰	forestedity, %	lakeness, %	ploughing, %
0.8	7.9	51	2270	246	0	0	35

The rivers that wander along the floodplain have a bed composed of easily erodible soils. Its deformation occurs almost continuously: in some places there is erosion, in others – alluvium. Due to the instability of the banks, the bed moves within the floodplain part of the valley. This is typical for the lower reaches of the Drakhtik rivers. For them, for almost the entire year, there is no clearly expressed relationship between the level and flow rate. In some cases, the deformation can be so significant that with single-digit levels, the water flow rates differ from each other in absolute values by 10-15 times.

Materials and methodology. The source materials used in the work are actual observation data on the water and ice regime of the Drakhtik River, which flows into Lake Sevan (at the Drakhtik section), as

well as data on air and water temperature, atmospheric precipitation, conducted by Armhydromet both at the water post and at the Sevan weather station, including the results of field work.

Table 2 provides information on We have one post for the hydrological posts (GP) under study. Mudflows often occur on the river. As a result of a mudflow on 04/05/1967, a water-gauge rod was demolished, a section of the post was destroyed, as a result of which the post was moved on 05/05/1967 500 m upstream. The new post is located on the right bank, equipped with a rod and a benchmark. The zero height of the graph of the new water post has been changed by the amount of the drop and is equal to 1920.29 m BS. Level observations before and after the post was moved are not comparable. That's why

Table 2

The hydrological post under study on the Drakhtik River

Name fasting	Code post	Geographic coordinates		Distance from the mouth, km	Square catchment area, km ²	Height zero graphics		Beginning of action date, month, year
		width	longitude			height, m	system heights	
Drakhtik	85353	40.5462	45.2122	0.8	39.2	1920.92	BS	12/08/1926 (05/05/1967)

our research are being carried out since 1967.

For each hydrological year, the dates of the beginning and end of ice phenomena, as well as the dates of the beginning and end of freeze-up, were determined at the studied posts. The duration in days of the freezing and freeze-up phases was calculated. The earliest and latest dates of the appearance and disappearance of ice on the river were determined, as well as the average dates for the studied period. As part of the study, the maximum and average ice thickness at the posts for the studied hydrological year was established.

The date of the beginning of ice phenomena is determined by the appearance of their first signs (coasts, slush, etc.), the end date is the complete clearing of the river from ice. Short-term cases of ice phenomena before or after a break of more than 10

days were not taken into account. For example, in 1984, ice phenomena were observed from October 18 to 23, then reappeared only on December 2. Therefore, December 2 was considered the beginning of ice phenomena.

In the course of the research, methods of hydrological analogy, interpolation, extrapolation, mapping, as well as standard methods of statistical analysis were used.

Results and discussion. Ice phenomena occur on the Drakhtik River every year. The formation of the ice regime depends on a large number of local factors, constant ones - hydraulic and morphometric parameters of the river bed, and variables that change every year and have a direct impact on the processes of formation of the winter regime of rivers, i.e. climatic parameters. Various types of anthropogenic im-

fact are also of particular relevance.

Climate parameters have been subject to significant changes in recent decades, which will certainly affect the ice regime of this water body. In mountainous countries, including the Republic of Armenia, local factors causing ice phenomena are complex, varied and poorly studied.

As a rule, when the water temperature in the river drops below 0°C, the river enters its winter regime phase, and the process of ice formation is observed in it. The moment of establishment of negative air temperatures, accompanied by the appearance of ice phenomena in the river, is conventionally accepted as the beginning of winter, and the moment of release of ice is considered the end of winter [1-4, 9]. To assess the impact of climatic conditions on the formation of ice phenomena, the results of observations of air temperature and precipitation at 08:00 and

20:00 in the area of the Drakhtik hydrological post for 2011/12–2024/25 were used, due to the failure to save observations for previous years. The values of average air temperatures for the period November–March fluctuate from -4.7 to 0°C, and the values of average water temperatures – from 0 to 2.2°C (Table 3). Air temperature begins to rise in February. Beginning in November, it begins to fall rapidly. The lowest average monthly temperature air temperature falls in January (-4.7°C): its fluctuations occur within the range from -7.9 to -2.8. Sometimes (27-28/01/2016) average daily air temperatures of -15.0°C and below were recorded. The course of air and water temperatures coincides, while the fluctuations in average daily water temperature values are less than the fluctuations in air temperature. With the exception of April, water temperature values exceed air temperature values.

Table 3

Climatic characteristics of the Drakhtik River in the Drakhtik section, 2011/12 -2024/2025

XI	XII	I	II	III	IV
with average air temperature, °C					
1.8	-2.6	-4.7	-3.6	0.0	5.9
number of days with air temperatures above 0 °C					
21.3	7.3	1.3	4.6	16.1	28.6
sum of positive temperatures, °C					
74.6	13.4	2.0	6.8	46.9	180.5
average water temperature months, °C					
2.9	1.0	0.0	0.0	2.2	4.9
amount of precipitation, mm					
16.9	15.4	16.0	17.8	38.5	38.5
number of days with precipitation of 0.1 mm and above, days					
4.1	4.4	5.9	5.6	9.9	9.2

IN cold winters meanings temperatures water Not were observed. These meanings Can reconstruct With help close correlations between temperatures water And air (Fig. 2).

Of great importance for hydrological processes is the time of transition of air temperature through 0°C in spring, which is associated with the beginning of snowmelt and flooding. The dates of transition of

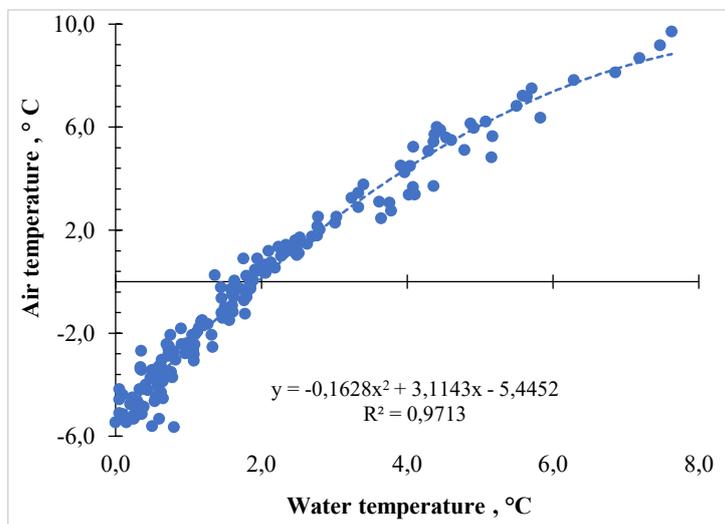


Fig. 2. Correlation between air and water temperature values for the cold period (XI - IV)

average daily air temperatures through 0°C in autumn and spring are also a sign of the beginning and end of winter. On the river Drakhtik – settlement Drakhtik the date of transition of average daily air temperatures through 0°C in spring occurs in the first and second ten-day periods of March, and sometimes in the third ten-day period of February. The transition of average daily air temperatures through 0°C in autumn is observed in the first ten-day period of December, and sometimes in the second or third ten-day period of November. The duration of the cold period fluctuates within wide limits – from 75 to 145 days. The beginning of the frost-free period falls on average on 23/III. The average date of the end of the frost-free period is 28/Nov.

The number of days with positive temperatures has been calculated and sum of positive temperatures during the cold period. The lowest value was recorded in January. This means that in January, negative air temperatures are predominantly observed in the

territory under consideration. In total, positive temperatures were observed for 1–4 days, the maximum was observed in 2024 and amounted to 7 days. The lowest value of the sum of positive temperatures during the winter period is also observed in January – 2.0°C .

Precipitation is determined by circulation factors, including local circulation of air masses. In the Drakhtik basin during the observed period (XI – IV), the minimum amount of precipitation falls in December and January – 15.4–16.0 mm. The average amount of precipitation for the entire period under consideration (2011/2012 – 2023/2024) ranges from 96.8 (2011/2012) to 178.0 (2014/2015) mm, and the number of days with precipitation of 0.1 mm and above is from 29 (2011/2012) to 52 (2017/2018, 2020/2021) days. The minimum number of days with precipitation of 0.1 mm and above falls in December (4.4 days), the maximum – in March (9.9 days). The daily maximum precipitation is 27 mm.

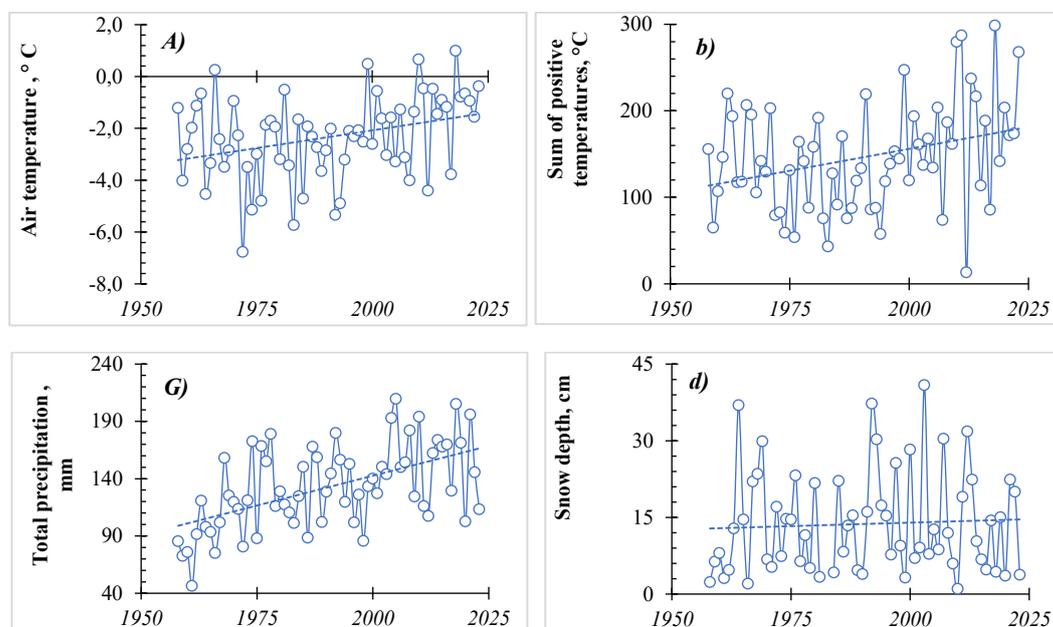


Fig. 3. Long-term changes in air temperature (a) and the sum of positive temperatures (b) in $^{\circ}\text{C}$, precipitation totals (years) and average snow depth in March (days) for the cold period (XI-III) for the Sevan weather station

Shown change temperatures air And precipitation For weather stations Sevan, located V pool lakes Sevan (Fig. 3). At the Sevan weather station, an increase was recorded throughout the study period (November – March). air temperature during the cold period. The linear trend coefficient for the average air temperature is $+0.27$, and for the sum of positive temperatures – $+10.1^{\circ}\text{C}/10$ years. On the investigated the territory also shows a tendency towards an increase in the amount of precipitation and the average height snowy cover V March, k linear trend coefficient The amount of precipitation is $+10.4$ mm/10 years, k coefficient of linear trend average height snowy cover V March – $+0.27$ s m/10 years.

Research shows that for the period 19 57/58 – 2024/25 for the river Drakhtik. Drakhtik there is a pronounced increase in the average air temperature during the cold period, the sum of positive temperatures, the amount of precipitation and the average heights snowy cover V March. Therefore, this change will certainly affect the water-ice regime of the study area.

The relatively small size of the catchment areas, the proximity of the feeding areas to the discharge point, the low permeability of the rocks that make up the surface of the basins, the mountainous, heavily dissected terrain, almost devoid of woody vegetation, the significant slopes of the watercourses, the dry

continental climate. All this leaves a bright imprint on the hydrological regime of the rivers. Their flow is distributed extremely unevenly throughout the year. Since, due to geological conditions, surface runoff prevails over underground runoff, the groundwater supply of the rivers is insignificant and the coefficient of natural regulation is low. On the Drakhtik River, up to 60-65% of the annual flow passes during the spring flood, about 25% in the summer-autumn season, the rest (10-15%) falls on the low-water period of the winter low water.

The winter low water period is established mainly in late November – early December and lasts until the first spring rises in water level. The dates of its beginning and end are also closely related to the altitude of the area. Water flow in the river is maintained in winter due to the inflow of underground waters into their beds. In the lower reaches of the rivers, short-term rises in water level due to thaws are possible. However, in many cases this does not particularly affect the average monthly flow values. The duration of the lowest water period during the winter low water period is about 25-30 days.

Determining the date of the beginning of the winter low water period is difficult because of the unclear transition from the summer-autumn to the win-

ter low water period. This is especially true for rivers where in some years the fluctuations in water levels and discharges are so small that the transition from the summer to the winter regime of the river is very imperceptible.

During strong and sudden cold snaps, which sometimes occur at the end of the autumn season, a correspondingly sharp decrease in runoff is observed due to a decrease in the inflow of groundwater.

The values of water levels and discharges in the Drakhtik River for the period November – March fluctuate within a small range, the water level is from 38 to 43 cm, and the values Water flow rate – from 0.074 to 0.22 m³/s (Table 4). The water level remains virtually unchanged from November to mid-March, after which it begins to rise. Water flow rate decreases from November to January, after which it increases due to warming. The lowest monthly value (0.074 m³/s) was recorded in January.

The results of the study confirm the transformation of the average winter runoff of the Drakhtik River. The results obtained indicate an increase in the average value winter runoff for the Drakhtik River (Fig. 4) and the growth of the value of the winter runoff characteristic for most rivers in the Lake Sevan basin [1-2, 9].

Table 4

Level water And consumption waters of the Drakhtik river in the Drakhtik section, 1967/68 – 2024/2025

Water level (cm) for the XI – III period					Water flow (m ³ /s) for XI – III II period				
XI	XII	I	II	III	XI	XII	I	II	III
39	38	39	39	43	0.11	0.091	0.074	0.089	0.22

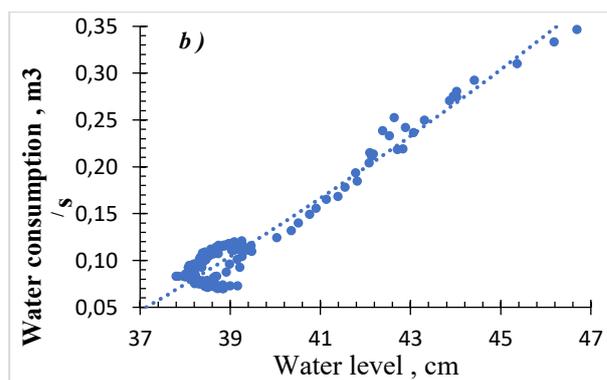
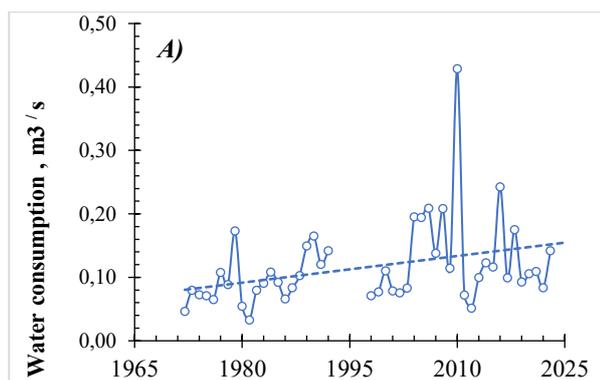


Fig. 4. Long-term changes in water consumption (a), correlation relationship between the values of water level and flow rate (b) Drakhtik river

Ice regime. Every year, various ice phenomena of varying size and duration are formed on the river under study: ice banks, freeze-up, etc. There are no spring or autumn ice drifts, slush drifts, ice jams or ice dams on the river under study.

The duration of freezing (from the appearance of ice phenomena to the establishment of ice cover) on the Drakhtik River at the Drakhtik outlets averages 19 days and fluctuates from 78 (2001/02) to 2 days

(1983/84, 1986/87, 2023/24) (Table 5). The earliest date of the onset of ice phenomena is 01 November 1976, 1982, the latest is January 24, 2024. There were years, and rare ones at that (1984, 1987), when in the last ten days of October an ice phenomenon was observed, interrupted by a period of 10 days or more, which was therefore not included in the calculations.

Among the rivers of the Lake Sevan basin, the Drakhtik River stands out for the largest number of

Table 5

Characteristics of the ice regime of the Drakhtik River in the Drakhtik section, 1974/75 – 2024/2025

Start date		Date Endings		Duration, day		
ice phenomena	ice formation	ice formation	ice phenomena	freeze	ice formation	general quantity
09/12	22/12	05/03	11/03	19	71	90

days with ice cover (freeze-up). On the Drakhtik River, continuous freeze-up forms every year, on average, lasting about 75 days. Freeze-up did not form only in 2003 and in the winter of 2003/04. The number of days with freeze-up on the Drakhtik River fluctuates between 0 and 137 days. The ice thickness at the end of the month varies: in November – from 3 to 14 cm, in December – from 4 to 24 cm, in January – from 3 to 31 cm, in February – from 2 to 34 cm. The average maximum thickness of the ice cover is 18 cm, in some cases it can reach 35 cm or more (for

example, on February 15, 1976, the ice thickness was recorded at 37 cm) (Table 6). Thus, on the river in question, the ice cover is formed mainly from December, in some years – already in November, then its thickness increases until the end of February, after which it begins to decrease and completely disappears by the first ten days of March. Sometimes (in the winter periods of 1971/72, 1981/82, 1984/85) the ice cover remained until the end of March. On average, the maximum ice thickness is recorded on February 8.

Table 6

Maximum ice thickness on the river Drakhtik table is not needed for one figure

Name of the post on the river Drakhtik	Thickness ice, cm		
	maximum, cm	date	average
Drakhtik	37	15/02/1976	18

Ice growth throughout the winter depends on hydrometeorological conditions – air temperature, amount of precipitation, thickness of snow cover on ice, its density, etc. Ice growth in the studied area occurs throughout the winter until the river opens up. Over the studied time interval, the maximum ice thickness has a decreasing trend at the studied posts – k linear trend coefficient thickness of ice makes up - 3.4 cm/10 years. The thickness of the snow cover on the ice also has a downward trend. The maximum thickness of the snow cover on the ice was 23-24 cm. The distribution pattern coincides with the distribution of ice thickness.

Ice phenomena after the river breakup last on average three days and maximum – up to 10 days. The earliest date of the river breakup is February 1, 2015. The latest breakup of the river was observed on March 31, 1982. The destruction of ice phenomena occurs in late February - mid-March.

The freezing dates in the studied river shift to later dates, and the dates of the opening and ending of ice phenomena shift to earlier dates, the duration of freeze-up and ice phenomena is reduced (Fig. 5). As for the coasts, it is clearly seen from the figure that there is a shift in the dates of its beginning and end towards later dates and a slight reduction in duration. This phenomenon is natural, since due to climate change, ice cover gives way to ice banks. On the Drakhtik River, the Drakhtik water post, on average, ice banks are observed from the first ten days of November to the end of March-beginning of April –

from 2 to 78 days.

Changes in ice phenomena on rivers are directly related to the dynamics of climatic conditions, mainly with the air temperature in the region [3], the tendencies towards breaking up and freezing closely correlate with the regional average temperature [17].

Conclusions. For the first time, a comprehensive study of ice phenomena on the Drakhtik River has been carried out. Climate changes observed in recent decades in the basin have affected the ice regime of the rivers. Increased winter air temperatures have accelerated the reduction in the duration of ice phenomena over the entire 50-year observation period, and the duration of ice formations has decreased.

The water level values in the Drakhtik River for the period November – March fluctuate within a small range – from 38 to 43 cm, and the water flow rate is from 0.074 to 0.22 m³/s. The water level remains virtually unchanged from November to mid-March, after which it rises. Water flow rate decreases from November to January, after which it increases;

Every year, various ice phenomena of varying size and duration are formed on the river under study: ice banks, freeze-up, etc.; there is no spring or autumn ice drift, slush flow, ice jams or ice dams;

The duration of freezing on the Drakhtik River averages 19 days and fluctuates from 78 (2001/02) to 2 days (1983/84, 1986/87, 2023/24). The earliest date of the onset of ice phenomena is 01 November 1976, 1982, the latest - January 24, 2024. Rarely (1984, 1987) ice phenomena were observed in the last ten

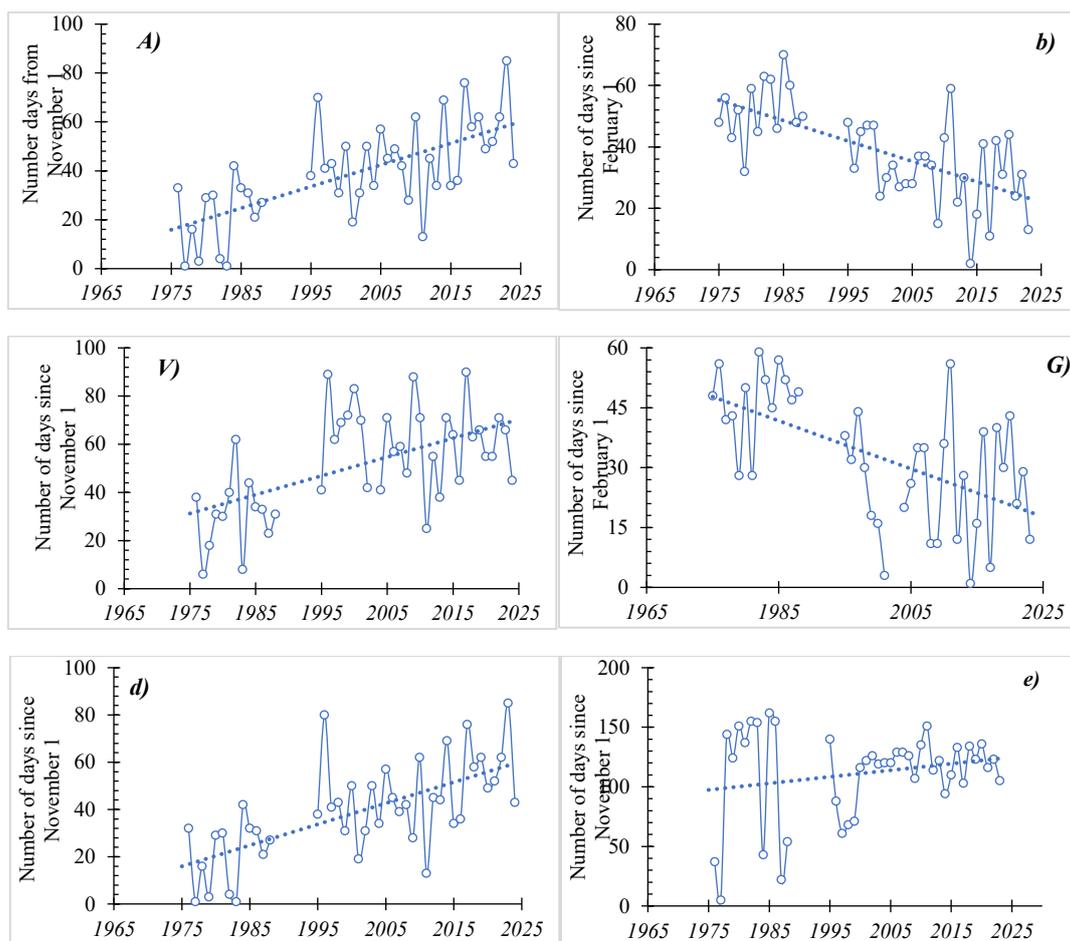


Fig. 5. Interannual changes in the onset (a, c, d), end (b, d, e) of ice phenomena (a, b), freeze-up (c, d) and ice cover (d, e) on the Drakhtik River – Drakhtik settlement for 1974/75 – 2023/24

days of October;

On the Drakhtik River, a continuous ice cover forms every year, which lasts on average about 75 days, fluctuating from 0 to 137 days. Ice cover It is formed mainly in December, in some years – in November and disappears by the first ten days of March. Sometimes (in the winter periods of 1971/72, 1981/82, 1984/85) the ice cover remained until the end of March;

The thickness of the ice at the end of the month varies: in November – from 3 to 14 cm, in December – from 4 to 24 cm, in January – from 3 to 31 cm, in February – from 2 to 34 cm. The average maximum thickness of the ice cover is 18 cm, in some cases it can reach 35 cm or more (for example, on February 15, 1976, an ice thickness of 37 cm was recorded);

In modern climatic conditions on the river under study, the freezing dates are shifted to later dates, and the dates of the opening and end of ice phenomena are shifted to earlier dates, the duration of ice formation and ice phenomena is reduced.

The maximum thickness of the ice cover has a steady tendency to decrease, as in other rivers. The depth of the snow cover on the ice also has a tendency to decrease. The maximum depth of the snow cover on the ice was 23-24 cm.

Changes in the timing and duration of ice phenomena on rivers are directly related to the dynamics of climatic conditions, mainly with air temperature.

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Льодовиковий режим річки Драхтик (басейн озера Севан) в умовах зміни клімату

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Робота висвітлює результати досліджень просторово-часових особливостей льодового режиму річки Драхтик, яка відноситься до басейну озера Севан. Основою проведених досліджень є фактичні ряди спостережень за метеорологічними, кліматичними та водним режимами за період з 1956-1957 рр. по 2024-2025 рр. «Центру гідрометеорології і моніторингу» ГНКО Міністерства навколишнього середовища Республіки Вірменія на представленій річці в районі населеного пункту Драхтик та польові дослідження. Отримані результати характеризують особливості формування льодових явищ на досліджуваному періоді, особливо привертають увагу процеси замерзання (скресання льоду) річки Драхтик, що впадає в озеро Севан. Часовий аналіз характеристик льодового режиму досліджуваної річки вказує на тенденцію до зменшення шару льоду в часі його існування. Зафіксовано зменшення тривалості та утворень льодових явищ на річці. На досліджуваних гідрологічних постах річки Драхтик дати замерзання та дати скресання льоду залишаються майже без змін. Виявлені залежності впливу коливань температури повітря на показники формування льодових явищ на представленій річці. Особливо це є характерним для зимових температурних коливань, які відбиваються на параметрах льодового режиму річки. Отримані результати дають можливість визначити основні зміни в умовах формування льодового режиму річки, що дозволить враховувати під час планування та організації гідротехнічних заходів, та надалі поглиблювати дослідження льодового режиму річок даної території з метою зменшення матеріальних збитків будь-якої економічної діяльності. Отримані результати є вагомим внеском у вивчення регіональних змін щодо умов утворення льодового режиму, що відбуваються на тлі тенденцій змін температурних показників, та можуть допомогти виявити більш тривалі довгострокові зміни режиму річки.

Ключові слова: льодові явища, температура повітря, замерзання, льодостав, атмосферні опади, рівень води, витрати води, річка Драхтик.

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