

RETROSPECTIVE ANALYSIS OF THE DYNAMICS OF HAIL PROCESSES IN EASTERN GEORGIA

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Abstract. This paper presents some results of a retrospective analysis of hail processes dynamics in Eastern Georgia. Specifically, GIS technology was used to update (digitize) V. Gigineishvili's (1960) well-known map-scheme of the foci and most common trajectories of intense hail in Eastern Georgia (based on long-term data from the meteorological network and field observations). A comparison was made between the trajectories of the hail processes presented on this map-scheme and the trajectories of the hail clouds on May 28 and July 13, 2019, obtained using radar observations of them. In the future, it is planned to update other previously created maps of the distribution of hazardous hydrometeorological processes in Georgia.

Key words: dangerous meteorological processes, hail, radar monitoring, hail process trajectory mapping, GIS technologies.

Introduction

Among the various types of natural disasters in Georgia, hail processes are among the most significant due to the high level of damage they cause. Therefore, over the years, a large number of works have been published on various areas of research into these processes (hail climatology [1–6], radar observations of hail clouds [7–12], etc.). Detailed information on the dynamics of hail processes is often necessary to solve various problems of scientific or practical significance [1,7,11,12]. In particular, a well-known work [1] provides a schematic map of hail process trajectories in Eastern Georgia, presented in graphical form. Later, similar studies began to be conducted using digital technologies [3,6,8,11,12]. For a more qualitative comparative analysis of modern and historical maps, it is better to convert the latter to a modern form. An example of such a comparative analysis is presented below.

Study area, material, and methods

Study area – Eastern Georgia. The following materials were used in this work.

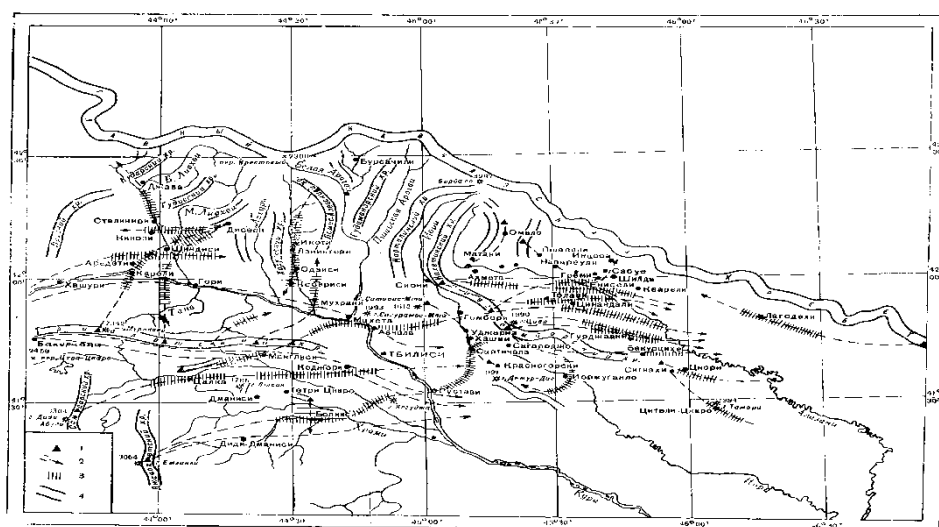


Fig. 1. Map-scheme of the foci and most frequently occurring trajectories of intense hailstorms in Eastern Georgia (based on long-term data from the meteorological network and field observations) [1].

1. Map-scheme the foci and most frequently occurring trajectories of intense hailstorms in Eastern Georgia (based on long-term data from the meteorological network and field observations) [1].
2. Radar data on hail cloud trajectories on May 28 and July 13, 2019, in Eastern Georgia [11,12]. The updating (digitization) of the map-scheme (Fig. 1) was carried out using GIS technologies.

Results and discussion

The results in Fig. 2 are presented.

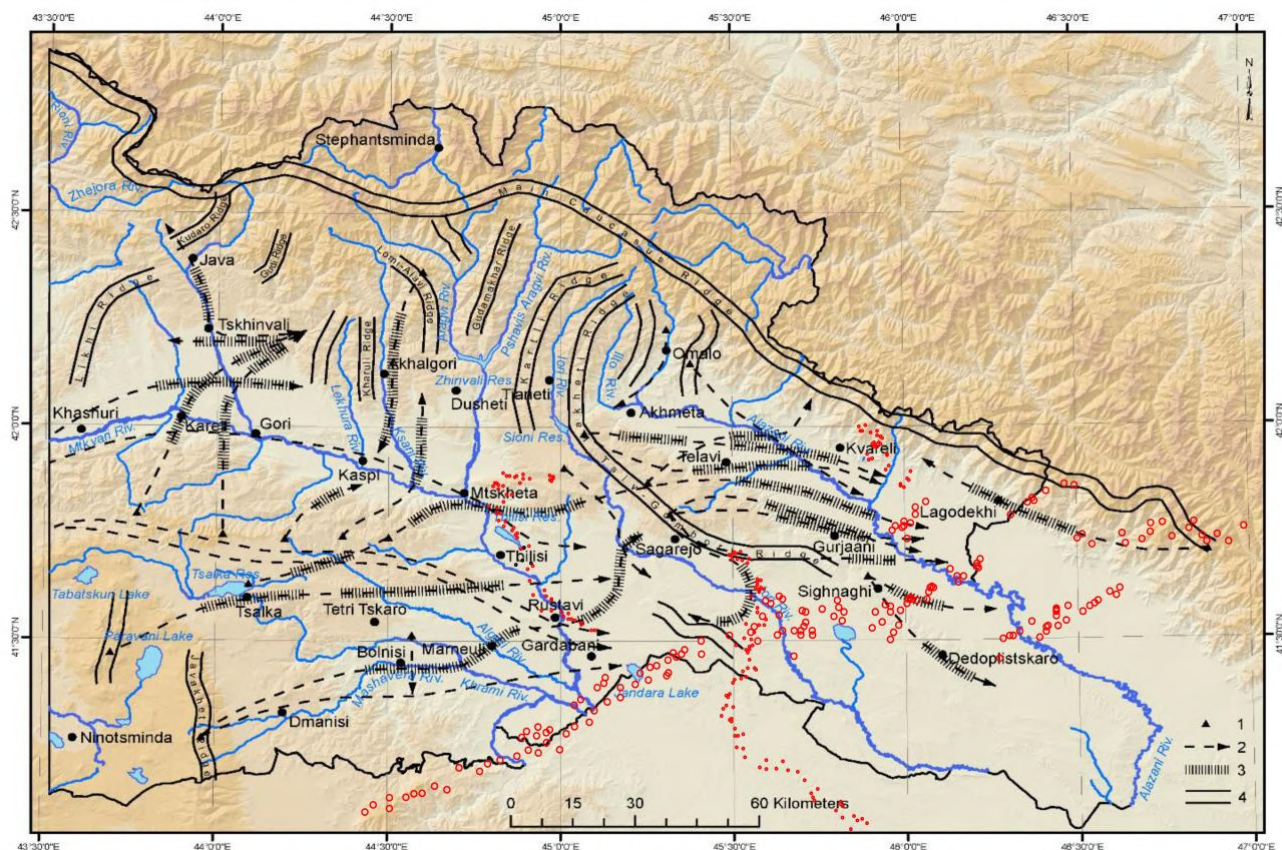


Fig. 2. Digitized map-scheme of Fig. 1.

1 – hailstorm foci. 2 – hailstorm trajectories. 3 – increasing hailstorm intensity. 4 – mountain ranges.

In Fig. 2, the digitized map-scheme of Fig. 1 is presented. Also, for example, data on the trajectories of hail clouds over the territory of Eastern Georgia on May 28 (small circles) and July 13 (large circles), 2019, obtained using radar observations of them [11,12] were superimposed on this updated map-scheme. The leading flow is Western.

As can be seen from Fig. 2, some hail cloud trajectories determined using radar observations coincide with the hail process trajectories according to [1], while others do not. For example, on May 28, 2019, some hail clouds moved from Azerbaijan to Georgia, and on July 13, 2019, from Armenia. Such trajectories are not shown on the map-scheme [1]. One explanation for this may be the lack of hail data in the specified area during the years of publication of [1]. Furthermore, radar observations are more representative for determining hail cloud trajectories than the network of meteorological stations.

It should be noted that a detailed graphic map-scheme of the trajectories of hail processes over the territory of Kakheti based on radar measurements is presented in the work [7], completed in 1982. In the future, it is planned to digitize this map, which will allow for a comparison of historical and modern radar data on the dynamics of hail processes over this territory.

As for the data from meteorological stations on hailstorms, the use of the information from the catalog [4] on them will allow a comparison of the dynamics of hail processes in Eastern Georgia in the last few decades with previous studies [1] in the context of climate change.

Conclusion

In the future, it is planned to update other previously created maps of the distribution of hazardous hydrometeorological processes in Georgia.

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