# Seven Years of Bright Meteor Data from the NASA All Sky Fireball Network

**Aaron Kingery**, ERC Inc. / Jacobs Space Exploration Group / NASA Meteoroid Environment Office aaron.m.kingery@nasa.gov

## Summary

The NASA All Sky Fireball Network is a network consisting of 18 all-sky meteor cameras across the continental US. We present a data release of 33,660 bright meteors collected between 2013 and 2019. The released data consists of trajectory, orbit, radiant, shower association, and brightness(1).



#### Data collection

The camera hardware consists of Watec 902H2 Ultimate CCD cameras with a fish-eye lens (2 mm f/1.4) giving an almost all-sky field of view. We use a commercial frame-grabber card that digitizes the camera video at 30 fps with 640 × 480 resolution. The cameras are spread across the continental United States in five subnetworks, with each subnetwork consisting of two to five cameras. A GPS receiver is used for accurate time correlation of meteors between camera stations. ASGARD is use for meteor detection. Detection information is sent to a central server where correlation and trajectory and orbital information are calculated each morning. The daily results are posted to the website https://fireballs.ndc.nasa.gov.



## Data summary

The database is a comma-separated values (csv) file with with each row being a correlated event where a trajectory was able to be calculated. Although rare, this leads to some bad data points, such as the meteor being detected by two different subnetworks and therefore included the database twice or detection of bugs, airplanes, or satellites that happen to produce a trajectory.

The trajectory of meteors that are correlated in time is calculated by MILIG(2) and the heliocentric orbit is calculated using MORB(3). We report the orbital elements and trajectory information and the associated uncertainties. The trajectory information includes start and end latitude, longitude, height, and velocity. Shower association is included in the database and is done by a 7.5° radiant and 20% velocity cutoff compared to the reference catalog.

We report two values for the brightness of the meteor. Aperture photometry is done for every frame of the video for each meteor and each station. We report the peak magnitude from any of the cameras and the mean of the integrated luminosity. We do not calculate mass to allow the user to use their preferred luminous efficiency. There is a flag reported that will be true if there is a frame in any camera that is saturated in the 8 bit cameras. The flag is overly aggressive and can easily be triggered by a hot pixel or random noise.



### References

(1) Kingery A., Moser D. E., Cooke W. J., Moorhead A. V. (2020) JIMO 48, 60–68.

(2) J. Borovicka. Bull Astron Inst Czech, 41:391–396, Dec. 1990. (3) Z. Ceplecha. Bull Astron Inst Czech, 38:222–234, July 1987.

#### Download Database

Download Database Link