Analysis of the Bright Fireball over Turkey on May 27, 2020

#6264

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Successful search for meteorites allows specifying the initial mass of the body, adjust the destruction model, and clarify the criteria for the fallout of meteorites [1,2]. Unlike meteorite finds, less than four dozen cases have been registered when, based on the photo and video data, it was possible to find meteorites and determine parameters of pre-atmospheric trajectory [3,4]. Our team is actively and successfully engaged in the search for fresh falls by using photo and video data [5]. Better way to improve the trajectory determination accuracy is building fireball networks [6] which automate calculations. CCTV cams are spread in dense population areas, but the meteorite recovery chance and the registry of a fireball depend on specialized cams. Even in this case, meteoroid's initial velocity determination is a hard task and significant errors can occur at certain atmospheric entry angles [7]. The aim of this work was to analyze the fireball observed on May 27, 2020 at 17:30:15 (UTC) [8] over the East Anatolia, Turkey (Artvin and Yusufeli) and search the meteorites. After the event, an international consortium was first organized by Ozan Unsalan and then V. I. Grokhovsky for this purpose.

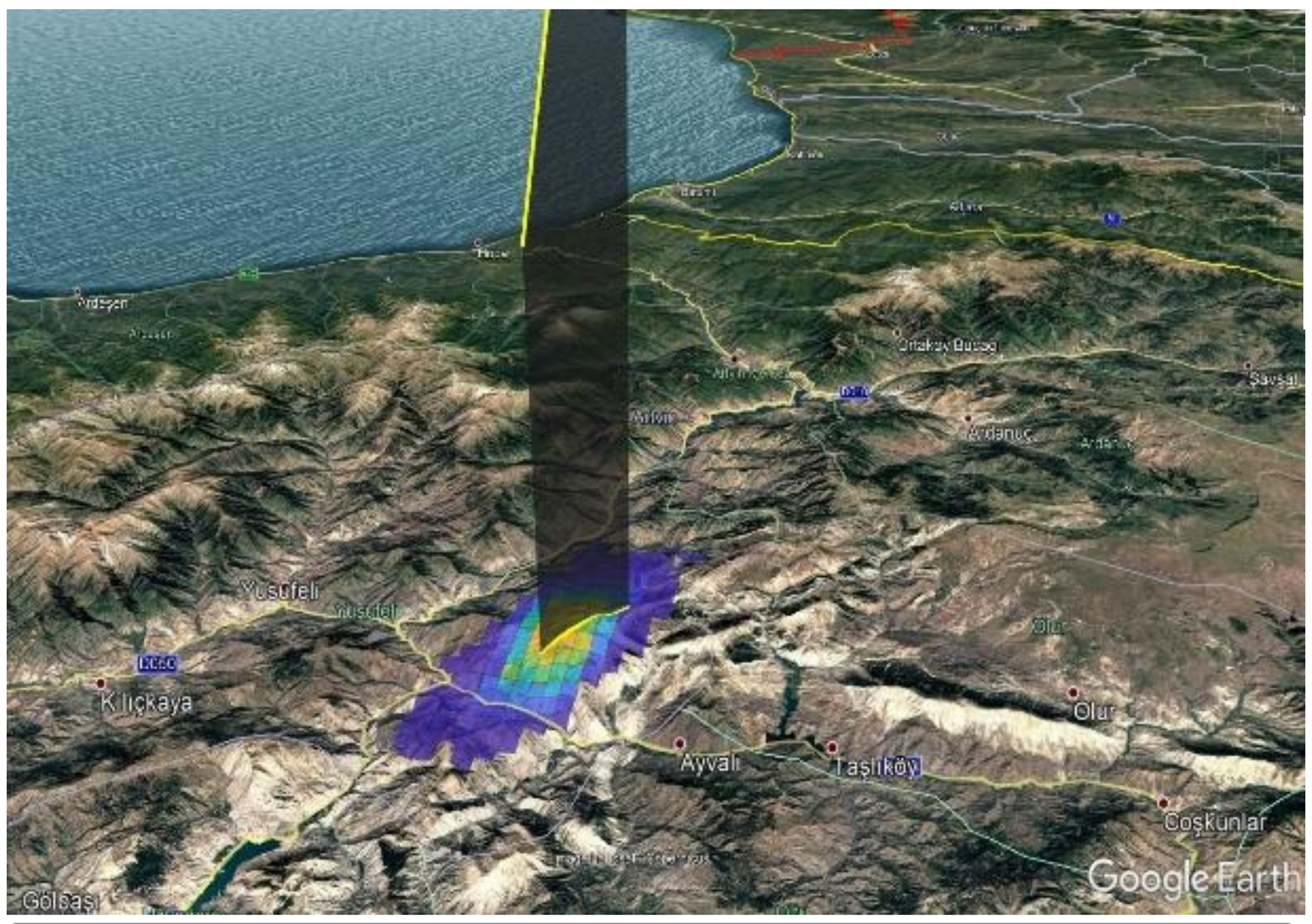

Fig.2.

Experimental

Mainly, stationary security cameras in several locations recorded the event in the Southern Federal District of Russia, Turkey, Georgia and Armenia. Atmospheric trajectory and strewnfield calculations were performed by previously described method [5,9]. In high-quality videos mostly from the Turkish universities, visible brighter stars allowed us to increase the directional accuracy to 0.045°. Event was observed in excellent observational conditions over a wide area, including Stavropol (~500 km). The first campaign was organized by a Turkish team of two persons near the İşhan and Arpacik where the strewnfield before the preliminary calculations were complete. Doppler, infared and the wind data were used. Some specimens were collected by UrFU team expedition, but investigations showed that they are not related to the event.

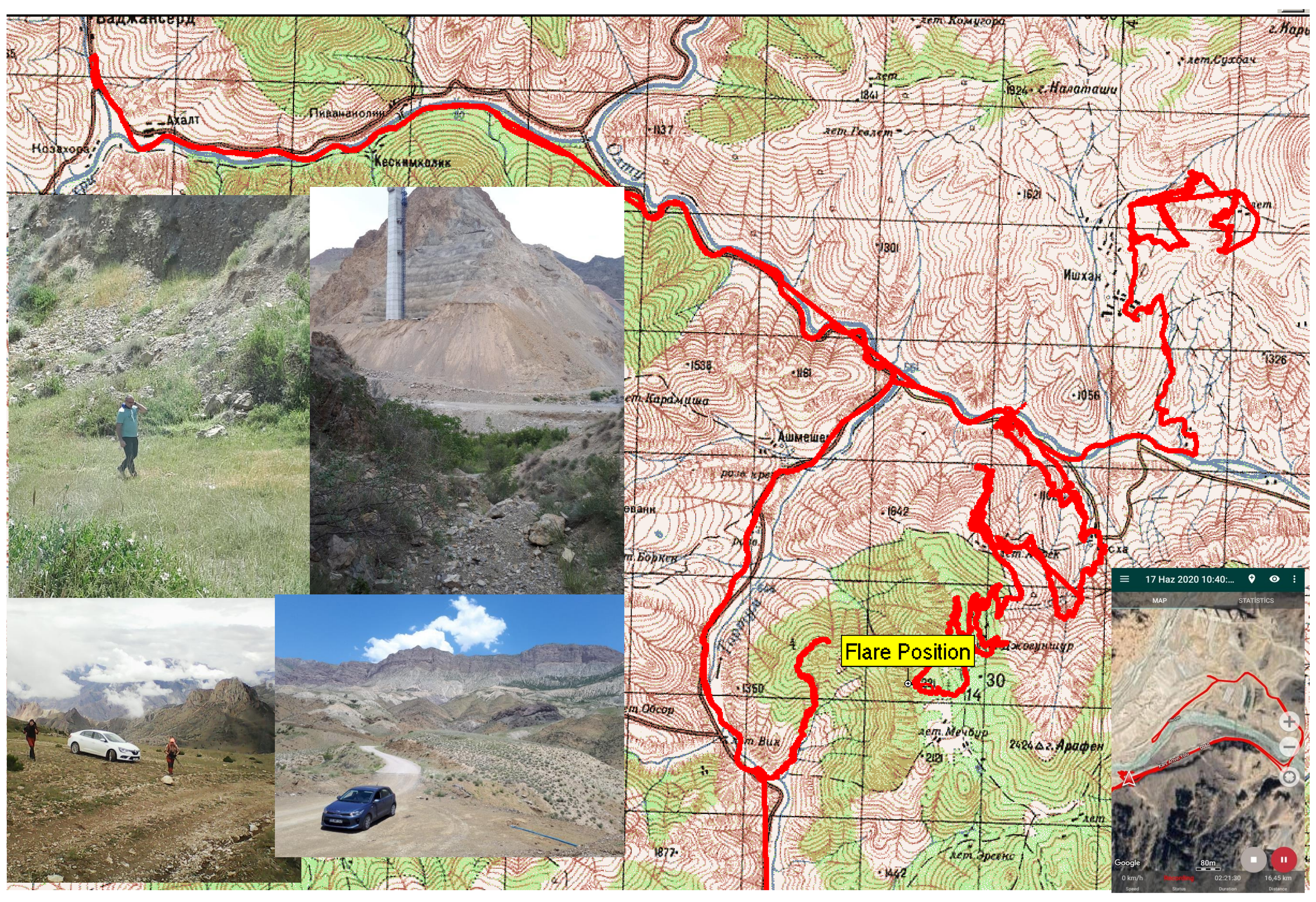

Fig.3.

Results

Totally, four unsuccessful searches were performed in the predicted field (June-August). It was possible to determine the time (accuracy of 1 s) and the coordinates of the flash, by the data from East Anatolian Observatory [11]. To further increase the accuracy of azimuth determination (up to 0.008° and 15 m), night images by a high-resolution sensitive camera from two points near Erzurum were produced during UrFU expedition . UrFU team also visited the mountains further above İşhan and Arpacik villages near the mountainsides by a systematic walk (20 Aug.-02 Sept.). The final trajectory calculation and the strewnfield determination were done by a previously proposed method [11].

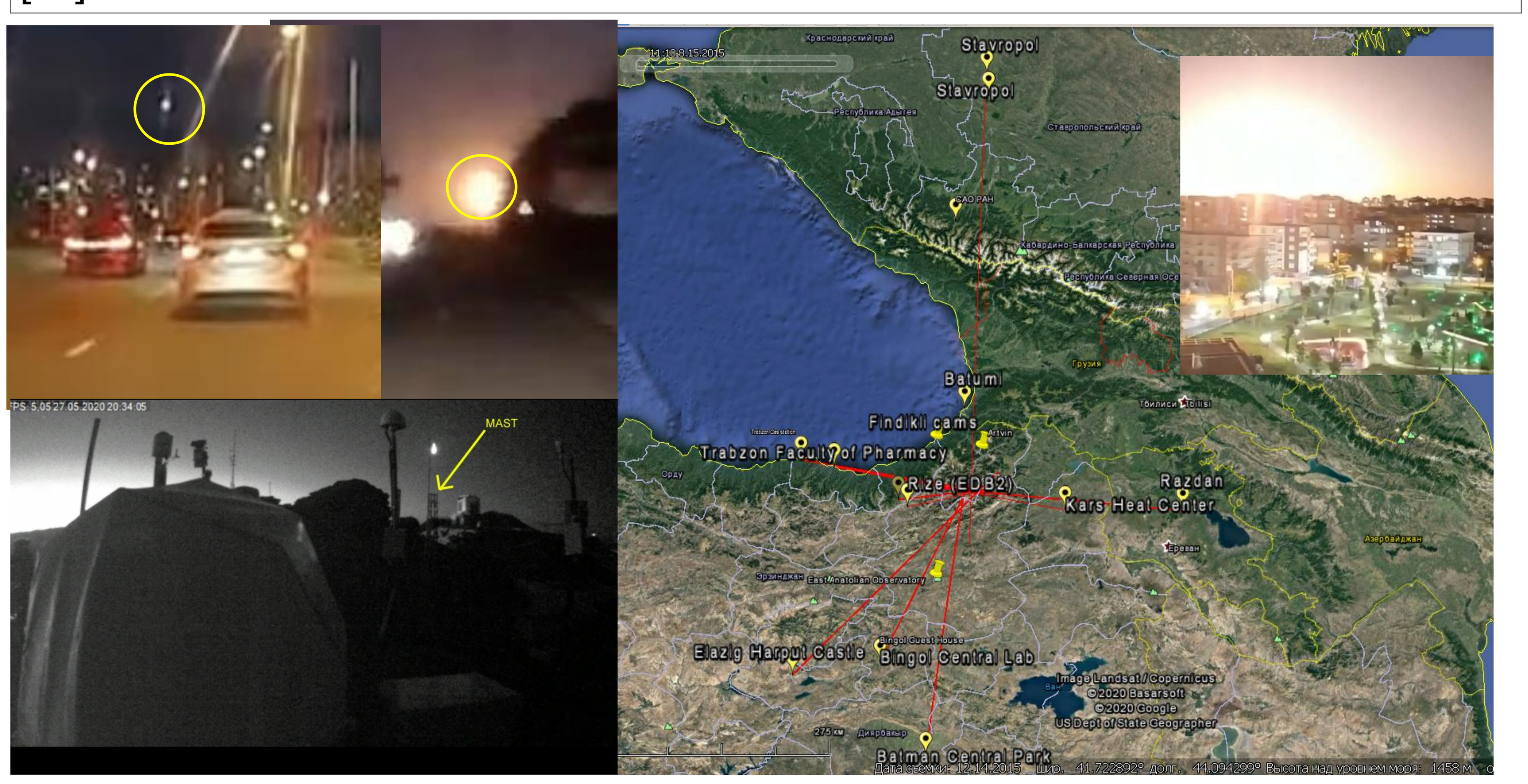

Fig.1.

Discussion and conclusion

Further search is required for the recovery of potential meteorites even the field is extremely full of harsh conditions and steep hills. Most of the predicted strewnfield was not available to reach. Unfortunately, a dam was built in May 2021 that intersects with the strewnfield which makes a further field trip almost impossible. So, the possibility to determine whether the material survived or broken into smaller fragments from the breakup is still suspicious. We could successfully determine the strewnfield by the high-accuracy video footages.

References

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