When the Sky Falls...

NASA's Response to bright bolide events over continental USA

R.C. Blaauw1, W.J. Cooke2, A.M. Kingery3, D.E. Moser4

1All Points Logistic/Jacobs ESSMA Group/NASA Meteoroid Environments Office, Huntsville, AL, 35812, USA, bliawon.c@nasa.gov
2JACOB/SPECTRUM, Huntsville, AL, 35812, USA.
3Jacobs/Jacobs ESSMA Group/NASA Meteoroid Environments Office, Huntsville, AL, 35812, USA.
4Jacobs/Jacobs ESSMA Group/NASA Meteoroid Environments Office, Huntsville, AL, 35812, USA.

Introduction

Being the only U.S. Government entity charged with monitoring the meteor environment, the Meteoroid Environments Office (MEO) has deployed a network of allsky and wide field meteor cameras, along with the latest software and hardware tools to quickly analyze data from these systems. However, the coverage of this network is still quite limited, forcing the incorporation of data from other cameras posted to the internet in analyzing many of the fireballs reported by the public and media. Information on these bright events often needed to be reported to NASA Headquarters by noon the following day; thus a procedure has been developed that determines the analysis process for a given fireball event based on the types and amount of data available. The differences between these analysis processes are shown by looking at four meteor events that the MEO responded to, all of which were large enough to produce meteorites.

November 3, 2014 - West Virginia

- Event was just south of the MEO’s north-east allsky network and just north of the MEO’s south-east allsky network.
- 118 eye-witness reports on the American Meteor Society’s website.
- Time of event found by mining tweets on Twitter containing ‘meteor’ or ‘fireball’.
- Web search of event surfaced:
  - Time of event found by mining tweets on Twitter containing ‘meteor’ or ‘fireball’.
  - Event was just south of the MEO’s north-east allsky network.
  - Locations of all videos/images were found and the azimuth of the start and end point of the meteor was mapped.
- Despite the event not being seen in any MEO cameras, the time it occurred, where it occurred, and the direction it was moving were all delivered quickly to Headquarters.

August 2, 2014 - Alabama

- Ideal event – seen in 4 of the Meteoroid Environment Office’s allsky cameras.
- Dark-light calculations incorporate winds at the time to find approximate location of meteors.
- Apparent magnitude of ~11.5, equating to an object tens of kg in mass.

November 7, 2013 - California

- 219 eye-witness reports on the American Meteor Society’s website.
- Seen in four Sandia allsky cameras (sky sentinel.nmsu.edu/allsky).
- Video converted and calibrated to be able to be used by MEO’s software.
- Trajectory and lightcurve manually found using METAL (METeor Analyzer), custom software created by the University of Western Ontario’s Meteor Physics Group.
- Dark-light calculations using the final position and velocity of the meteor, along with incorporating winds at the time, a map is created to show where particles of various sizes may have landed on the ground.

October 30, 2012 - Addison Meteorite Fall

- Daytime fireball over Alabama.
- 56 eye-witness reports to American Meteor-Society, from Arkansas to Florida, many reporting sonic booms.
- Doppler weather radar detected pieces of debris in the atmosphere.

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