ANALYSIS OF THE BRIGHT FIREBALL OVER THE URAL REGION OF RUSSIA ON MARCH 6, 2018

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The aim of this report is to present the results of our study of the bright bolide widely observed on March 6 2018 at 17:58UT (22:58 local time) in the Ural region of Russia. The event was registered in several settlements of the Ural region (in Ekaterinburg, Chelyabinsk, Nizniy Tagil, Troizk cities and in many villages). In particular, it was recorded by one camera (I. Yankovsky, Irbit city, 57.638923, 63.143285) of the Ural's brunch of the Russian Fireball Network. This fireball monitoring activity has developed since 2016 [1]. This allowed to rapidly identify the location of the fireball, to account for the real atmospheric conditions corresponding to the actual time and location of the fireball [2], and to predict the meteorite fall [3]. Subsequently, it was possible to promptly (within a few days) organize an expedition to the calculated area.

Analysis of the eyewitness video was additionally performed for the fireball trajectory and probable coordinates of survived meteorite fragments were determined. The coordinates, azimuths, altitudes of the fireball positions and accuracy of measurements were determined based on data available from different cameras. Finally, the videos with best accuracy were chosen as a primary set for our analysis. Basic fireball trajectory parameters were determined by analytical calculations as soon as a geometrical solution was found. The entry velocity of the fireball was 13 km/s, the terminal height of a luminous flight was 22 km and the trajectory slope was 73.5°. The preatmospheric orbit of the meteoroid was determined using the open source software Meteor Toolkit [4]. Futuremore, strewn field modeling was also carried out. The search area was determined westwards from Kataysk city (62.22 E, 56.33 N, 2x5 km).

The determination of trajectory parameters and geographical coordinates was independently carried out by several Russian and Finnish fireball network researchers to achieve the best result. Such regular calculations for different cases have already resulted in a successful recovery for the Annama case [2,4,5].

In order to verify the calculation results, shadow analysis for video recordings was performed, as well as interviews with eyewitnesses in nearby settlements were conducted. The interview approach primarily included conversations with the firefighters, policemen, village leaders who were on duty at the time of the event and communicable people with wide circles of acquaintance. As the result of the conversations, the calculated coordinates of the search area were approved as being correct. In spite of the news, no one reported hearing roaring or blasting sounds. The majority of eyewitnesses were inside the buildings, since the time was quite after sunset. The brightness of the flash inside facilities was reported to be comparable with electric welding or short circuit arc. This fact produced a certain level of panic in some cases. A visual search of meteorite fragments and interviews of eyewitness were carried out by the UrFU meteorite search team that was operating in the aforementioned area from 9th to 10th of March and 22nd of April. The visual search was carried out using vehicles, on skis and by foot. It is proposed to continue the search since the calculated area is relatively large due to the determination accuracy provided by the amateur videos.

Acknowledgements: This work was supported by Act 211 of the Russian Federation, contract N02. AO 321.00006 and the PROTOPLANETS Project. (K.N.A.) by State Task of the FASO of the Russian Federation (Theme “Pressure” № AAAA-A18- 118020190104-3).

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