LUMINOUS TRAJECTORIES AND LIGHT CURVES OF FRIPON METEORS.

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Introduction: The Fireball Recovery and Inter-Planetary Observation Network (FRIPON) [1,2] has been monitoring the sky with the use of all-sky cameras with fish-eye lens since 2016. We focus our research on analyzing the meteors detected by the Meteorite Orbits Reconstruction by Optical Imaging (MOROI) [3,4,5,6] component of the FRIPON network. As of May 2024, the MOROI project has installed 18 all-sky cameras over the surface of Romania and recorded more than 270 multi-station events (meteors seen by 2 or more cameras). The full list of cameras and events can be found online on the FRIPON website [7].

Methods: Once a fireball is seen by 2 or more cameras, its 3D trajectory is computed. The process is explained in detail in [1, 2]. After the luminous trajectory is determined, we compute the ballistic coefficient α and mass loss parameter β for the decelerated fireballs [8,9,10,4] with a possibility to account for atmospheric conditions [11]. This allows us to determine the outcome of the analyzed meteor events, obtain dynamic mass estimates, and effectively identify potential meteorite droppers [4,12]. Additionally, following the method proposed in [13] we are able to determine the luminosity and the luminous efficiency of the fireball. The derived shape coefficient μ [13] gives us information related to the rotation of the meteoroid during the luminous flight [14,15,16]. The analysis of the light curve (the variation of the absolute magnitude during the flight) allows us to compute the photometric mass of the meteoroid that can be compared to the dynamic mass estimates, in particular at the beginning of the luminous trajectory.

Results: We present the luminous trajectory of some of the latest fireball events recorded by the MOROI component of the FRIPON network in Romania. We analyze the plots of the observed and simulated light curves of the meteors and make a comparison between them. We derive the shape change coefficient that allows to characterize the rotation of the meteoroid during the luminous part of the trajectory and allows to specify the way meteoroid mass changes along the trajectory. We determine the mass of the meteoroid at the beginning of the luminous trajectory and the ablated mass taking into account considerations on the density of the meteoroid. We determine the time and the height of fragmentation episodes for the studied events using the light curve. We compare our results with other detections from the literature.

Conclusion: We combine the photometric and dynamic methods in order to analyze the luminous part of the trajectory of some of the latest detections of the FRIPON-MOROI network in Romania. The methods used allow us to determine the shape change and the luminous efficiency coefficients. Additional application is the determination of meteor body mass at the beginning and at the end of the luminous trajectory.

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