Data from several meteor networks in Europe

L. Kornoš, J. Koukal, R. Piffl, J. Tóth
and EDMONd team

SVMN and CEMeNt

Slovak Video Meteor Network

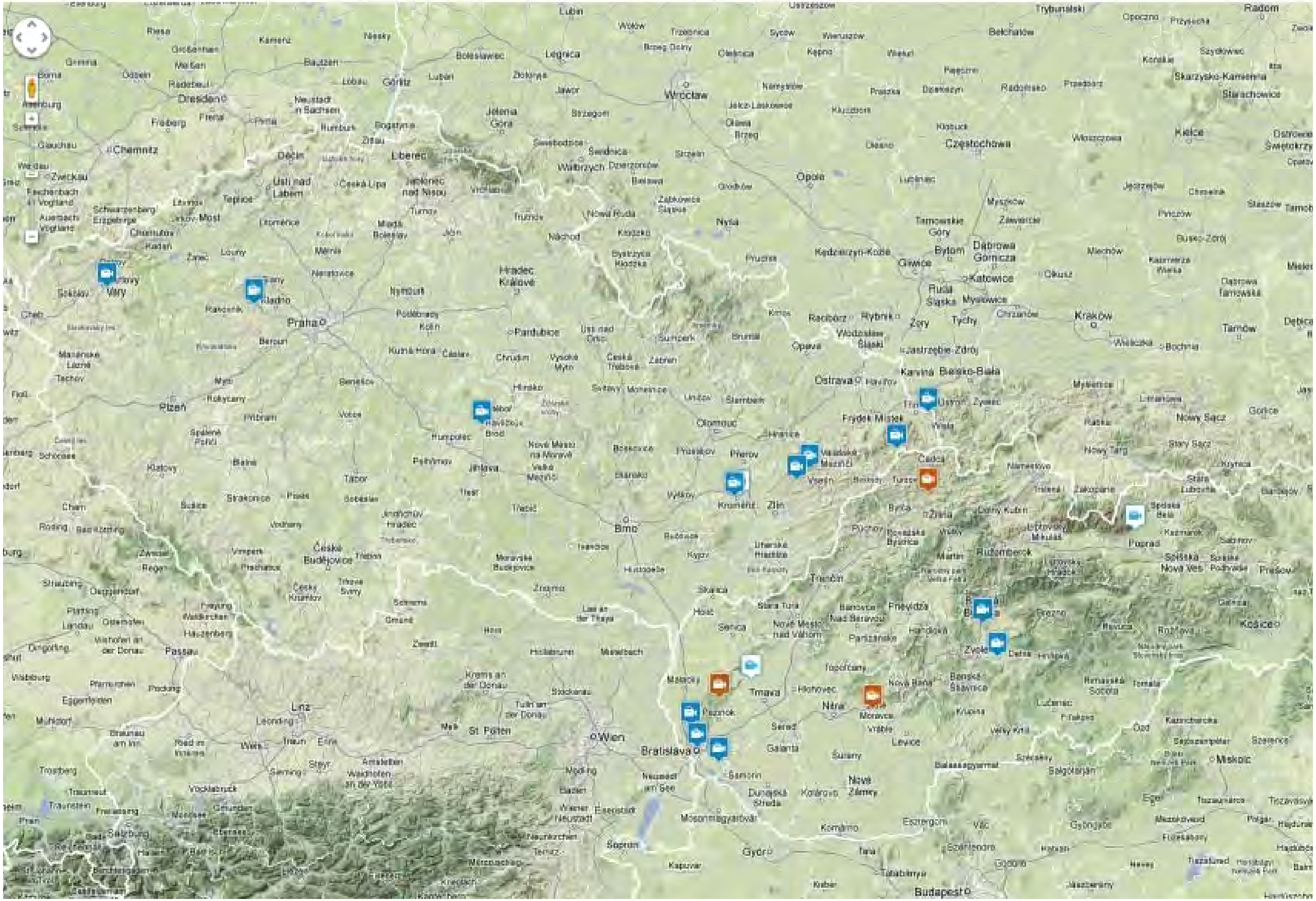
- SVMN – Slovak Video Meteor Network
  - Comenius University in Bratislava
  - camera AMOS – All-sky Meteor Orbit System
  - started in 2007, 2009, 2012


SVMN
Prague
Czech Republic
Krakow
KNM
Slovakia
AGO
ARBO
Vienna
Bratislava
Austria
Budapest
Carpathian Mountains
Hungary
Slovenia
Zagreb
Croatia
Voivodina
US Dept of State Geographer
© 2012 Tele Atlas
© 2012 Google
© 2009 GeoBasis-DE/BKG
48°24'40.99" N 17°56'26.02" E elev 361 m

Central European Meteor Network

- CEMeNt – Central European Meteor Network
  - stations in Czech Republic and Slovak Republic
  - Amateur astronomer network
  - started in 2009
  - cooperation with SVMN
  - advantage to both – multi-station, weather conditions

CEMeNt / SVMN



Lubin
Legnica
Wrocław
Opole
Częstochowa
Kielce
Radom
Dresden
Chemnitz
Děčín
Liberec
Ústí nad Labem
Teplice
Most
Karlovy Vary
Kladno
Praha
Hradec Králové
Pardubice
Kolín
Plzeň
Jihlava
České Budějovice
Brno
Olomouc
Přerov
Zlín
Opava
Ostrava
Frýdek Místek
Bielsko-Biała
Katowice
Kraków
Tarnów
Nowy Sącz
Poprad
Trenčín
Prievidza
Trnava
Nitra
Bratislava
Wien
St. Pölten
Linz
Passau
Salzburg
Győr
Budapest
Miskolc
Košice
Žilina
Ružomberok
Zvolen
Nové Zámky

HOME AUTOMATIC VIDEOSTATION

J. Koukal

CCTV CAMERA

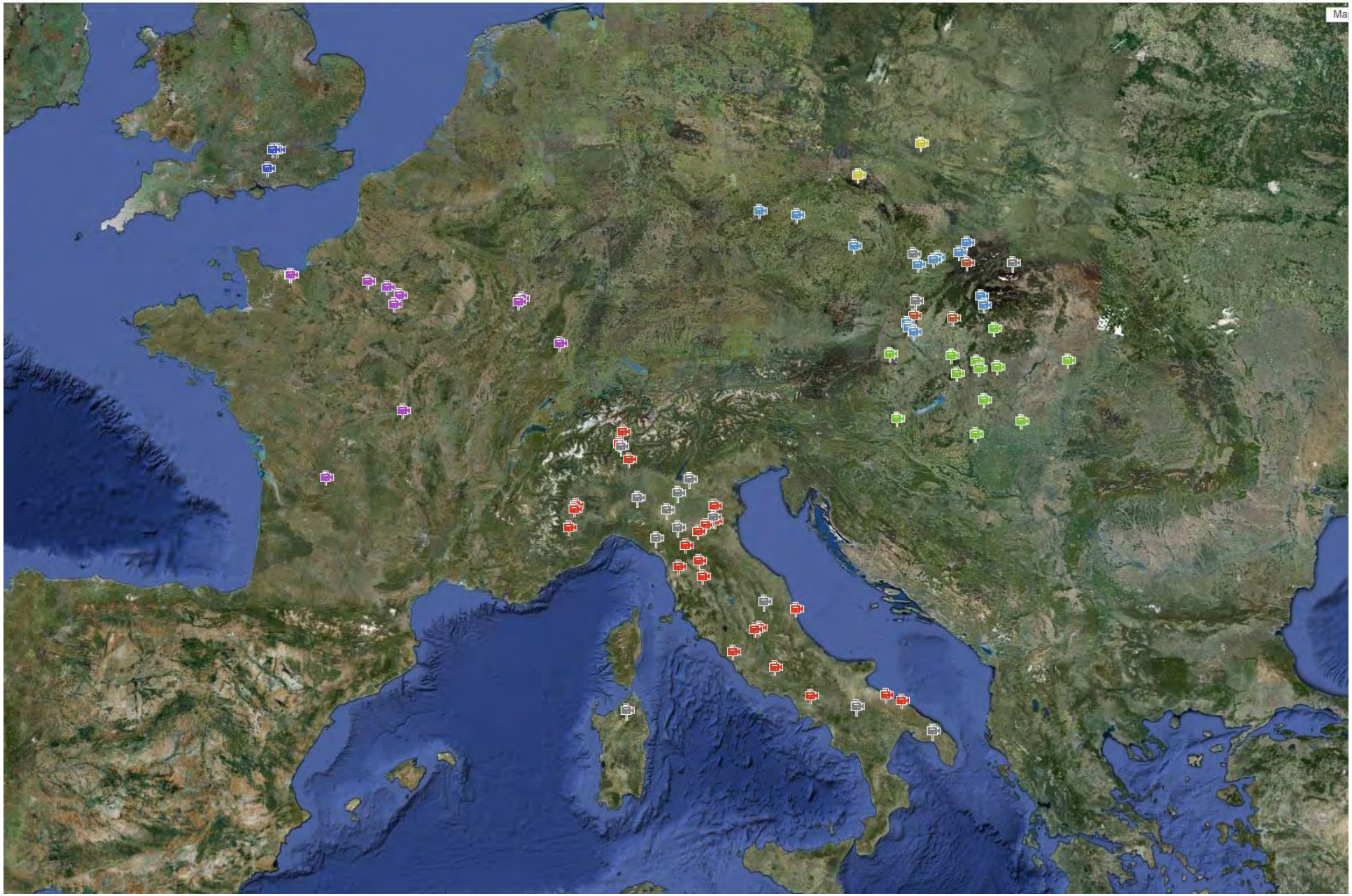
Specification of used camera		
Typ, name	**Watec 902 H2 Ultimate**	**KPF 131 HR**
Senzor	1/2“ Sony Ex-View HAD	1/3“ Sony Super HAD II
Resolution (px)	752 x 582	582 x 500
Resolution (TVL)	570	500
Sensitivity	0,0001 lx (F=1,4)	0,002 lx (ČB, F=1,2)
S/N	> 50 dB	> 50 dB
Gamma	HI, LO, Off (0,35-0,45-1)	Continuous setup (0,05-1)
AGC	HI, LO	HI, MED, LO, Off

Networks' cooperation

- 2009 - SVMN – CEMeNT - first common data, mostly bolides
- 2010 (spring) – PFN and HMN
  - combined data obtained by using different detection and processing tools (UFO, MetRec)
- 2011 Draconids campaign – IMTN
  - paper in WGN 40:4, 2012, p. 117-121
- also French and UK observers started to share data

- **European viDeo Meteor Observation Network**
- **EDMONd** *http://www.fireball.sk/edmond_map.html*

EDMONd / European viDeo Meteor Observation Network



European viDeo Meteor Observation Network EDMONd

- **BOAM** - France BOAM network / Base des Observateurs Amateurs de Météores
- **HMN** - Hungarian Meteor Network / Magyar Hullócsillagok Egyesület
- **IMTN** - Italian Meteor and TLE network
- **PFN** - Polish Fireball Network / Pracownia Komet i Meteorów, PKiM
- **UKMON** - UK Meteor Observation Network
- **CEMeNt** - Central European Meteor Network, Czech and Slovak AA
- **SVMN** - Slovak VideoMeteor Network, CU

Single meteors in 2009 – 2012

Network	Number of stations	Meteors (single)
BOAM	9	20 128
CEMeNt	13	17 922
HMN	13	107 582
IMNT	16	105 989
PFN	5	174
SVMN	2	15 840
UKMON	1	215
sum	59	267 850

Effort to create a common database

- ~ 1/3 of data are MetRec data
- J. Koukal tested the conversion sw **INF2MCSV** (SonotaCo)
  - 230 double-station meteors, UFO – MetRec (Molau)
  - followed QA, dur, Vg
  - the best transfer method is (Y)

- due MetRec data and very large spread of stations

  the main computation of orbits – **UFOOrbit (Q_0, dt = 5 sec)**

- Q_0 – all possible combinations
- dt – some stations – problems with time precision

- **obtained ~ 37 000 orbits**

- many fictional meteors (SonotaCo)

- 1. step - $\mathbf{H_{1,2}}$: (15, 200) km - beginning and terminal heights
  Gm% > -100 - overlapping of a meteor from two stations (accordding to SonotaCo)

- 2. step - $\mathbf{Q_0}$ > 1 deg - angle of observed trajectory
  dur > 0.1 sec - duration of meteor
  dGP < 0.5 deg - diff. of 2 poles of ground trajectory
  $\mathbf{Q_c}$ > 10 deg - convergence angle
  dv12% < 10% - diff. of 2 velocities

- we obtained ~ **25 255 orbits**

European viDeo MeteOr Network Database

http://www.fireball.sk/edmond.php

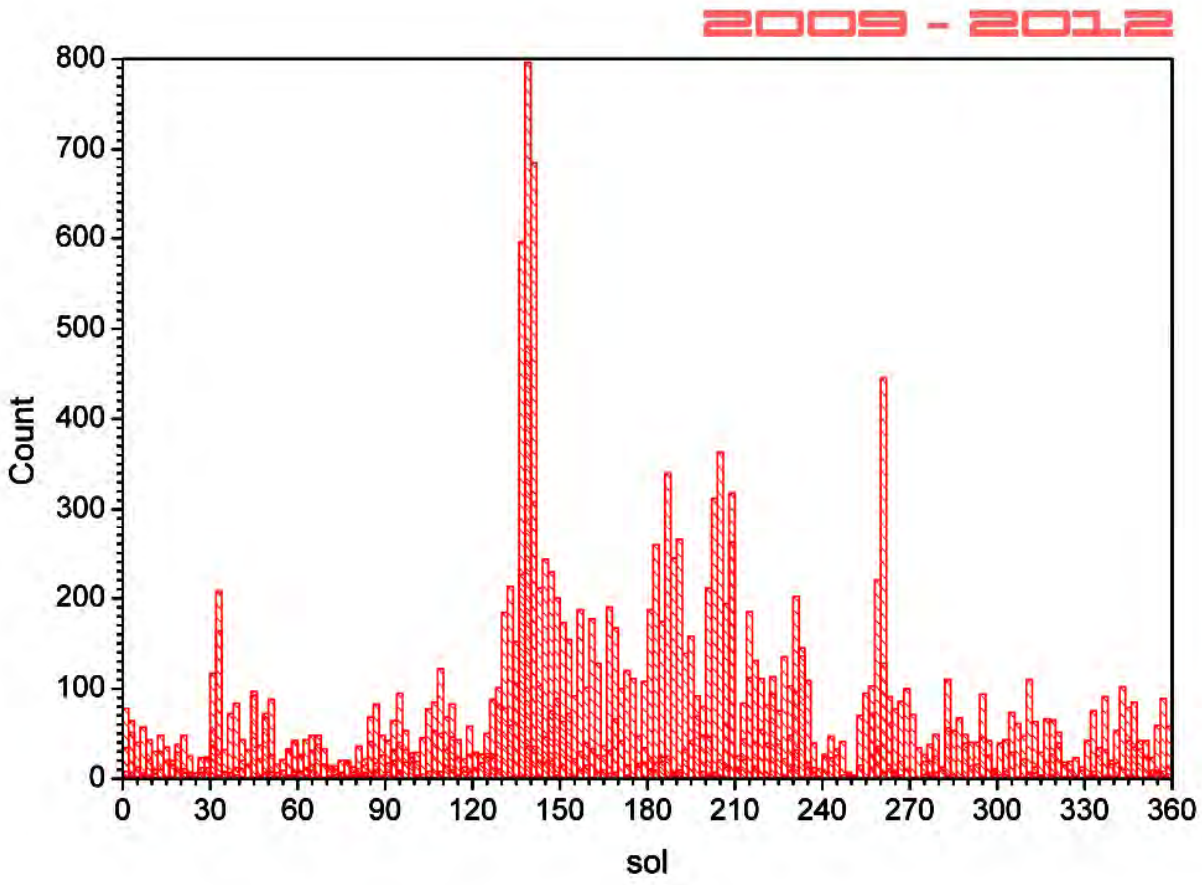
In the database :

2	stations -	21 833 meteors
3	-	2666
4	-	527
5	-	148

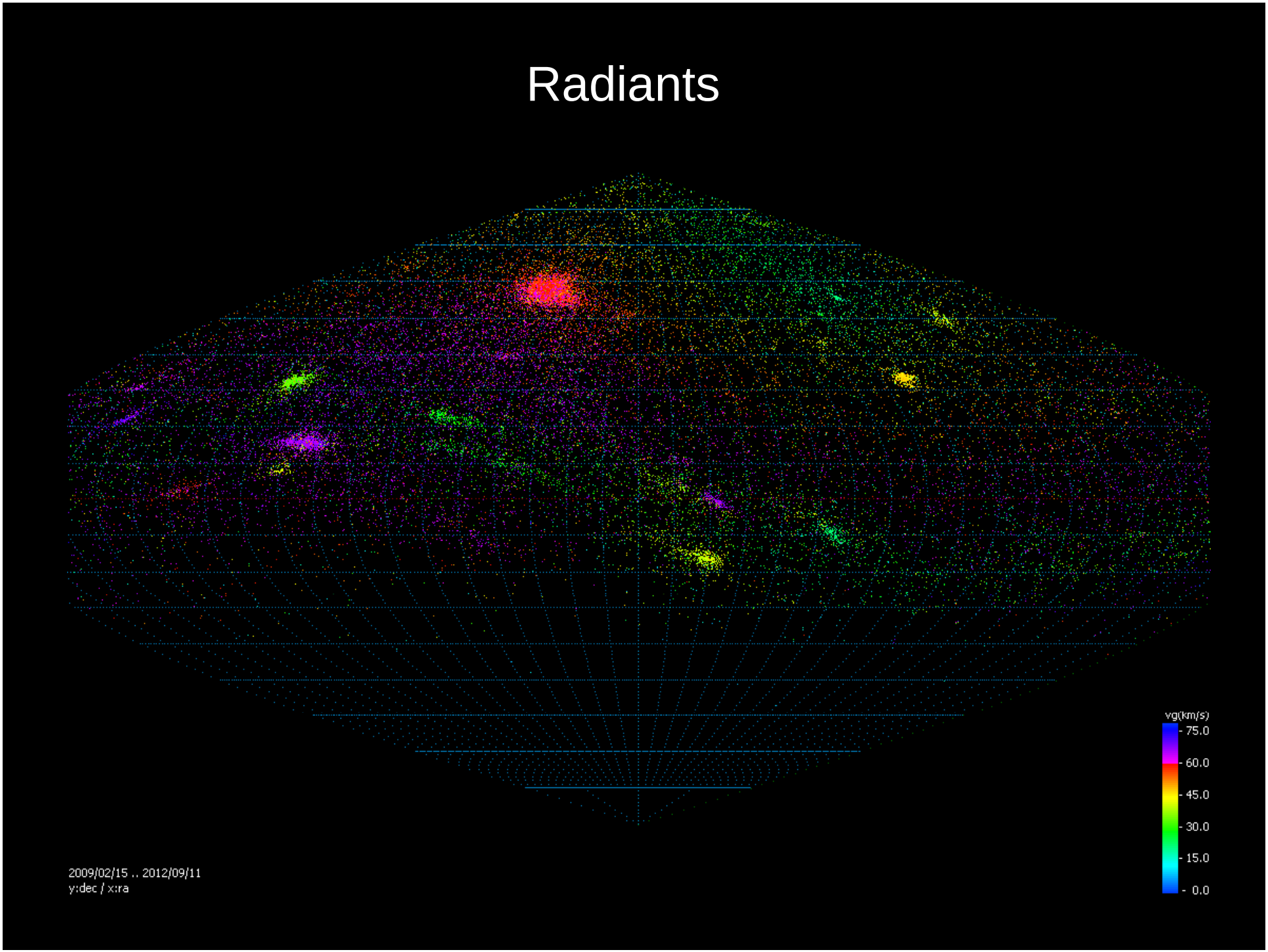
- precision of multi-station observations was not analysed yet

- 15 870 sporadic / 9 385 shower meteors
- identified 33 established / 22 working showers (10 and more meteors)

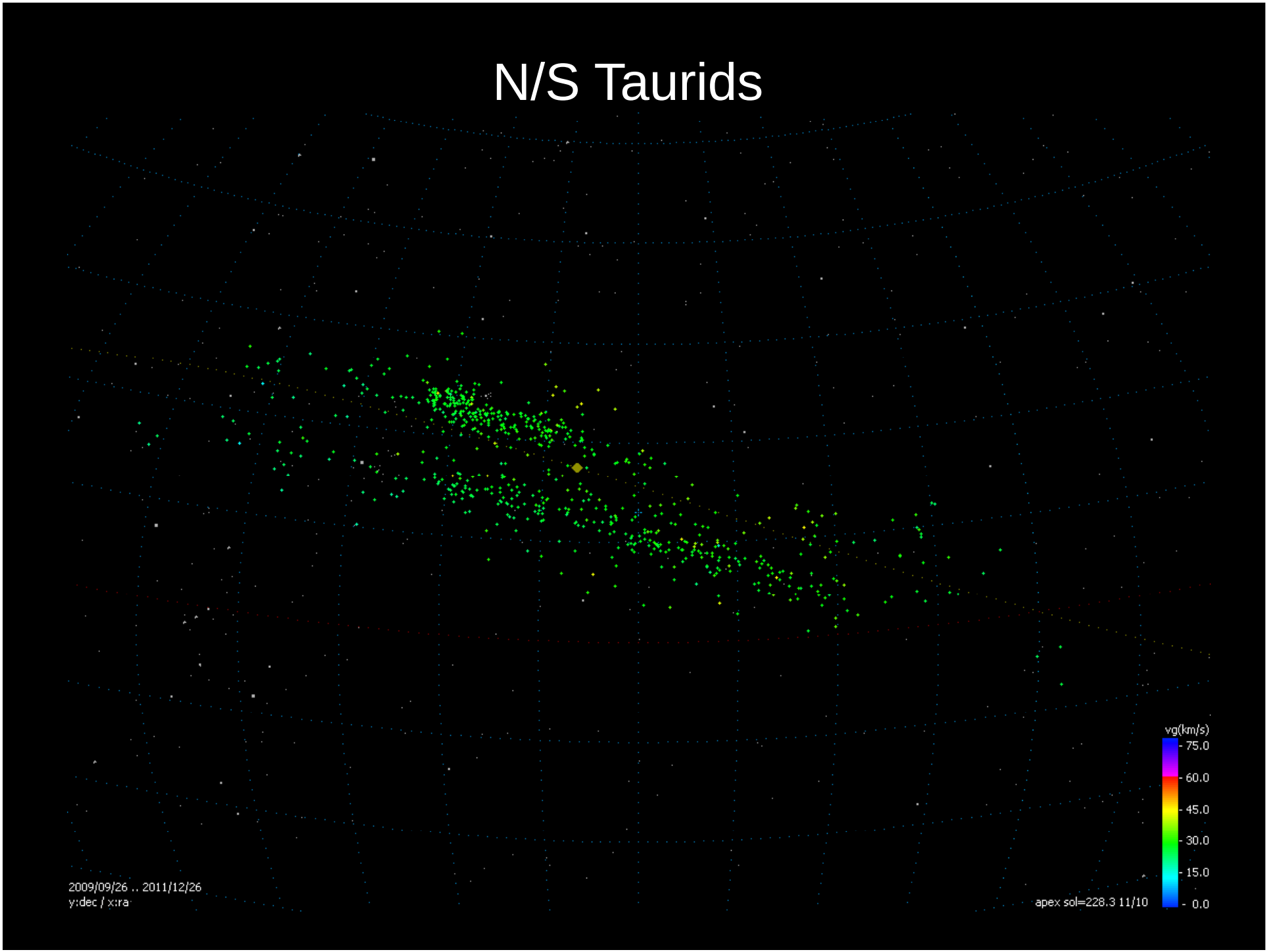
Meteor activity from all stations

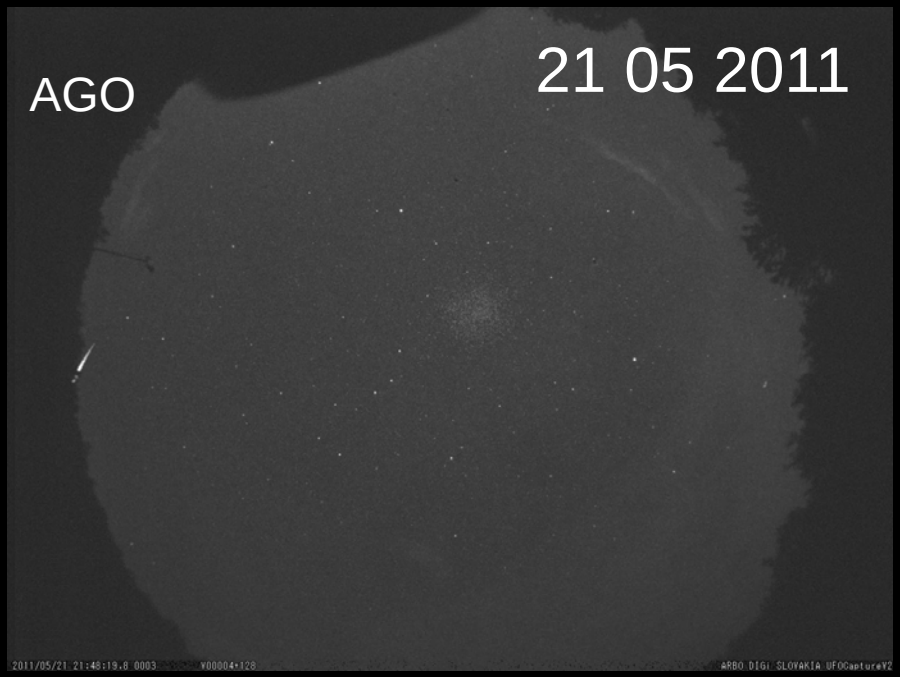


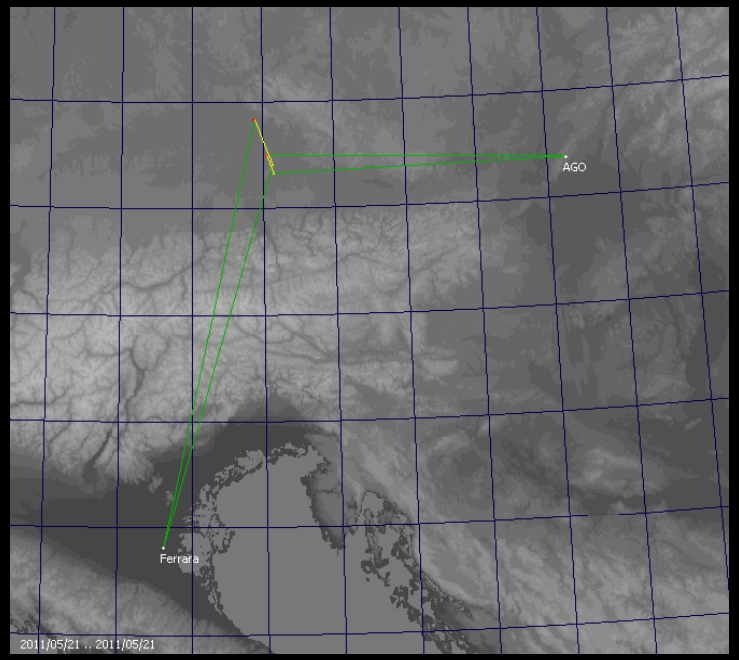
Radiants



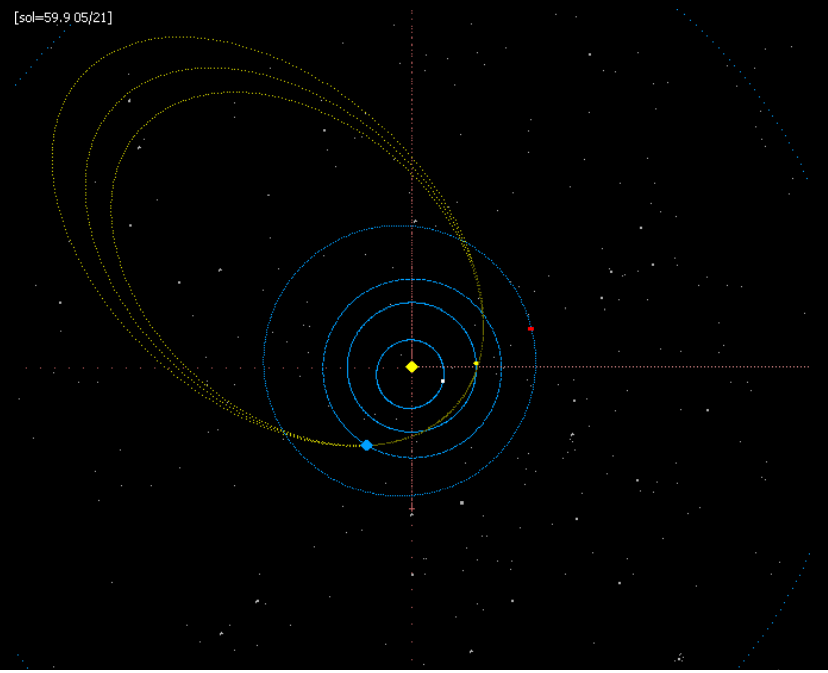
N/S Taurids


2009/09/26 .. 2011/12/26
y:dec / x:ra
vg(km/s)
75.0
60.0
45.0
30.0
15.0
0.0
apex sol=228.3 11/10

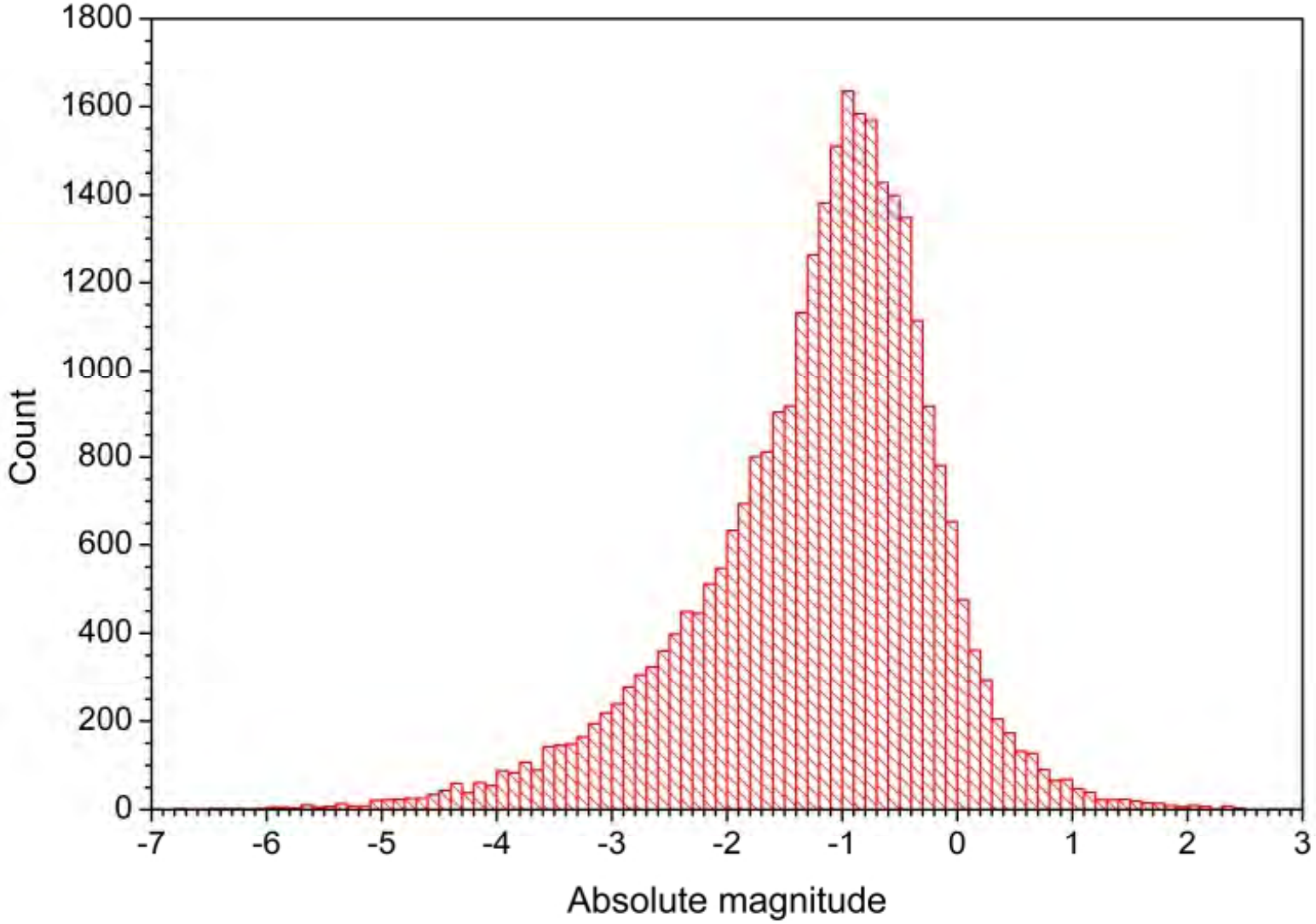

AGO
21 05 2011


AGO
Ferrara
2011/05/21 .. 2011/05/21


Ferrara
Ferrara 2011/05/21 21:48:12.1 0071 V00011+080 F. Zanotti (TLE Tracker) IMTN

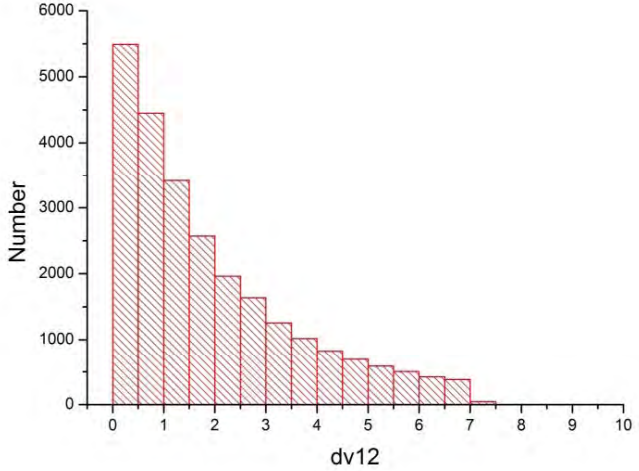

[sol=59.9 05/21]

Absolute magnitude distribution

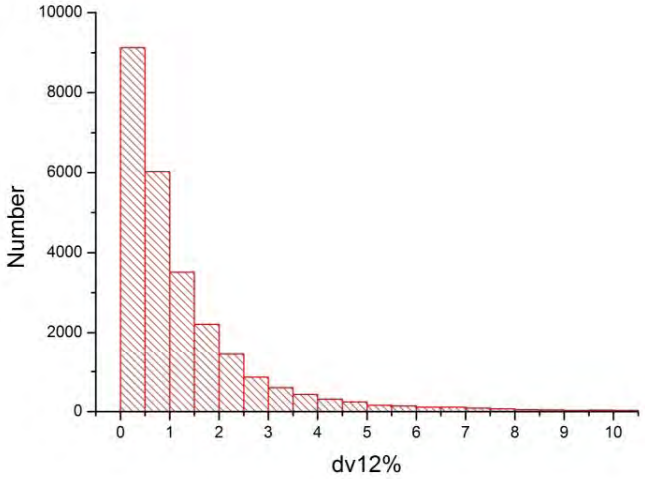


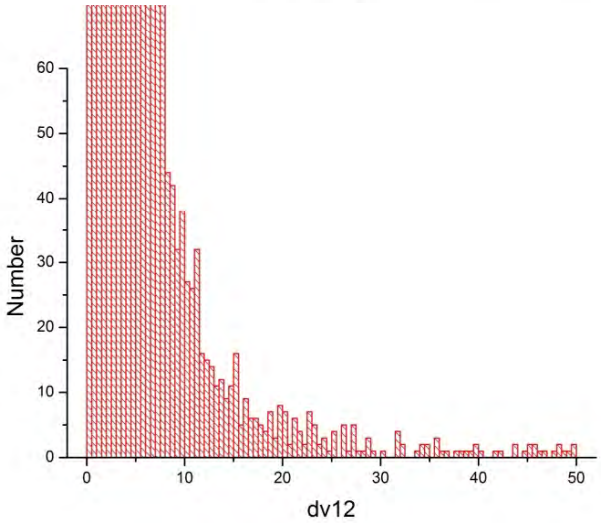
Distribution of *dv12%*

EDMOND



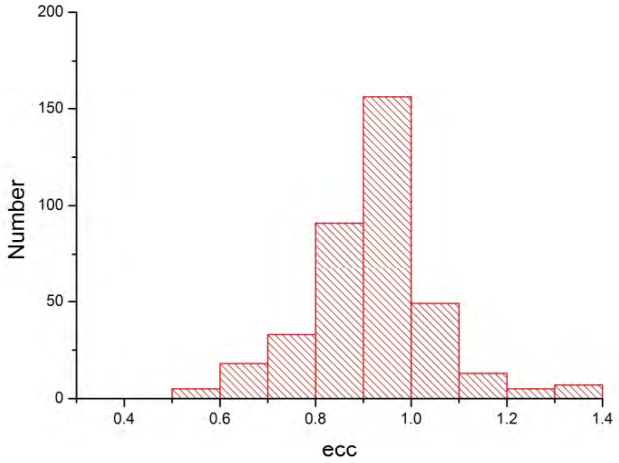
SonotaCo Q1 2009

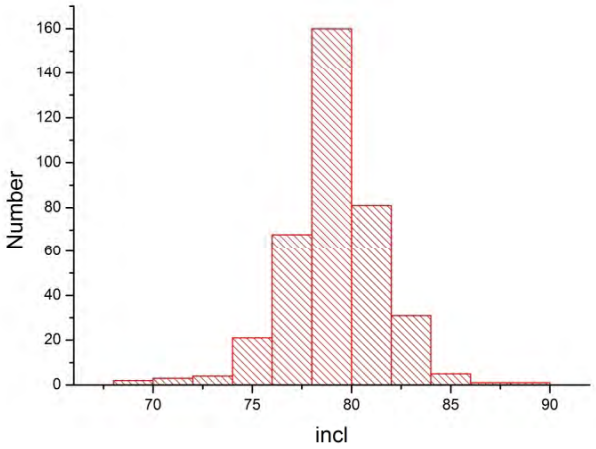




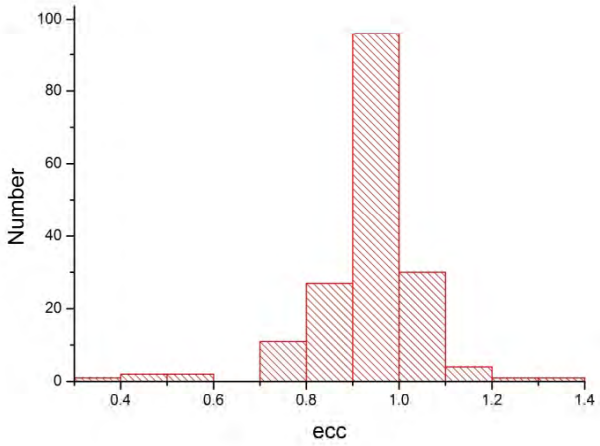
Lyrids – dispersion of *e*, *i*

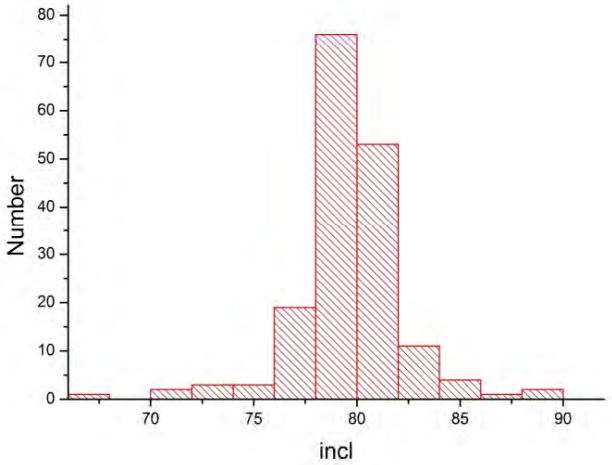
EDMOND





SonotaCo Q1 2009





Conclusions

- EDMOND
  - data from 8 networks, 59 stations, 25 255 orbits
  - 2009 - 2012
  - data have not been used to compute orbits yet
- less consistent data
  - different equipment (resolution, analog / digital)
  - different processing tools (MetRec, UFO)
  - measurement (experience)
  - SVMN and CEMeNT - confronted with photographic data
- **EDMOND joined many observers and has potential to be improved and enlarged.**

Thank you for your attention