The NASA Fireball Network Database

Danielle E. Moser, Dynetics/Meteoroid Environment Office

The NASA Meteoroid Environment Office (MEO) has been operating an automated video fireball network since late-2008. Since that time, over 1,700 multi-station fireballs have been observed. A database containing orbital data and trajectory information on all these events has recently been compiled and is currently being mined for information. Preliminary results are presented here.
The NASA Fireball Network Database

Danielle Moser
Dynetics/MEO
Objectives of the NASA Fireball Network

1. Determine the speed distribution of cm-sized meteoroids
2. Determine the major sources of cm-sized meteoroids (showers/sporadic sources)
3. Characterize meteor showers (numbers, magnitudes, trajectories, orbits)
4. Determine the size at which showers dominate the meteor flux
5. Discriminate between re-entering space debris and meteors
6. Locate meteorite falls
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Data Flow

Events with trajectory/orbit solutions displayed on public website

Fireballs (MSFC)
fireballs.ndc.nasa.gov

Grimsby (MSFC)
Database and data backup

- **01** Huntsville, AL
  - 12/2008

- **02** Chickamauga, GA
  - 12/2008

- **03** Tullahoma, TN
  - 01/2011

- **04** Cartersville, GA
  - 03/2011
Database Computing Environment

- Programmer: Ellen Jones/MITS
- OS: Linux
- Development Language: PHP
- DB design: Navicat
- Database: MySQL
- Data browsing: PhpMyAdmin
- Custom file parsing/loading code
  - 52,000 files
Database Contents

- **Trajectory**
  - Beg/end location: lat, lon, ht
  - Speed

- **Orbit**
  - Radiant info
  - Orbital elements

- **Media file links**
  - Calibration plates
  - Movies
  - Images
  - Summary graphic

- **Shower identification**
- **Camera data**
  - Cams that saw event
  - GPS status
  - Number of frames detected
Note

- All data here is raw, with only minimal processing to retrieve $Q^* > 15$
- All results are therefore preliminary.
Coverage

MEO Multi-Station Meteors

Alabama, Georgia, Mississippi, Tennessee, Kentucky, South Carolina, North Carolina
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**NASA Workshop on Meteor Video Observations & Analysis, Aug 4-5, 2011**
Raw Radiant Distribution

Fireballs, Q > 15

Vg (km/s)

NASA Workshop on Meteor Video Observations & Analysis, Aug 4-5, 2011
Sporadic Velocity Distribution

Sporadics

$Q^* > 15$, outlier removed

![Graph showing the Sporadic Velocity Distribution with counts for different velocity bins (v_g in km/s).]
2010 Perseids

Date | Number of meteors
--- | ---
8/2 | 1
8/3 | 1
8/4 | 1
8/5 | 4
8/6 | 4
8/7 | 6
8/8 | 4
8/9 | 4
8/10 | 5
8/11 | 5
8/12 | 20
8/13 | 24
8/14 | 9
8/15 | 2
8/16 | 1
Future Work

- Data quality assurance
- Magnitude estimates
- Database auto-update