First Year Results from the CAMS System
Cameras for Allsky Meteor Surveillance

Peter Jenniskens, SETI Institute
Dave Holman
Pete Gural
The People Involved in CAMS

**Funding Agency**
- NASA

**Prime Contract**
- SETI Institute Lick Observatory

**DVR Development**
- BCSI

**Software Development**
- NASA ARC

**Dr. Peter Jenniskens**
- Principle Investigator
- SETI Institute

**Bryant Grigsby**
- Support astronomer
- Lick Observatory

**Pete Gural**
- Meteor analysis software

**Jim Albers**
- Station Sunnyvale

**Dave Holman**
- Bob Haberman
- CAMS data reduction and analysis

**Kathryn Steakley**
- Anthony Berdeu
- Summer interns
- SETI Institute
- NASA ARC

**Dave Samuels**
- Single CAMS

**Rick Morales**
- Director
- Fremont Peak Observatory Association

http://cams.seti.org
**CAMS Goal:** Scale up the number of meteoroid orbits using multi-station video observations

**Success!** Over 47,000 orbits in the 1st year of operation

e.g. Data from the 1st week of December

IAU database in 2003

CAMS + SonotaCo databases
Ongoing Collection of Meteor Databases

EO Video: IMO Video Meteor Network
- Led by Sirko Molau, Worldwide but mostly EU
- MetRec software http://www.imonet.org/
- Over 1,000,000 single-station observations
- Meteor showers inferred from statistical analysis

EO Video: CMN Network
- Led by Damir Segon, Croatia
- MeteorScan/UFO software
- 1211 multi-station orbits 2007

Bistatic Radar: CMOR
- Univ of Western Ontario, Canada
- Led by Dr. Peter Brown
- Millions of orbits
- Less precise than video
- Sees mostly 23-45 km/s

EO Video: SonotaCo Network
- Led by Touru Kanamori, Japan
- UFO software http://sonotaco.jp/doc/SNM/
- 114,000 multi-station orbits
- Published database 2007-2011
CAMS: Scaling up Multi-Station Video → Automation

Cameras

Sites

Computers

Compression

Software
Quality Control $\rightarrow$ Interactive Coincidence Analysis
One year: 47,000 orbits  (November 2010 shown)

Following Charts Yellow/Blue Indicates Established Shower at Beijing/IAU this Year
March

Combined CAMS and SonotaCo
Late April

Combined CAMS and SonotaCo
Early May

Combined CAMS and SonotaCo
Late July

Combined CAMS and SonotaCo
August
Early September
Early October
Late October
Early November
Early December
Late December

Combined CAMS and SonotaCo
Early January
Mid January
Early February (New Shower)
CAMS Successes

47,000 Precisely estimated meteor orbits in just one year

Established 31 showers in the IAU database, total now 95

Automated capture, compression, detection, calibration

Multi-parameter fit algorithm for trajectory estimation

HIL for coincidence

Extending capabilities for individuals to build a network

Single, Dual and Quad camera options
Establish your own CAMS survey area:

http://cams.seti.org

Statistics
Latitude
Longitude