



Clodbait
Observatory

The Colorado Allsky Camera Network

IMC 2010

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Description of Hardware



- PCI 64C 30 fps 1/3" format video camera
- Rainbow LI 63VDC 1.6-3.4mm f/1.4 lens
- Auto-iris, 24/7 operation
- Acrylic dome
- Internal fan driven waste heat re-circulator
- Matrox Meteor II PCI framegrabber

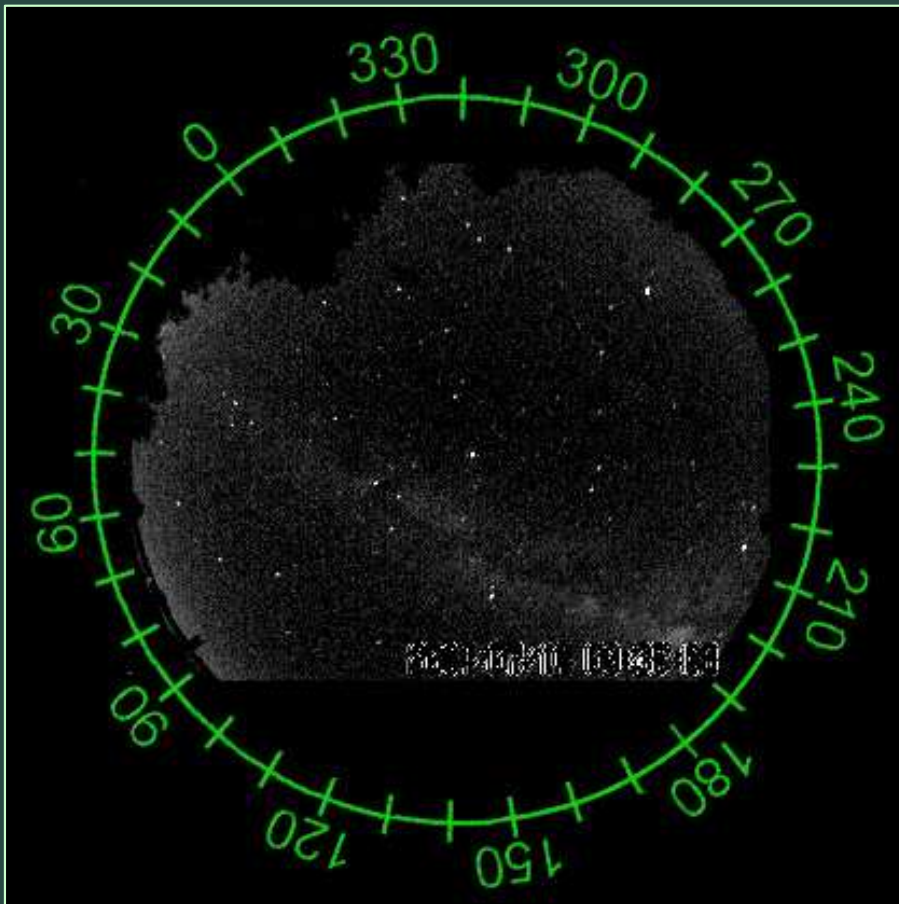


- *Detection and capture:* Metrec V4 running under DOS
- *Post processing:* custom tool (Windows) analyzes Metrec log, solves for topocentric (altaz) coordinates, generates data file for each event, uploads info to central server
- *Data viewer:* custom tool (Windows) displays composite, video, shower identification, and event statistics
- *Additional tools:* radiant analyzer, light curve generator, velocity profile analyzer, mass analysis tool, atmospheric path calculator, orbit calculator, impact location predictor
- *Server side tools:* FTP/PHP receiver for post processed data, MySQL database manager, web tools



System Performance

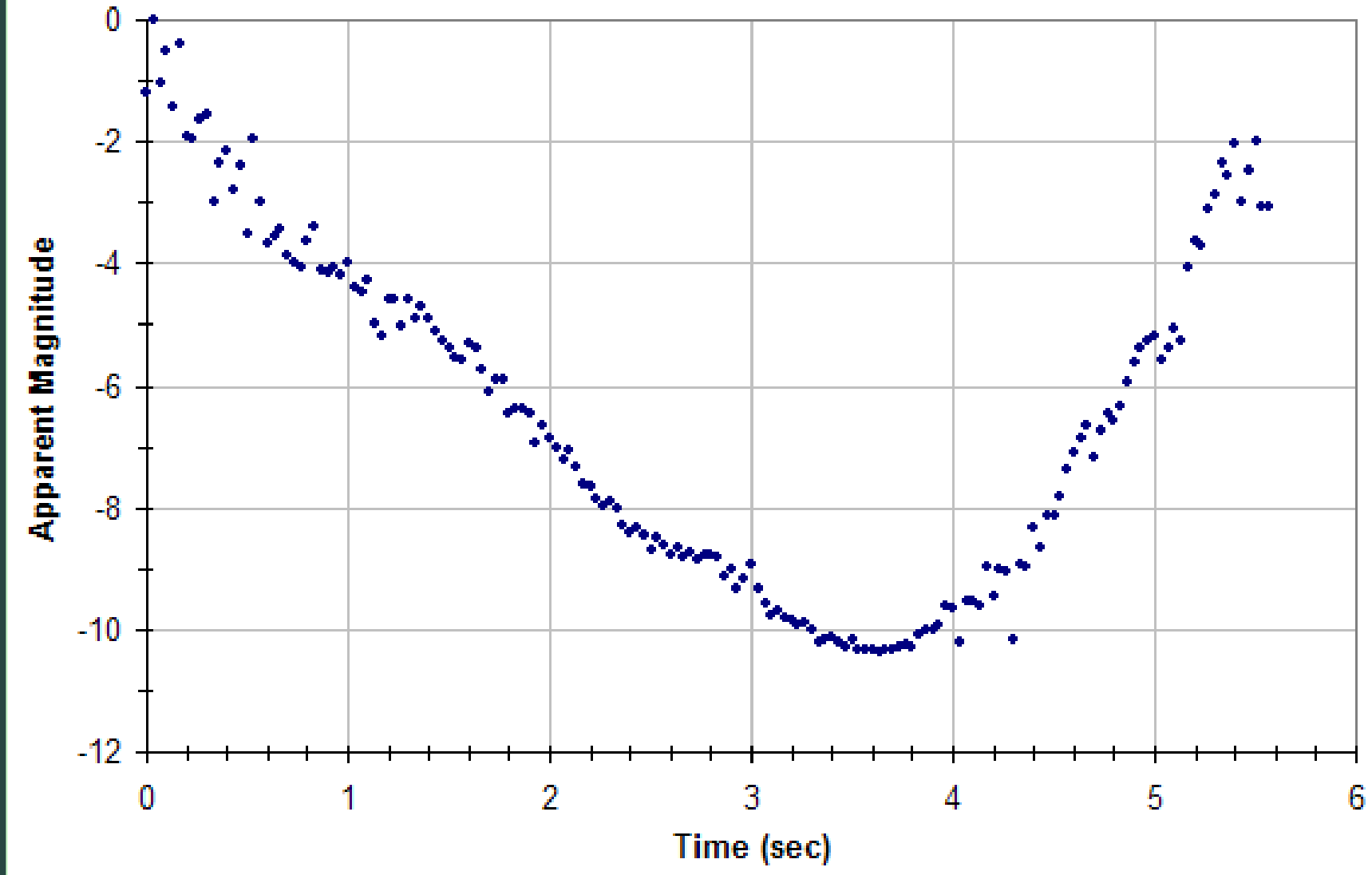
- Acquisition: up to 300 frames at 30 fps without drops
- Astrometric calibration yields typical centroid accuracy of 10 arcminutes (350 m at 100 km) for altitude $> 30^\circ$



- Sensitivity: low end \sim mag 2; saturation \sim mag -4
- Photometry accurate (0.1 mag) to about mag -8 (profile saturation correction)
- Photometry estimates to mag -1.8 (sky background saturation correction)



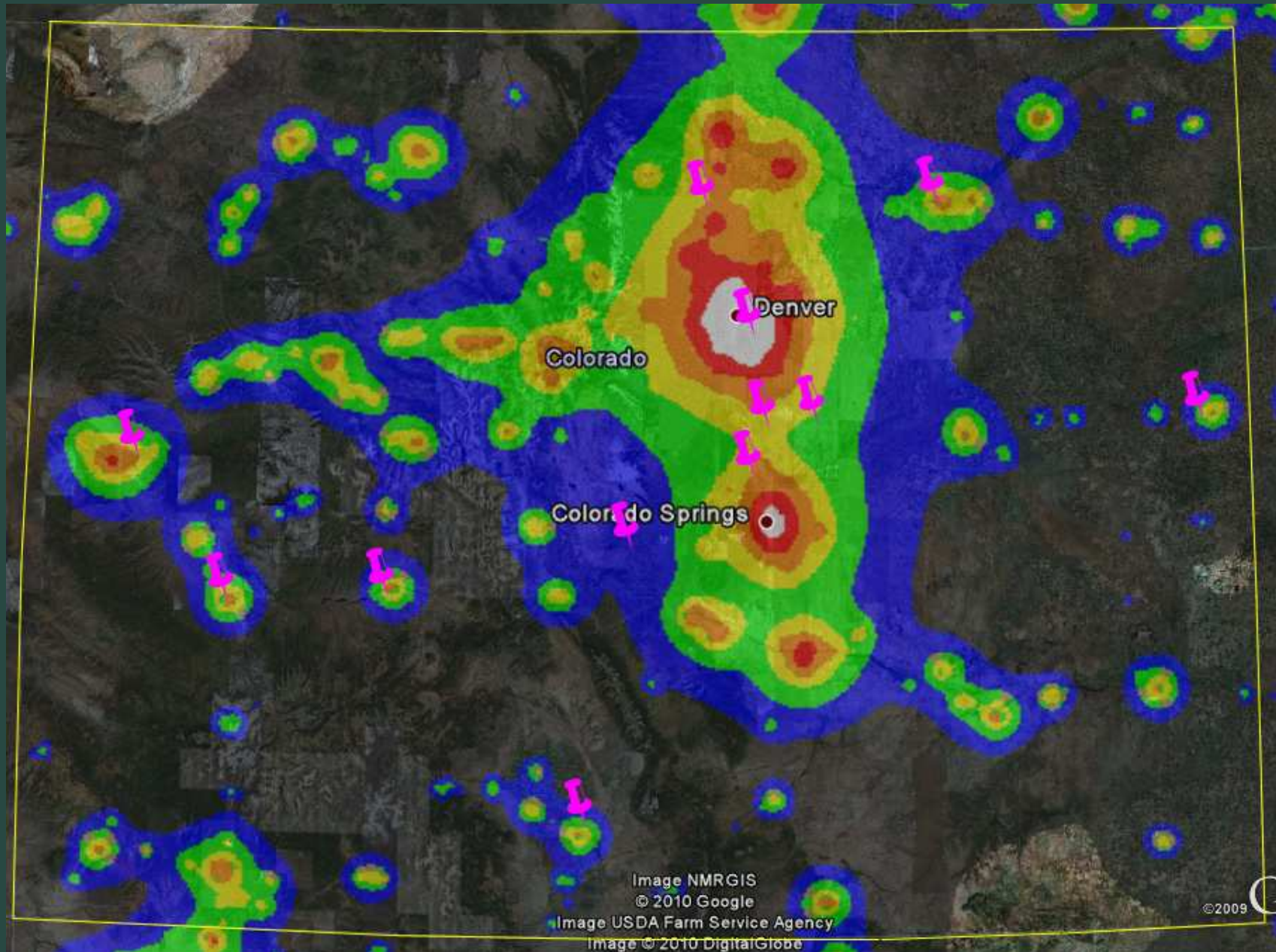
Light Curve, 2009.07.13 Fireball



5
y of
mag 2;
about
mag



Location of Cameras





Automated Processing

- Fireball endpoints are determined (local altitude and azimuth)
- Duration and length (degrees) are recorded
- Shower identification is estimated

Manual Processing

- Meteor centroid for each frame is determined
- Partial deceleration profile is estimated

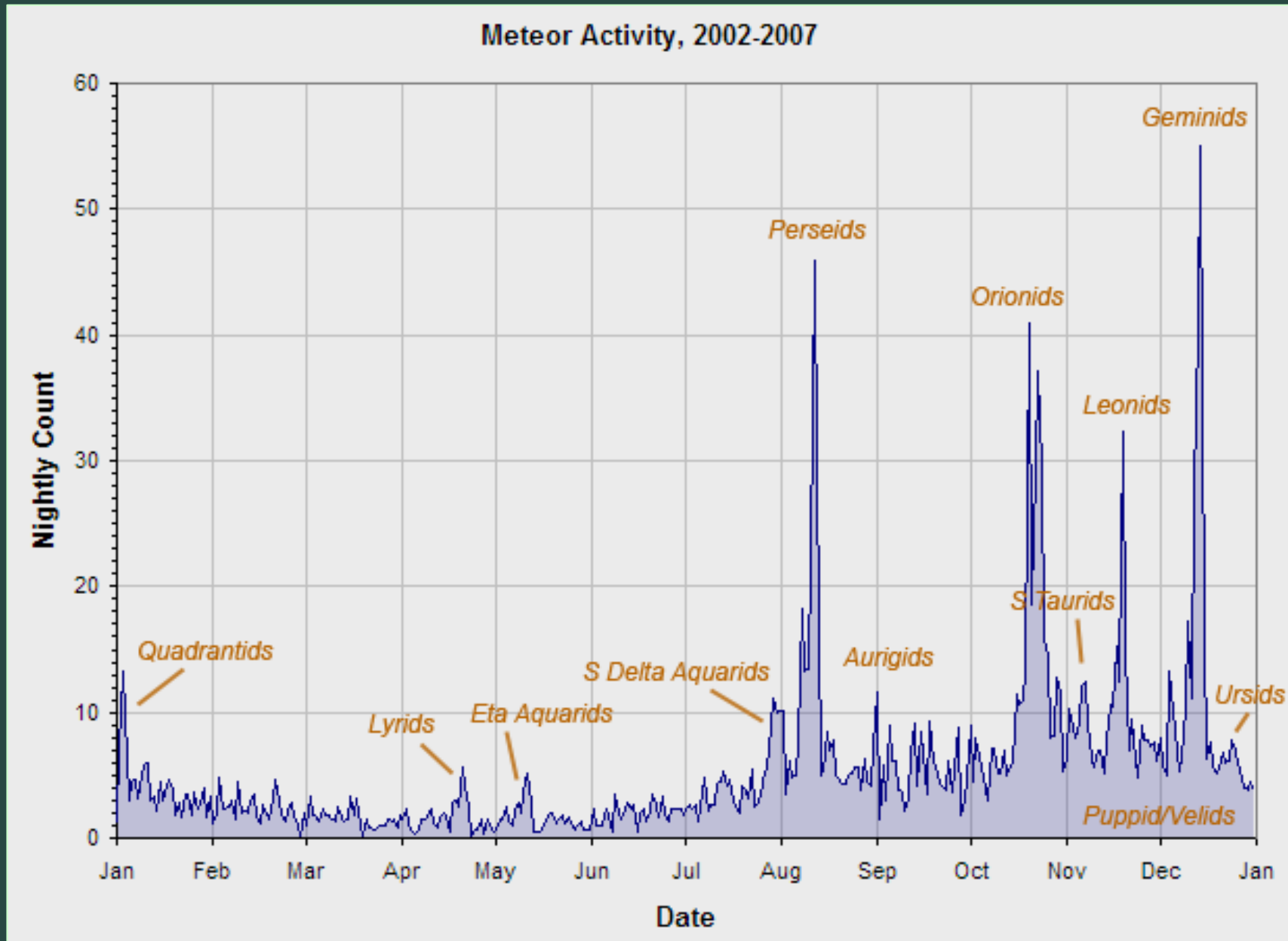


Multistation analysis is currently a manual operation, reserved for interesting events.

- Local altitude and azimuth of meteor centroid in each frame are converted to equatorial coordinates
- Path is resolved from multiple stations using a spherical Earth model
- Acceleration and zenith attraction are calculated
- Orbit is calculated
- Possible strewn field is estimated
- Report is packaged and published online

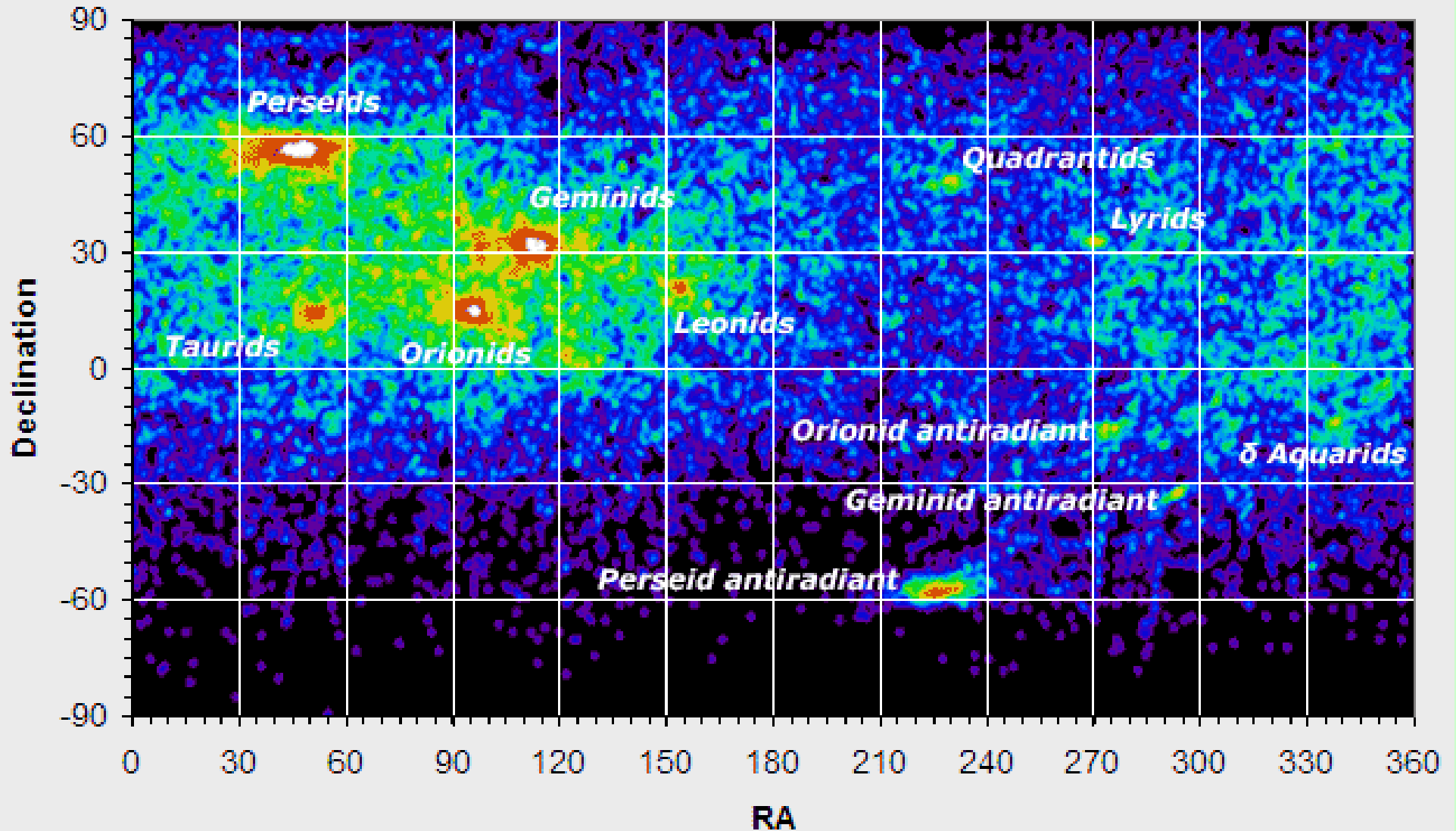


- 75,000 events, 34,000 online at meteor.cloudbait.com
- 5% of events are multistation
- 4000 fireballs recorded (~ 15 per week)
- Ground searches: Saguache, Montrose, Black Mesa, Breckenridge, Alamosa, Cañon City
- Data provided for four meteor stream analysis studies





2004-2007 Meteor Radiants





Meteor Database Query Results

- Identified **54** events between **2010-05-16 19:07**.
- Events that occur within **60 seconds** of each other.
- Events flagged as fireballs are shown in **bold type**.
- Events flagged as deleted are shown with data set to **0**.

Click on an event number for additional information.
Click on a camera name for location details.
Select multiple events using the checkboxes and then use the selected meteor azimuths.

A note about calibration: some cameras are internally calibrated when their data is submitted. Uncalibrated cameras normally have a 10 degree azimuth error. Only internally calibrated cameras are marked as such in this table, but azimuths and sometimes altitudes will usually be requested.

Map	Event	Camera	Time
<input type="checkbox"/>	1	DMNS	2010-05-16 21:55:53 MDT
<input type="checkbox"/>	2	DMNS	2010-05-16 21:55:55 MDT
<input type="checkbox"/>	3	DMNS	2010-05-16 21:55:57 MDT
<input type="checkbox"/>	4	DMNS	2010-05-16 21:55:59 MDT
<input checked="" type="checkbox"/>	5	Clodbait	2010-05-16 21:56:07 MDT
<input checked="" type="checkbox"/>	6	DSST	2010-05-16 21:56:54 MDT
<input type="checkbox"/>	7	DMNS	2010-05-16 22:50:57 MDT
<input type="checkbox"/>	8	Clodbait	2010-05-16 22:57:12 MDT
<input type="checkbox"/>	9	Clodbait	2010-05-16 23:30:18 MDT
<input type="checkbox"/>	10	DMNS	2010-05-17 01:20:56 MDT
<input type="checkbox"/>	11	DSST	2010-05-17 01:21:57 MDT
<input type="checkbox"/>	12	DMNS	2010-05-17 01:57:20 MDT

Azimuthal Meteor Map

produce some azimuth error for meteors occurring a few hundred miles from a camera location.

Click on any camera location on the map for event details.

Event Details

- Database event number: 33874
- Camera site: 16
- Camera name: DSST ([map](#))
- Camera description: Denver School of Science and Technology
- Camera coordinates: N39.749013 W104.890133
- Camera altitude: 1600 meters
- Total events for this site: 695
- Event time: 2010-05-16 21:56:54 MDT
- Image coordinates: (0.925,0.385) - (0.828,0.107)
- Azimuth: 248.5 - 218.1
- Altitude: - - -
- Approximate duration: 7.4 seconds (207 video frames)
- Fireball: Yes [Change: Yes No]
- Deleted: No [Delete]
- Comments:
- [View video](#)

http://meteor.clodbait.com



New Detection/Acquisition Software

- Windows/DirectX grabber support
- Realtime frame-by-frame linear motion detector
- 1 second / 3 second ring buffer
- Post-detection false detection discriminator
- Periodic stack sets for astrometric calibration (test + repair)
- Low priority HTTP-based upload thread (simple stats + video)



Server-side Processing

- PHP/mySQL HTTP data receiver module
- Computation of single-station parameters
- Detection of multistation events
- On demand computation of multi-station parameters
- Database management



Web-based Data Portal

- Public/subscription access to database
- Rich data processing toolbox
- Near realtime meteor reports
- Social networking support



Extension of Network

- Non-profit foundation established
- Support for several full-time workers
- Short term funding secured
- Long term funding search in progress
- Dense network: from 1/20,000 sq km to 1/500 sq km
- Subscription package to schools and amateurs
- Rich curriculum package



Dense Network

- High redundancy
- Very robust solutions for state vectors
- Positional accuracy with 8 solutions @ 640x480 is better than 2 solutions @ 1280x960
- Timing accuracy with 8 solutions @ 30 fps is better than 2 solutions @ 120 fps
- Improved light curve accuracy using multiple datasets from 8-bit cameras



Thank you to the IMO for
helping to support my
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