Cloudbait
Observatory

The Colorado Allsky Camera Network

IMC 2010

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Cloudbait Observatory

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Description of Hardware

- PC164C 30 fps 1/3" format video camera
- Rainbow L163VDC 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

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Description of Software

- **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

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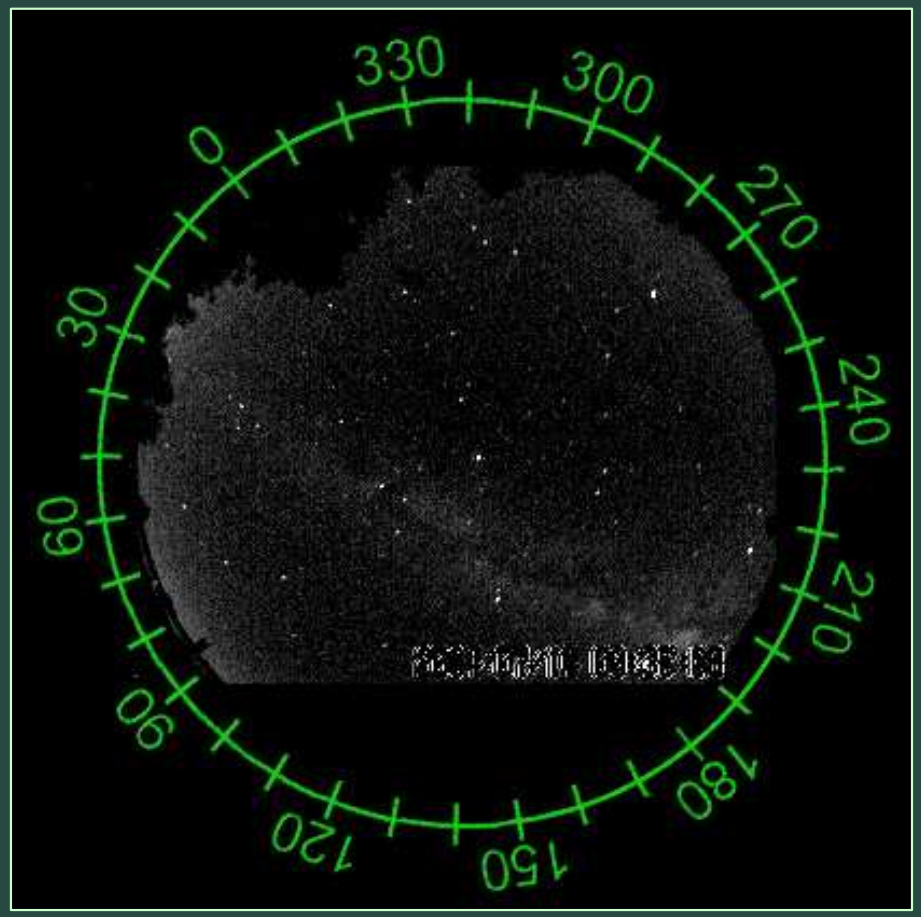
System Performance

- 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°



- Sensitivity: low end ~ mag 2; saturation ~ mag -4
- Photometry accurate (0.1 mag) to about mag –8 (profile saturation correction)
- Photometry estimates to mag –18 (sky background saturation correction)

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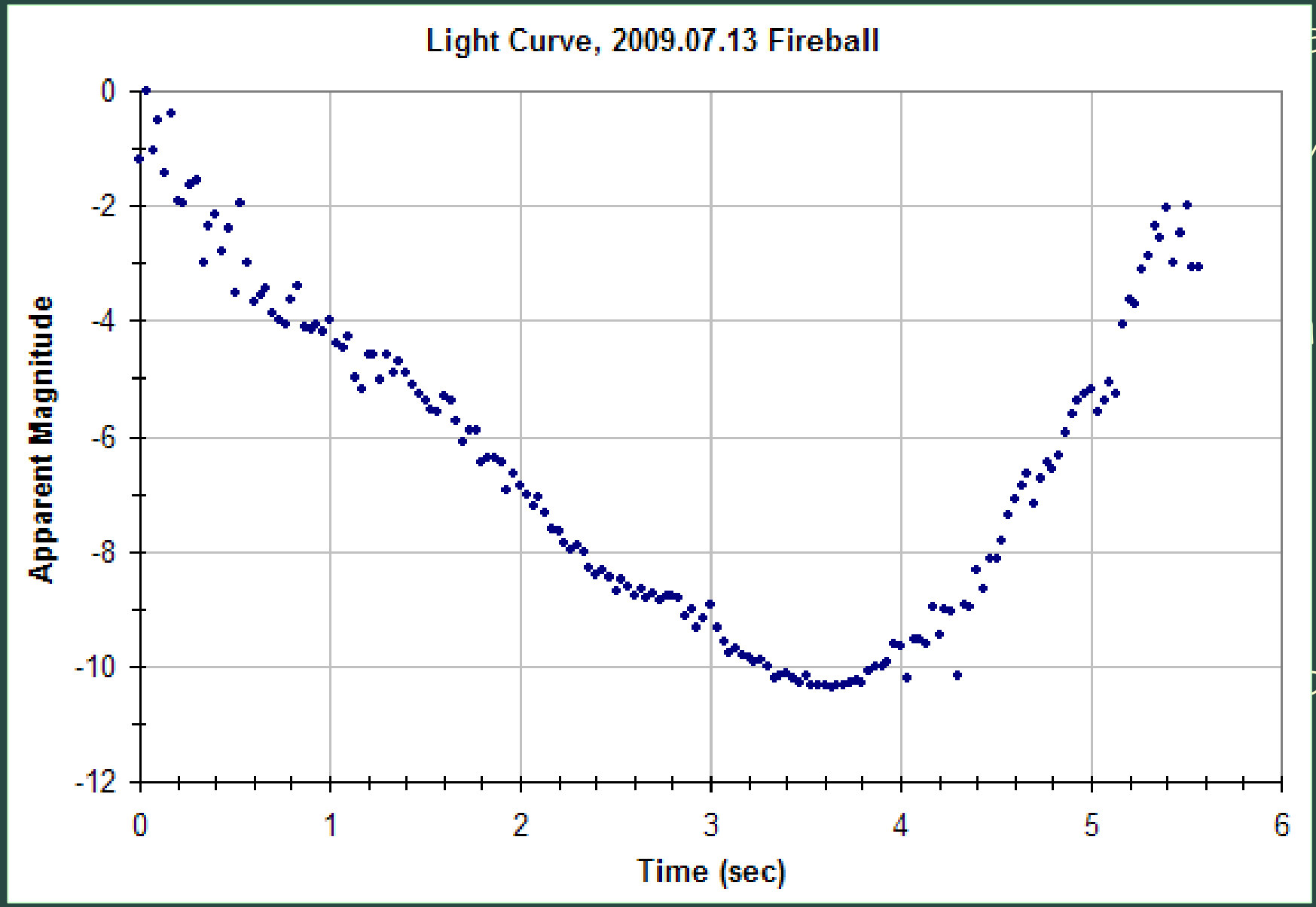
System Performance



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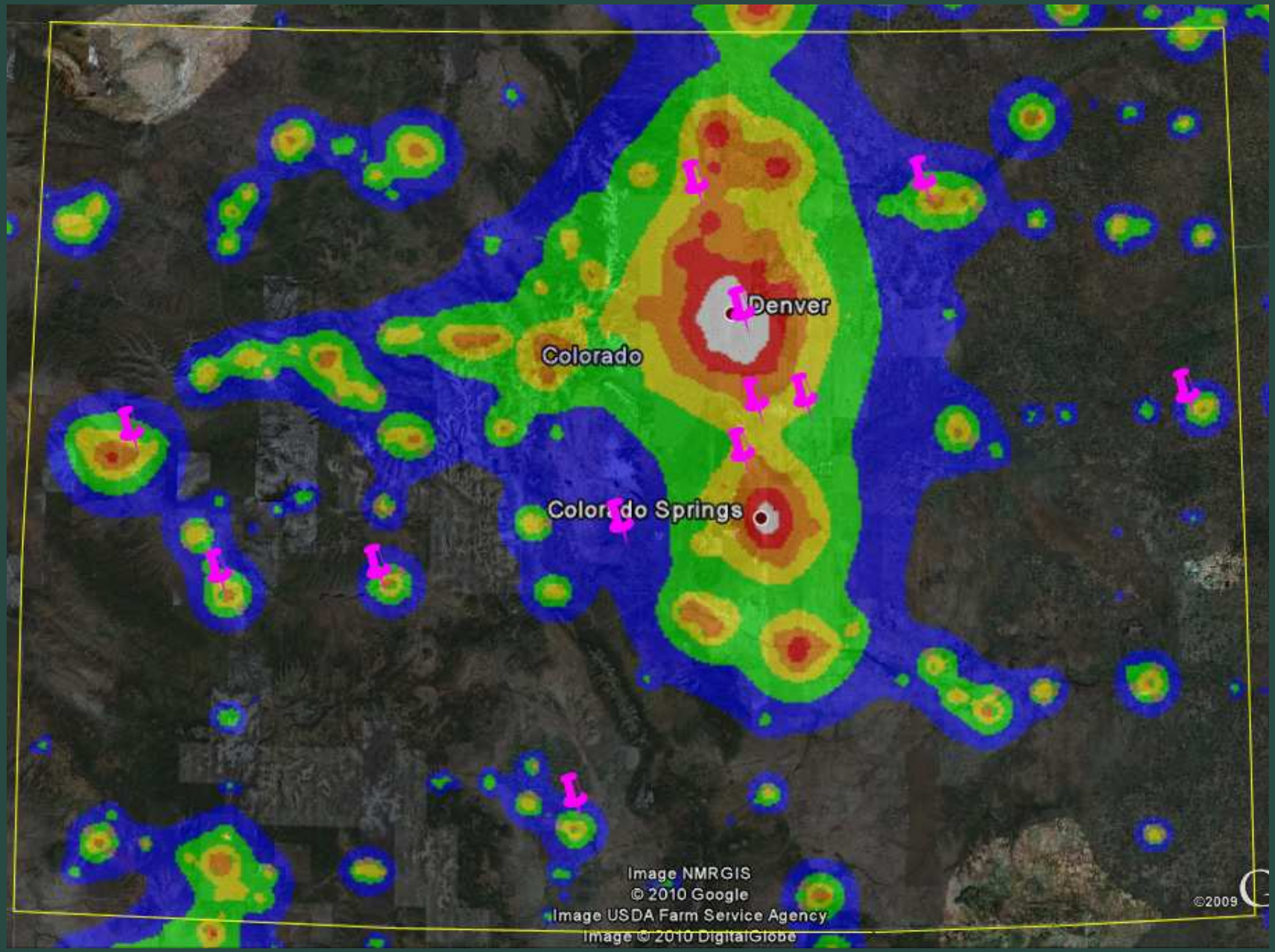
Location of Cameras



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Single Station Analysis

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

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Multistation Analysis

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

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Long Term Statistics

- 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

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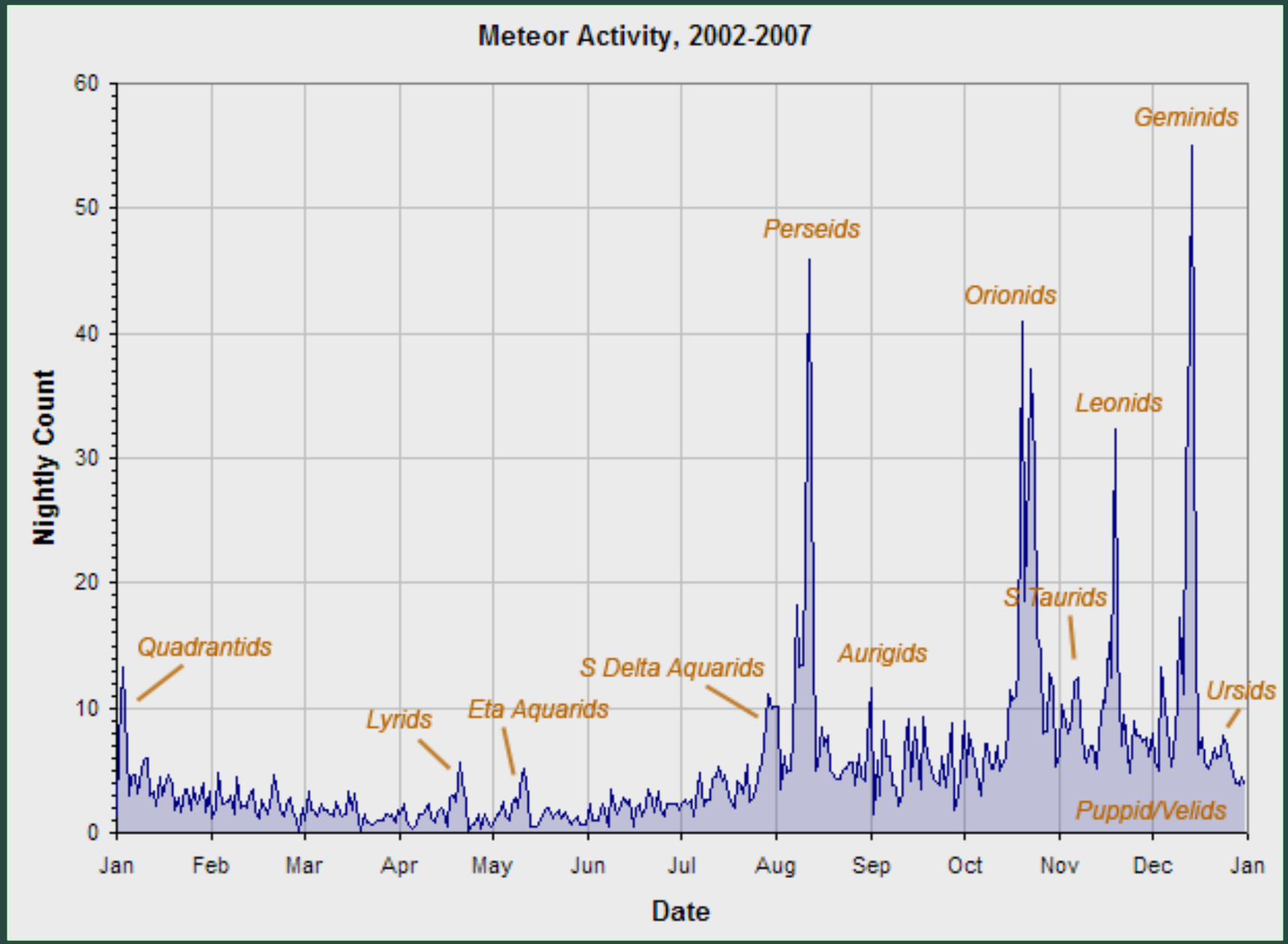
Long Term Statistics



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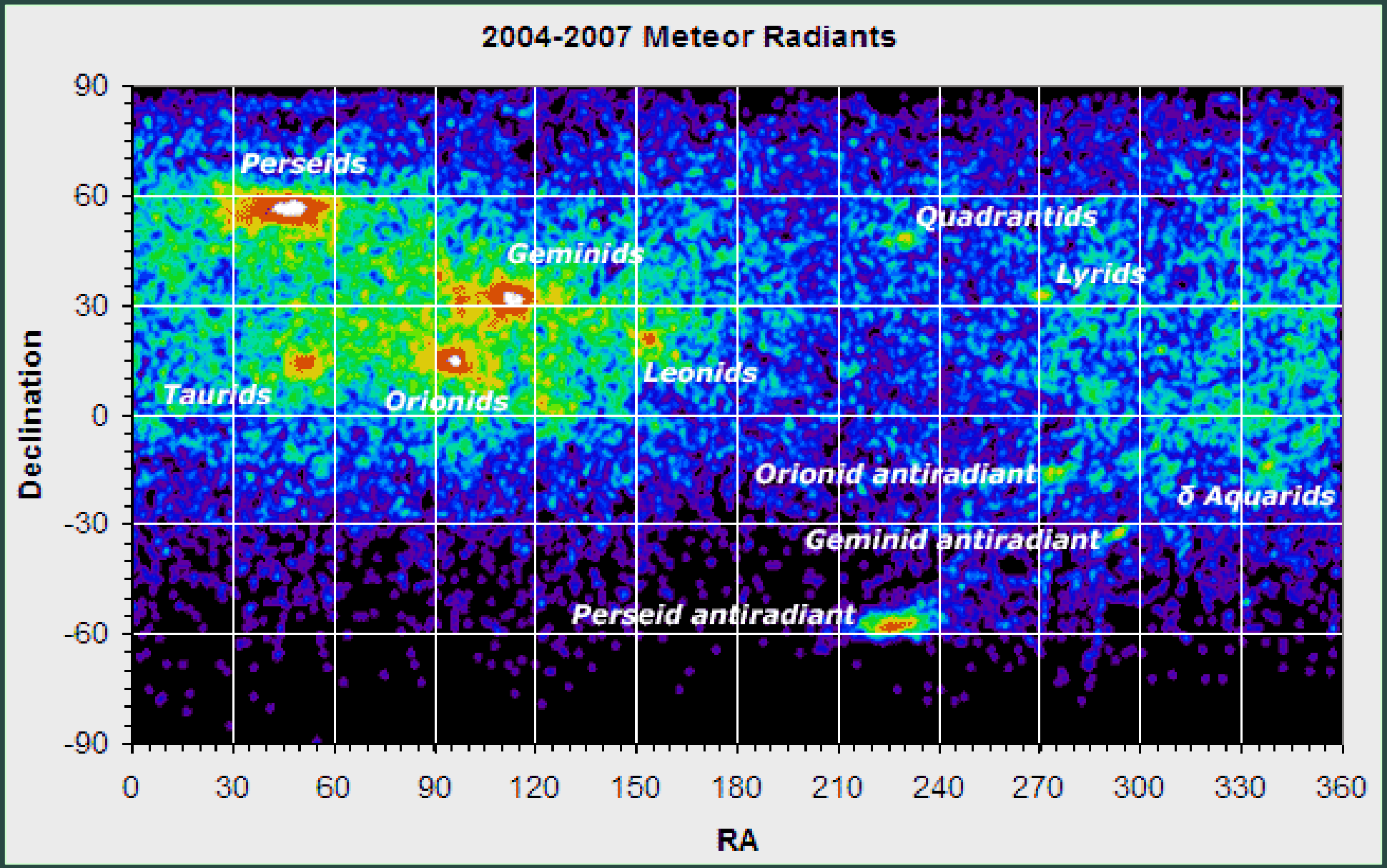
Long Term Statistics



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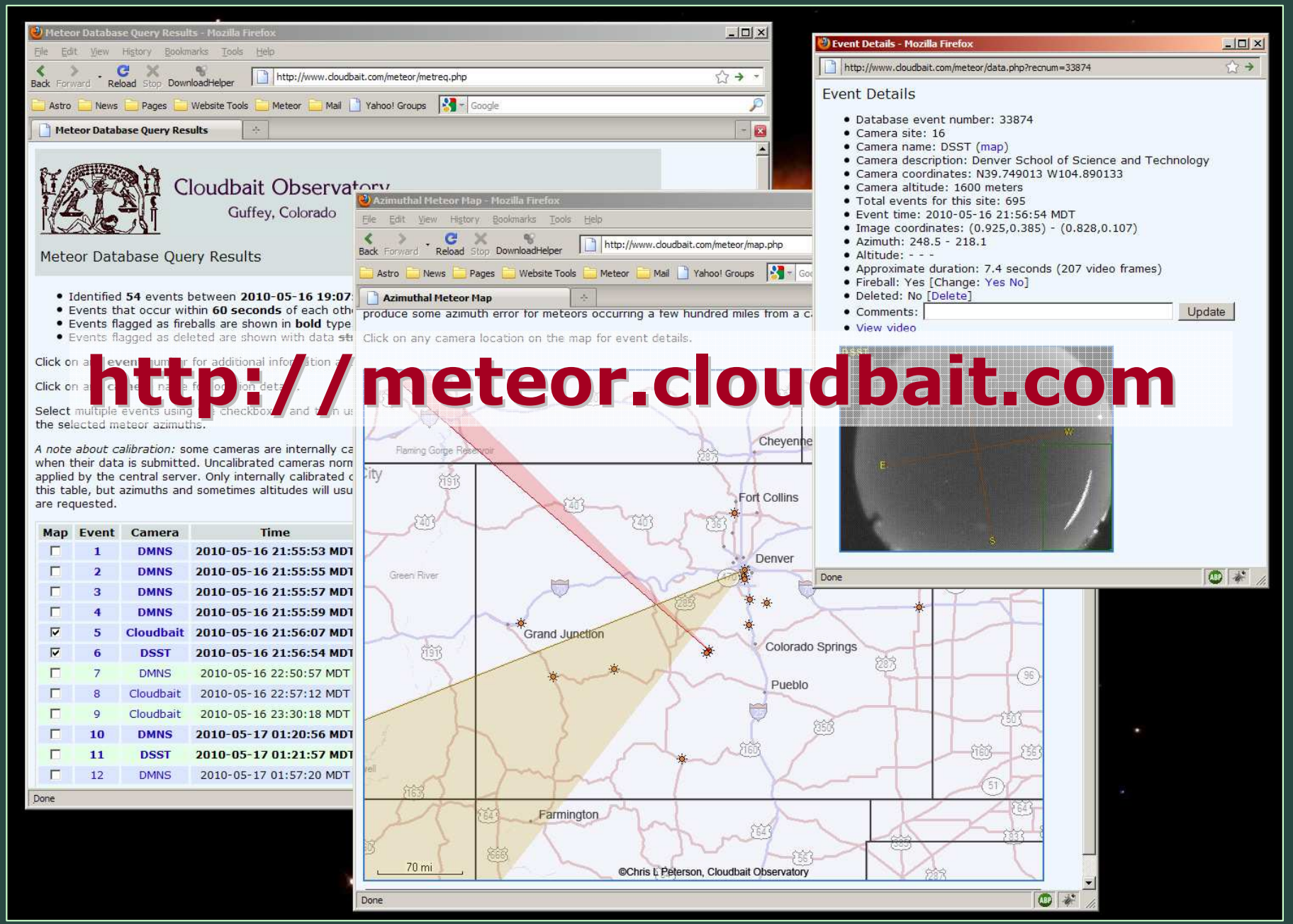
Public Education



http://meteor.cloudbait.com

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Future Work

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)

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Future Work

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

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Future Work

Web-based Data Portal

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

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Future Work

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

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Dense Network

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

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Questions