

ANALYSIS OF HEAVY PRECIPITATION IN THE ADIGENI AND CHOKHATAURI MUNICIPALITIES ON JULY 21, 2025, BASED ON SATELLITE MEASUREMENTS

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Abstract: In the work some results of heavy precipitation analysis in Adigeni and Chokhatauri municipalities on July 21, 2025 based on ground-level and satellite measurements are presented. In particular, heavy rain caused damage to residents of the villages of Gomaro and Shoka in the Adigeni municipality and contributed to a landslide in the village of Zoti in the Chokhatauri municipality, which blocked the access road for eight families.

Key Words: atmospheric precipitation, flooding, flood, landslide.

Introduction

Atmospheric precipitation, as one of the most important factors in climate formation, directly affects the vital functions of the environment. In this regard, in many countries of the world, including Georgia, special attention has always been paid to the study of precipitation patterns, their spatial-temporal distribution, as well as their forecasting [1-4]. Interest in these studies has increased even more in recent decades due to the process of global warming [5,6]. Both heavy precipitation (floods, landslides, mudflows, damage to vegetation, etc. [7-14]) and its deficiency (droughts, desertification, decreased crop yields, etc. [15]) hurt the environment. Thus, heavy rainfall over several days led to a landslide with casualties in Nergeeti (Imereti) on February 7, 2024 [12].

This work is a continuation of previous traditional studies [13,14]. Some results of heavy precipitation analysis in Adigeni and Chokhatauri municipalities on July 21, 2025, based on ground-level and satellite measurements are presented below.

Study area, material and methods

Study area – two municipalities of Georgia – Adigeni and Chokhatauri.

The following information is used. Satellite observation data [https://neo.gsfc.nasa.gov/view.php?datasetId=GPM_3IMERGM] about the daily sum of atmospheric precipitation. Satellite measurement resolution is $0.1^\circ \times 0.1^\circ$ ($\approx 90 \text{ km}^2$). Accordingly, for the territory of Georgia there are satellite data on precipitation for 768 points.

Lightning data – from [https://www.blitzortung.org/ru/live_lightning_maps.php?map=42].

In the proposed work the analysis of data is carried out with the use of the standard statistical analysis methods.

Results and discussion

Results in Fig. 1- Fig. 4 and Table 1 are presented.

On July 21, 2025 thunderstorms with heavy precipitation were observed over various parts of the territory of Georgia (including Adigeni and Chokhatauri municipalities).

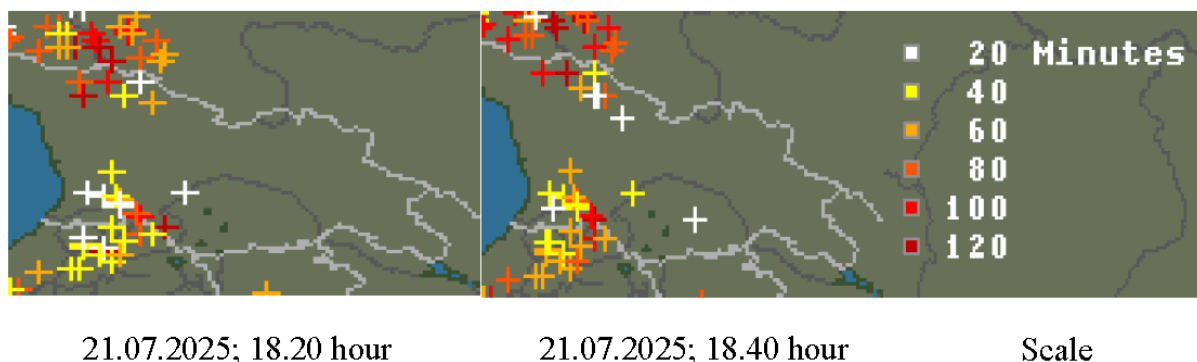


Fig. 1. An example of the distribution of lightning discharges over the territory of Georgia on July 21, 2025 at 18.20 and 18.40 hours.

In Fig. 1 an example of the distribution of lightning discharges over the territory of Georgia (including Tbilisi) on July 21, 2025, at 18.20 and 18.40 hours.

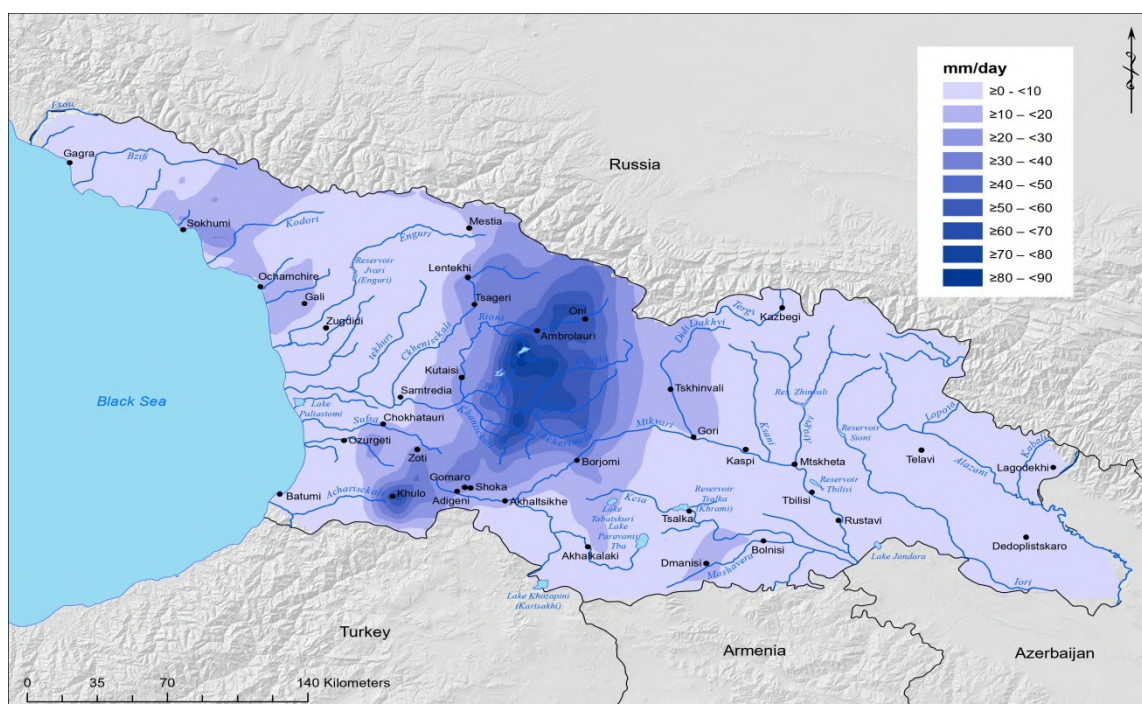


Fig. 2. Distribution of the daily sum of atmospheric precipitation on the territory of Georgia on July 21, 2025, according to satellite measurements.

In Fig. 2 and Table 1, data about the daily sum of atmospheric precipitation on the territory of Georgia on July 21, 2025, according to satellite measurements are presented. In Fig. 3 data on the repetition of the daily sum of atmospheric precipitations in Georgia are presented.

Table 1. Statistical characteristics of the daily sum of atmospheric precipitations on the territory of Georgia on July 21, 2025, according to satellite measurement (Fig. 2).

Min	Max	Average	St Dev	St Err	Count
0.00	89.5	11.7	15.6	0.56	768

As follows from Table 1, on the specified day, in accordance with satellite data, the precipitation amount varied from 0.00 mm to 89.5 mm (Ambrolauri Municipality, Racha-Lechkhumi and Kvemo Svaneti, Georgia), with an average value of 11.7 mm in the villages of Gomaro and Shoka in the Adigeni Municipality. Satellite data showed a daily rainfall of 30.2 mm. Seven families in Gomaro were affected by the disaster. Due to heavy rain, a mudflow damaged homes and yards. One house was almost completely buried by the mudflow. Furniture, appliances, and household items were damaged and destroyed. About ten cars were also damaged.

In the village of Zoti in the Chokhatauri Municipality, a daily rainfall of 36.2 mm was recorded. A landslide caused by the heavy rain blocked the access road for eight families in the village (Fig. 2).

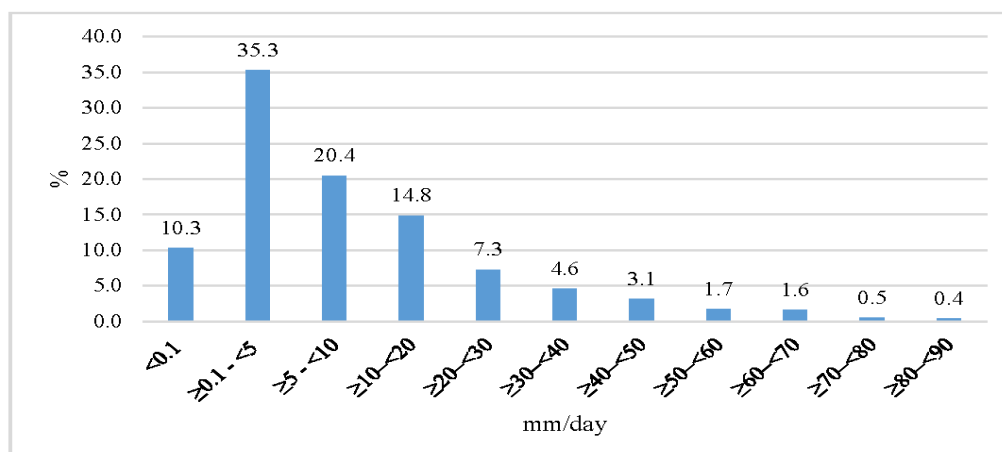


Fig. 3. Repetition of the daily sum of atmospheric precipitations in Georgia on July 21, 2025, according to satellite measurement.



Fig. 4. An example of the negative consequences of a heavy rainfall on two locations in Adigeni municipality on July 21, 2025. [<https://1tv.ge/news/adigenis-municipalitetsshi-ukhvma-naleqma-problemebi-sheqmna-daitbora-dadazianda-sakhlebi-sagzao-infrastruqtura-sasoflo-sameurneo-savargulebi/>].

Finally, in Fig. 4 an examples of the negative consequences of a heavy rainfall on two locations in Adigeni municipality on July 21, 2025, are presented.

Conclusion

In the future, we plan to continue similar studies for other regions of Georgia using ground-based and satellite measurement data against the backdrop of climate change.

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