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Some results of precipitation distribution in the territory of Georgia
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Abstract

The distribution of precipitation in Georgia depends on the geographical location, the nature of the terrain and the characteristics of atmospheric processes, and is characterized by great diversity. The heaviest precipitation falls on the Black Sea coast and in those areas of Western Georgia where orographic conditions contribute to the development of ascending movements of air masses on the slopes of mountain ranges.

In the article, based on data from 35 meteorological stations for the period 2016-2022, the distribution of precipitation by regions of Georgia was studied, the annual precipitation amount was determined, and regions with heavy precipitation were identified.

The results obtained will allow the relevant services to carry out preventive measures to mitigate the effects of individual hazardous natural phenomena (floods, high waters, mudflows, landslides).

Key words: *precipitation, natural phenomena, climate*

Introduction

Precipitation distribution in Georgia is uneven due to its physical and geographical features. Western Georgia experiences heavier precipitation than Eastern Georgia.

Frequent and intense precipitation causes natural disasters such as floods, landslides, and other events. In recent years, the frequency of such events has increased in Georgia, due, among other things, to climate change. For example, on January 11, 2021, heavy precipitation across Georgia caused problems in both western and eastern Georgia. In the village of Bashi in Samtredia Municipality, agricultural fields and the first floors of residential buildings were flooded, while in Tskaltubo Municipality, arable land was flooded. In the town of Surami, water penetrated homes. Heavy rains in the village of Latani in Mestia Municipality caused a rock collapse on a road. Similar events have repeatedly occurred in recent years across Georgia [1-3;6;9].

Studying precipitation distribution will help us implement preventative measures against natural disasters.

Area under study

The study area is Georgia. Its physical and geographical features, the interaction of the Caucasus Mountains and the Black Sea, and the different climatic conditions of Western and Eastern Georgia determine the uneven distribution of precipitation across Georgia.

Materials and Methods

The results of precipitation distribution in Georgia are based on data for 2016-2022 provided by the National Environmental Protection Agency.

The research is carried out using the methods of mathematical statistics and probability theory widely used in climatology.

Results

Based on the materials on precipitation in Georgia, including data from 35 meteorological stations for the period 2016-2022, a table of precipitation distribution by the relevant stations (Table 1) and regions of Georgia (Table 2) was compiled.

Tab. 1. Average annual precipitation (mm) in Georgia according to meteorological stations (2016-2022)

Point	Precipitation (mm.)	Elevation (m)
Akhalkalaki	670	1707
Khertvisi	565	1250
Keda	2330	256
Tsalka	700	1482
Khulo	1520	923
Bakuriani	980	1700

Sagarejo	680	772
Kobuleti	2800	10
Borjomi	705	850
Dedoplistskaro	560	800
Telavi	755	490
Akhaltikhe	650	1029
Tbilisi, Digomi	480	520
Khashuri/Agara	620	640
Gori	580	588
Chokhatauri	1750	150
Mta-Sabueti	1230	1246
Tianeti	620	1100
Poti	2170	2
Zestafoni	1350	160
Zemo Chaladidi	1850	3
Magharoskari	810	920
Sachkhere	1080	500
Fasanauri	860	1050
Nokalakevi	1898	140
Kutaisi	1485	120
Zugdidi	1740	100
Ambrolauri	1080	550
Alpana	1160	560
Legakhare	1525	220
Shovi	1280	1600
Luji	1540	1000
Khaishi	795	700
Bolnisi	655	550
Lagodekhi	1200	450

According to meteorological stations, the average annual precipitation rate in Georgia ranges from 480 mm (Tbilisi, Digomi) to 2800 mm (Kobulti, Adjara region).

Tab. 2. Average annual distribution of precipitation by regions of Georgia (2016-2022)

Region	Precipitation (mm.)
Adjara	2220
Guria	1750
Imereti	1290
Kakheti	800
Mtskheta-Mtianeti	765
Racha-Lechkhumi and Kvemo Svaneti	1265
Samegrelo-Zemo Svaneti	1600
Samtskhe-Javakheti	725
Kvemo Kartli	675
Shida Kartli	600
Tbilisi	480

Based on Table 2, a corresponding histogram was compiled (Fig. 1).

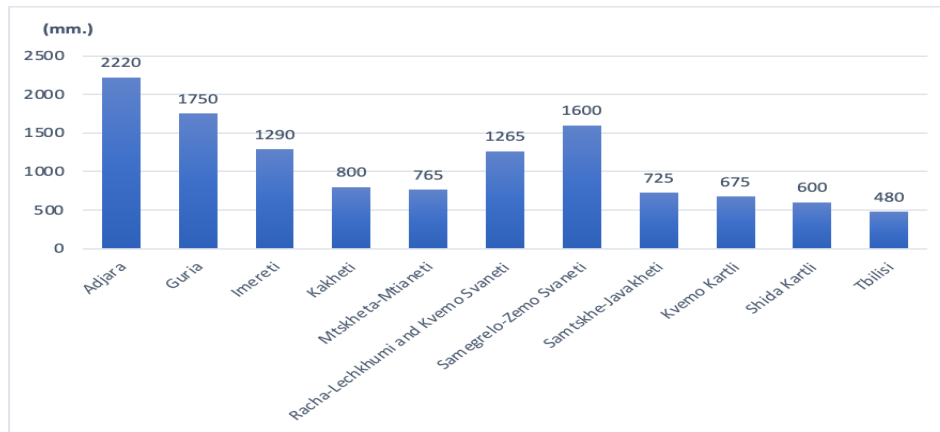


Fig. 1. Average annual precipitation (mm) by region in Georgia (2016-2022)

Precipitation ranking

Tab. 3. Distribution of Average Annual Precipitation (mm) by Increment in Georgian Regions, Based on Data from 1961-2022

0-500	Tbilisi
501-750	Shida Kartli, Kvemo Kartli, Samtskhe-Javakheti
751-1000	Kakheti, Mtskheta-Mtianeti
1001-1500	Imereti, Racha-Lechkhumi and Kvemo Svaneti
1501-2000	Samegrelo-Zemo Svaneti, Guria
2001 and above	Adjara

According to Table 3, we compiled a geoinformation map showing the distribution of average precipitation across Georgia by region (Fig. 2).

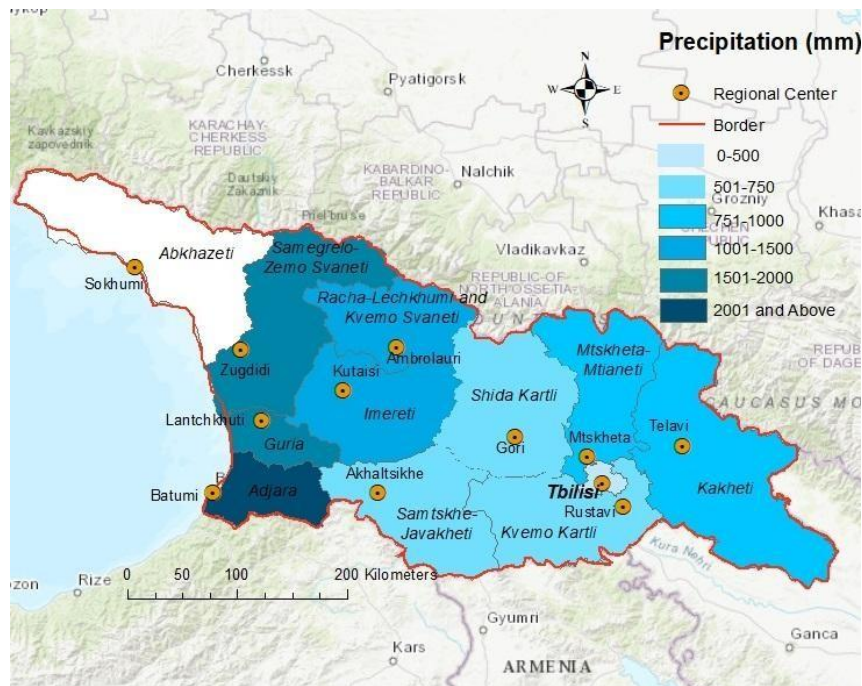


Fig. 2. Distribution map of the average annual amount of precipitation (mm) by regions of Georgia, based on data from 1961-2022

Discussion

An analysis of precipitation data for 2016-2022 showed that Western Georgia is traditionally characterized by heavy rainfall. However, the frequency of intense and heavy precipitation events in Western and Eastern Georgia is increasing, largely due to global climate change. Such events pose a significant threat to both agricultural crops and human life. We have examined individual cases from recent years in various studies. [4-5; 7-8; 10].

Conclusions

As studies have shown, based on data from 2016-2022, Western Georgia receives more precipitation during the year than Eastern Georgia. The regions of Samegrelo-Zemo Svaneti and Adjara stand out in particular, where the annual total precipitation is 1500-2000 mm and more than 2000 mm, respectively. Meanwhile, the least precipitation falls in Tbilisi (Eastern Georgia), where it does not exceed 500 mm during the year.

Note: The report on the mentioned study entitled “Precipitation in the territory of Georgia in 2016-2022” was made at an international scientific conference held in 2025 in Burgas (Bulgaria). - 34th International Conference "Ecology and Safety"

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ნალექების განაწილება საქართველოს ტერიტორიაზე 2016-2022 წლების მონაცემების მიხედვით / მიხეილ ფიფია, ნაზიროლა ბეგლარაშვილი, ნინო ჯამრიშვილი, ნინო შავიშვილი / სტუ-ის ჰმ-ის შრომათა კრებული-2026.-ტ.139.-გვ. 67-71 -ქართ., რეზ. ქართ., ინგლ., რუს. საქართველოში ნალექების განაწილება დამოკიდებულია გეოგრაფიულ მდებარეობაზე, რელიეფის ბუნებასა და ატმოსფერული პროცესების მახასიათებლებზე და ხასიათდება დიდი მრავალფეროვნებით. ყველაზე ძლიერი ნალექები მოდის შავი ზღვის სანაპიროზე და დასავლეთ საქართველოს იმ რაიონებში, სადაც ოროგრაფიული პირობები ხელს უწყობს მათა ქედების ფერდობებზე ჰაერის მასების აღმავალი მოძრაობების განვითარებას. სტატიაში, 2016-2022 წლების პერიოდის 35 მეტეოროლოგიური სადგურის მონაცემების საფუძველზე, შესწავლილია ნალექების განაწილება საქართველოს რეგიონების მიხედვით, განისაზღვრა წლიური ნალექების რაოდენობა და გამოვლინდა ძლიერი ნალექების მქონე რეგიონები. მიღებული შედეგები საშუალებას მისცემს შესაბამის სამსახურებს, განახორციელონ პრევენციული ღონისძიებები ცალკეული საშიში სტიქიური მოვლენების (წყალდიდობა, ადიდება, ღვარცოფი, მეწყერი) შედეგების შესამცირებლად.

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Распределение осадков в Грузии по данным за 2016-2022 годы / Михаил Пипия, Назирола Бегларашвили, Нино Джамришвили, Нино Шавишвили / Сб. Трудов ИГМ ГТУ. - 2026. – том 139. - с. 67-71 - Груз.; Рез: Груз., Англ., Рус. Распределение осадков в Грузии зависит от географического положения, характера местности и особенностей атмосферных процессов и характеризуется большим разнообразием. Наибольшее количество осадков выпадает на побережье Черного моря и в тех районах Западной Грузии, где орографические условия способствуют развитию восходящих движений воздушных масс на склонах горных хребтов. В статье на основе данных 35 метеорологических станций за период 2016-2022 годов изучено распределение осадков по регионам Грузии, определено годовое количество осадков и выявлены регионы с обильными осадками. Полученные результаты позволят соответствующим службам проводить профилактические мероприятия по смягчению последствий отдельных опасных природных явлений (наводнений, паводков, селевых потоков, оползней).