The Colorado Allsky Camera Network

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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
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
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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![Light Curve, 2009.07.13 Fireball](chart.png)
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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
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
Long Term Statistics

Meteor Activity, 2002-2007

- Geminids
- Perseids
- Orionids
- Leonids
- Ursids
- S Taurids
- Puppids/Velids
- Aurigids
- S Delta Aquarids
- Eta Aquarids
- Lyrids
- Quadrantids
Long Term Statistics

2004-2007 Meteor Radiants

- Perseids
- Geminids
- Quadrantids
- Lyrids
- Taurids
- Orionids
- Leonids
- Orionid antiradiant
- Geminid antiradiant
- δ Aquarids
- Perseid antiradiant

Declination vs. RA
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)
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
Future Work

Web-based Data Portal

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