HAIL STORMS IN GEORGIA IN 2016-2018

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Summary:
The analysis of the data of the Georgian Environment Agency on the incidents of hail in Georgia and damage from them in 2016-2018 is presented. The greatest number of days with hail for the indicated three years was recorded in Kakheti (32 days with hail, 90 locations subjected to hail), the smallest – in Samegrelo-Zemo Svaneti (one day with hail, 1 subjected to hail locations). A map of hail cases has been built.

Key Words: Hail storm, dangerous meteorological phenomena, geoinformation map

Introduction
Among natural disasters, hail is a dangerous event for Georgia. It causes significant material damage, damages the roofs and walls of buildings, crops, orchards, vineyards and leads to the death of pets. Research on hail processes in Georgia has been the subject of many works, including over the past 15 years [1-12]. Therefore, the city has attracted the attention of local residents, historians and travelers from ancient times. In July 1877, the Iveria newspaper reported that on July 4, in fine weather, it got dark in the afternoon, a heavy thunderstorm, heavy rain fell, and then hail, the grain of which was the size of an egg of a dove, followed. Crops and vineyards were completely destroyed in Gurjaani, Vejni, Bakurtsikhe and nearby villages. On June 6, 1972, hail was noted in the regions of Lagodekhi, Gurjaani, Telavi and Dusheti, resulting in damage to hundreds of hectares of crops. On July 19, 2012, a midnight natural disaster struck the eastern part of Georgia, Telavi and neighboring villages in the Telavi and Gurjaani districts. A whirlwind storm was accompanied by a strong hail. Buildings were damaged, crops were completely destroyed, and at dawn not a single leaf was on the plants. The loss exceeded $ 100 million [1].

This paper studies the occurrences of hailstorms in the territory of Georgia in 2016-2018 and analyzes the damage caused during this period. For the work were used materials National Environmental Agency observational data and literature on hail.

Results
Based on the materials available to us, on the hail and the damage it caused, which covers 2016–2018, a table was compiled (Table), which shows data on the damage caused by hail for the regions of Georgia. It also indicates the number of hail days, duration, damage, process and affected municipalities.

Analysis of Table 1. shows that hail processes in 2016-2018 were significantly more active in eastern Georgia than in western Georgia, especially in the Kakheti region (32 days) and Samtskhe-Javakheti region (16 days), where hail was observed in all municipalities these regions. It was also shown that hail is more common and more destructive during Western processes.

This trend of the hail is not new and was mentioned in a number of literary sources and scientific articles, including in our studies [2-6]. It should also be noted that the damage caused by hail in the east of Georgia over the past three years has reached tens of millions of GEL, which is a huge loss for the Georgian economy.
### Table 1

<table>
<thead>
<tr>
<th>Regions</th>
<th>Number of days</th>
<th>Damage</th>
<th>Duration</th>
<th>Process</th>
<th>Municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjara</td>
<td>2</td>
<td>Hail damaged citrus and plants</td>
<td></td>
<td></td>
<td>Batumi Khelvachauri Khulo</td>
</tr>
<tr>
<td>Guria</td>
<td>1</td>
<td>Traffic was hampered by the hail</td>
<td>15 min.</td>
<td></td>
<td>Ozurgeti</td>
</tr>
<tr>
<td>Samegrello-zemo Svaneti</td>
<td>1</td>
<td>The hail destroyed the crops</td>
<td></td>
<td></td>
<td>Tsalenjikha</td>
</tr>
<tr>
<td>Tbilisi</td>
<td>3</td>
<td>Cars damaged</td>
<td></td>
<td></td>
<td>Tbilisi</td>
</tr>
<tr>
<td>Kakheti</td>
<td>32</td>
<td>Agricultural fields have been destroyed, poultry have been</td>
<td>10-30 min.</td>
<td>Western process, Eastern</td>
<td>All municipalities</td>
</tr>
<tr>
<td>Mtskheta-Mtianeti</td>
<td>2</td>
<td>Plants and vineyards were damaged. Vegetable crops, fruit trees were damaged.</td>
<td></td>
<td>process, Intramass process</td>
<td>Mtskheta, Dusheti</td>
</tr>
<tr>
<td>Samtskhe-Javakheti</td>
<td>16</td>
<td>Hail destroyed crops, damaged orchards and agricultural</td>
<td>10-20 min.</td>
<td>Western process</td>
<td>All municipalities</td>
</tr>
<tr>
<td>Kvemo Kartli</td>
<td>7</td>
<td>Agricultural crops were damaged. In Tsalka municipality the diameter of the hail was 24 mm.</td>
<td></td>
<td>Intramass process</td>
<td>Rustavi, Bolnisi, Dmanis, Tsalka</td>
</tr>
<tr>
<td>Shida Kartli</td>
<td>10</td>
<td>The disaster has destroyed much of the fruit trees, vineyards and crops in Shida Kartli. Yards and roads were flooded in the city of Gori and traffic has slowed.</td>
<td>20 min.</td>
<td>Western process, Eastern</td>
<td>Gori, Kaspi, Kareli</td>
</tr>
</tbody>
</table>

According to Table and based on statistical data for 2016-2018, we have prepared a geoinformation map of the hail on the territory of Georgia. (Fig.).

![Fig. Hail According to 2016-2018 Data in Georgia](image)
Fig. also shows that the hail especially damages the Kakheti region and also causes great damage to the regions of Samegrelo-Zemo Svaneti. The smallest hail is observed in the Samegrelo-Zemo Svaneti region.

Over the past three years, the number of hail days in Kakheti was 32, which was recorded in 90 locations in the region, this is the highest indicator hail in Georgia. The lowest indicator hail is in the Samegrelo-Zemo Svaneti region, where the number of hail days is 1 in 1 location.

**Conclusion**

Over the past three years, hail has been a frequent occurrence in Georgia. The hail in eastern Georgia is characterized by a duration (30 min) and the largest hail grain (24 mm), which is mainly due to western processes.

**References**