WHY CHIPOLATA?

fast **CH**opp**I**ng **P**h**O**tographic meteor camer**A**

CAMS BENELUX

Felix Bettonvil, Carl Johannink & Martin Breukers

INTRODUCTION

- Nowadays is a choice of video systems
  - e.g. Metrec, UFOCapture, CAMS.
- They form networks,
- Deliver data,
- Results &
- Create Feedback

CAMS

CAMERAS FOR ALL SKY METEOR SURVEILLANCE

Mission statement

CAMS is an automated video surveillance of the night sky in search of meteor showers to validate IAU Working List of Meteor Showers.

CAMS IN THE NETHERLANDS

- On occasion of Draconid outburst (2011) introduced in NL
- First trial with Orionids 2011. 2x4 cameras from 2 Dutch stations. Because of ~100 double station meteors considered as success.

- Start of CAMS Benelux = Belgium, Netherlands, Luxembourg
- Initially 4 stations, start April 2012
- Counterpart of the US & New Zealand networks

- Goal of this talk: status update + invitation to join

CAMS TECHNICS

- Watec 902H2
- 12mm F F1.2 lens (20x30˚ FoV)
- EZ CAP USB framegrabber
- Dual core PC
- Free CAMS software

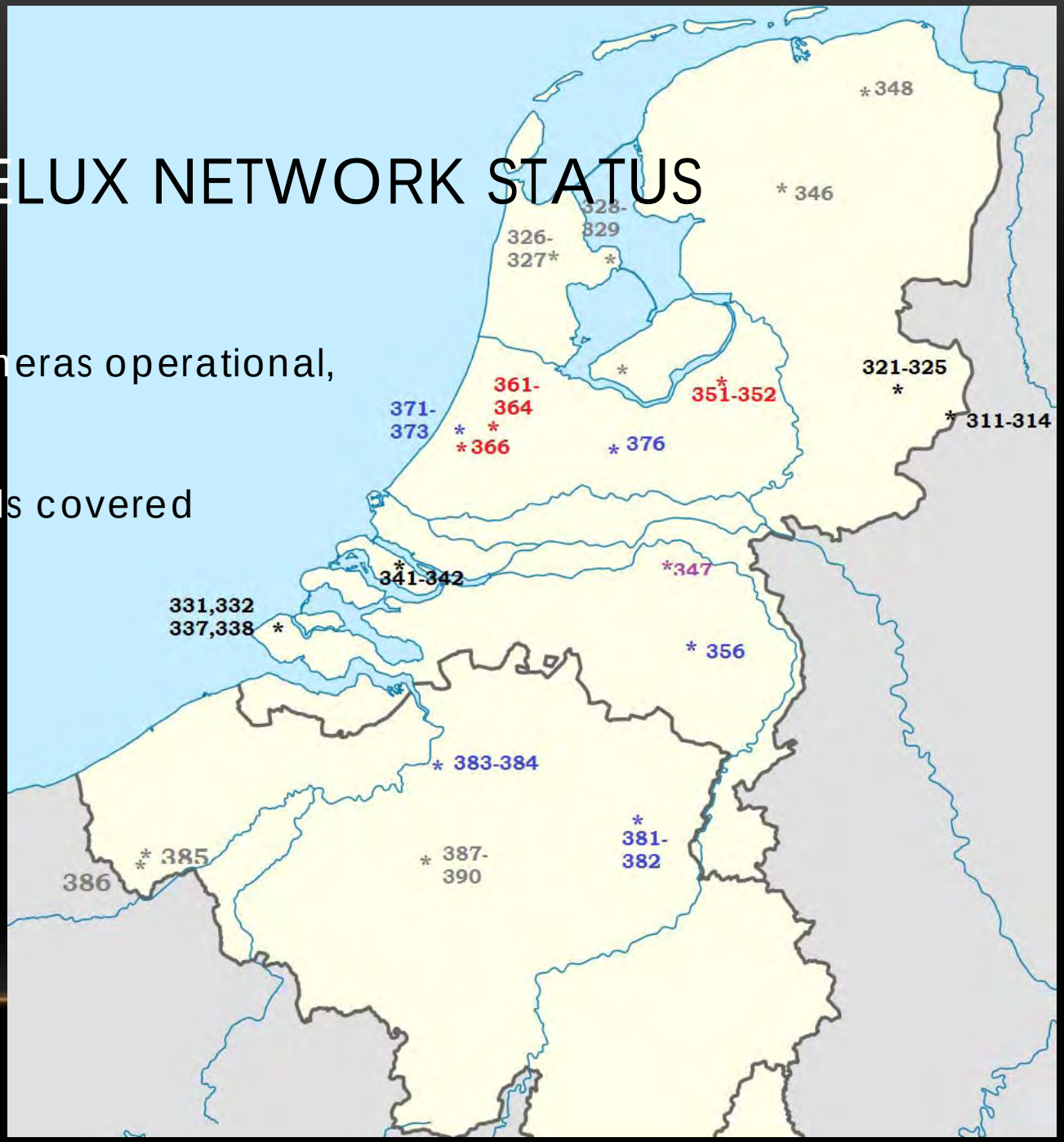
- Automatic recognition
- Automatic astrometry (to ~1arcmin)
- To do yourself: quality check, daily submission of data txt files
- Remote operation

In operation every clear night
5-20 meteors/night

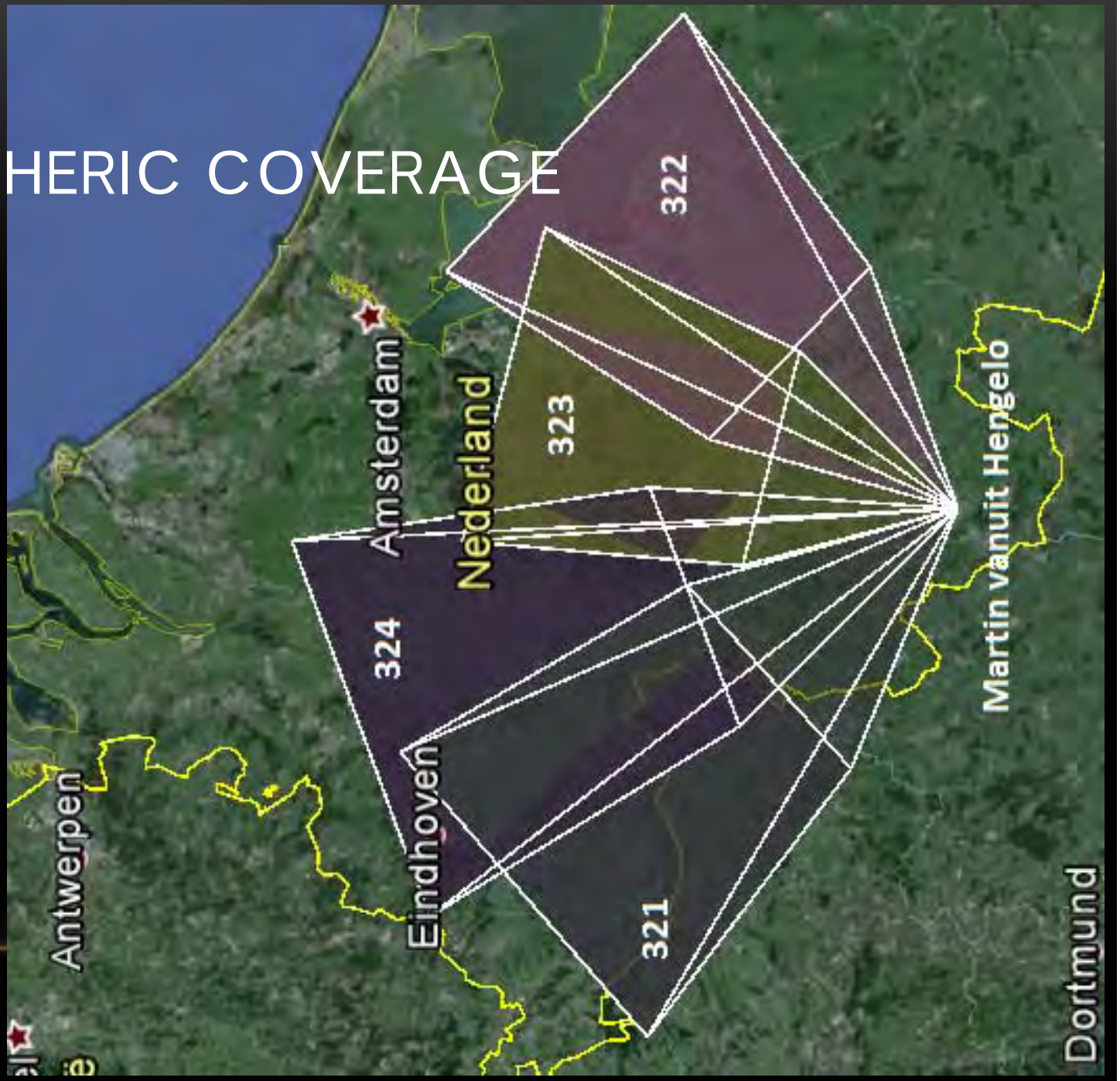
CAMS BENELUX NETWORK STATUS

Currently 32+3 cameras operational, in 14 stations

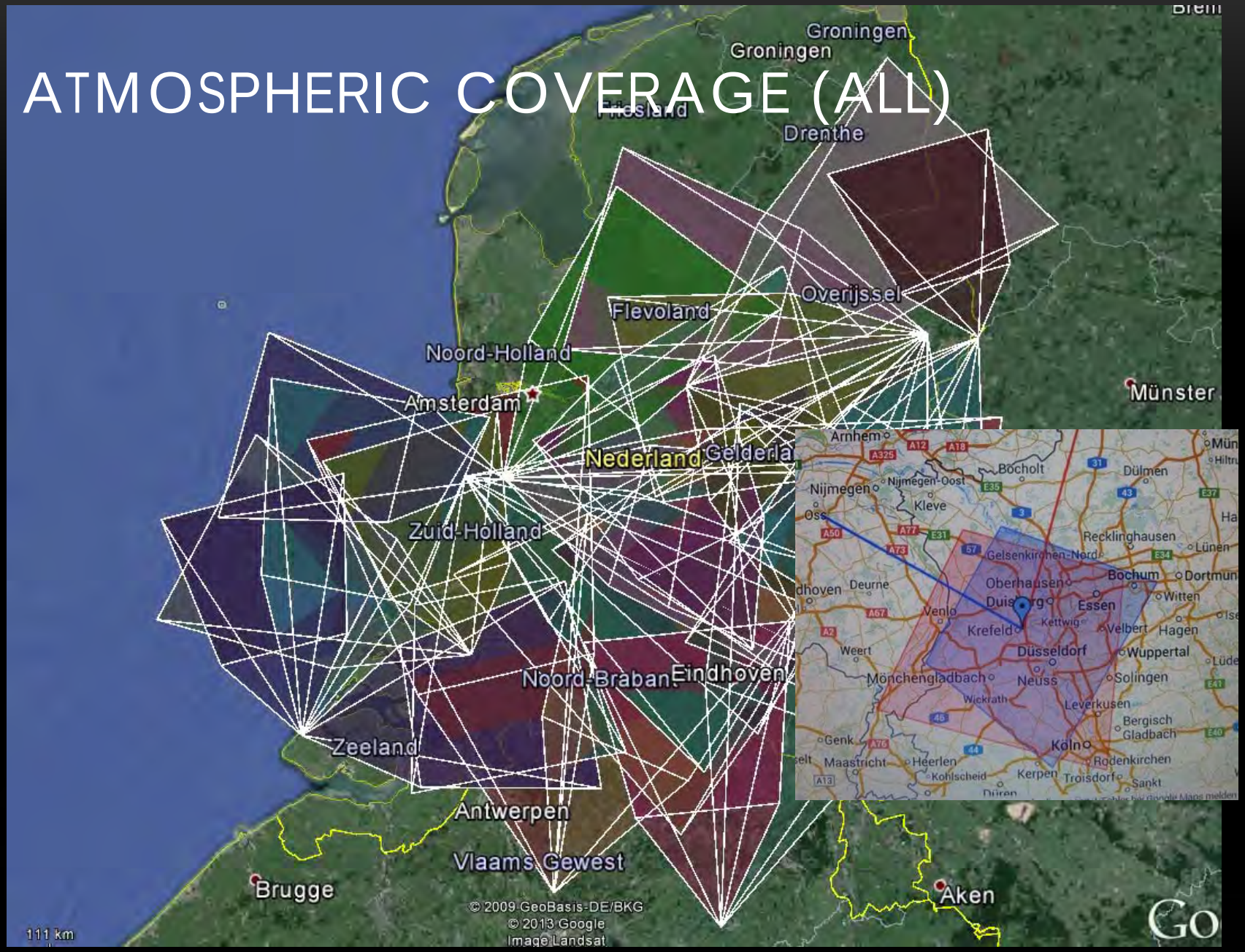
Most of Netherlands covered



ATMOSPHERIC COVERAGE



ATMOSPHERIC COVERAGE (ALL)



SIDE PRODUCTS

- Fireballs captured as well
- Thus plays the role of fireball patrol network too
- Powerful
- Redundant
- Meteorites!

$\alpha = 307.3^\circ +/- 0.4$
$\delta = 32.7^\circ +/- 0.4$

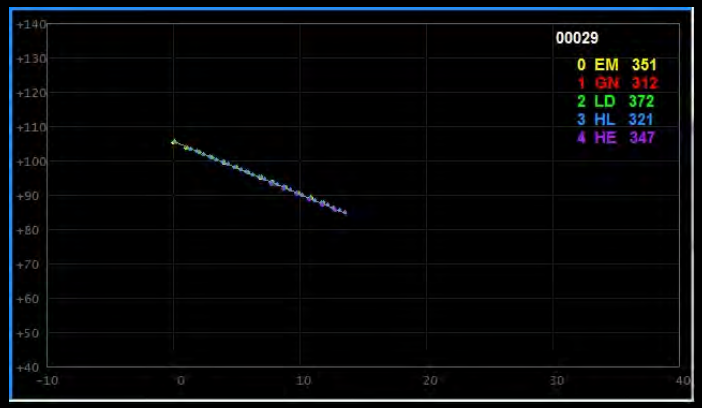
$V_g = 18.0$ km/s +/- 0.1

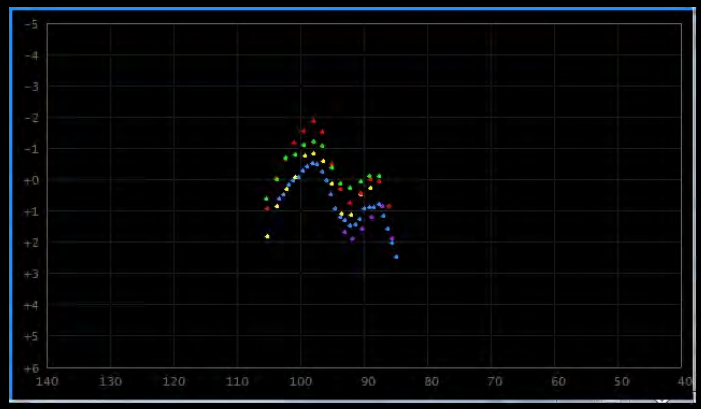
Station 352 [Ermelo / K. Miskotte]

Station 311 [Gronau / C. Johannink]

IT IS A PROJECT

- And thus needs organization & coordination:
  - Coordinator (Carl Johannink); Standby-coordinator (Martin Breukers)
  - Daily: submission of files by observers, processing/administration & updates to observers. Extremely fast response time & results known





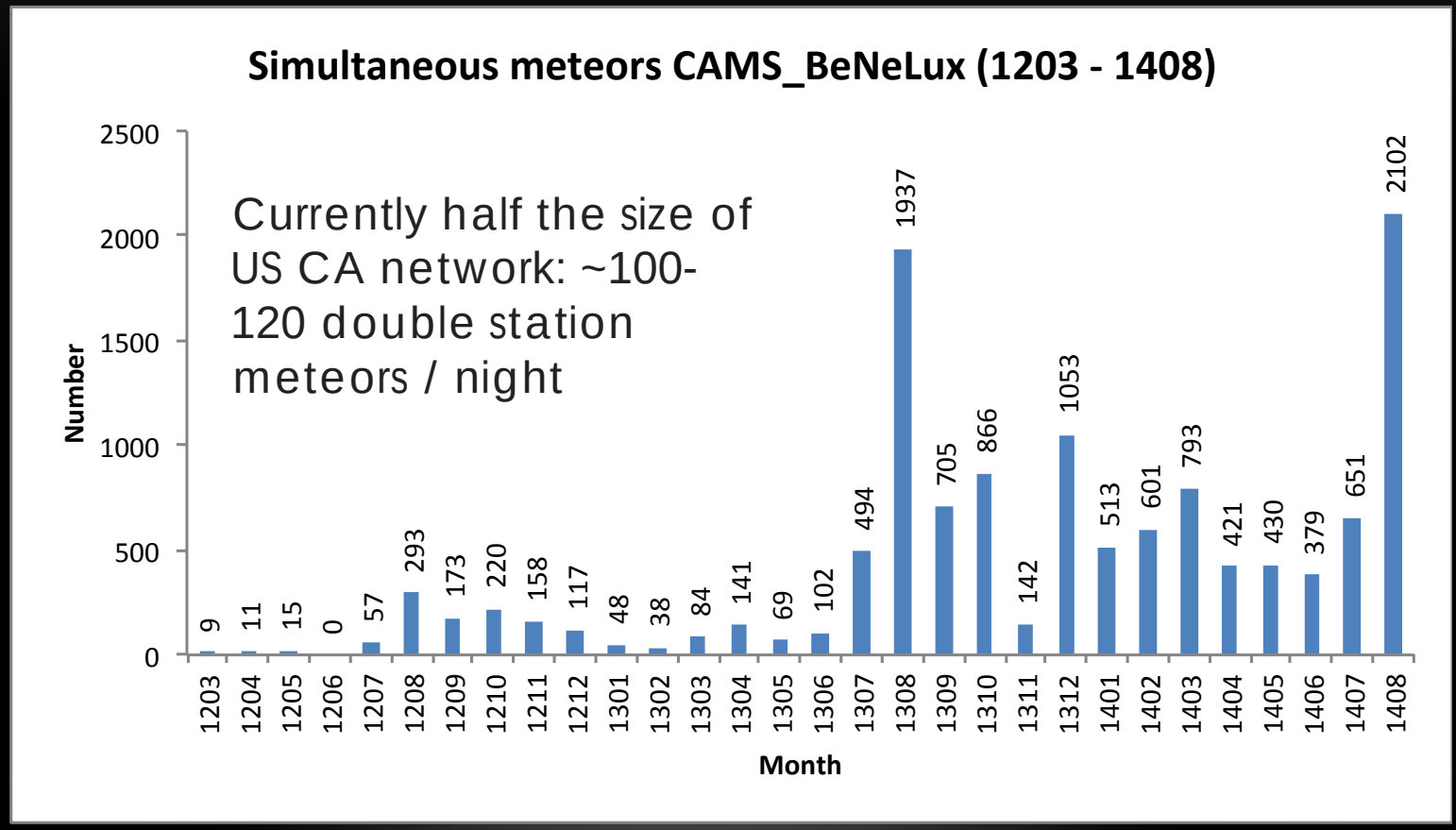
- Data sent regular to Jenniskens for final analysis / publication
- Thereafter data public

ADMIN

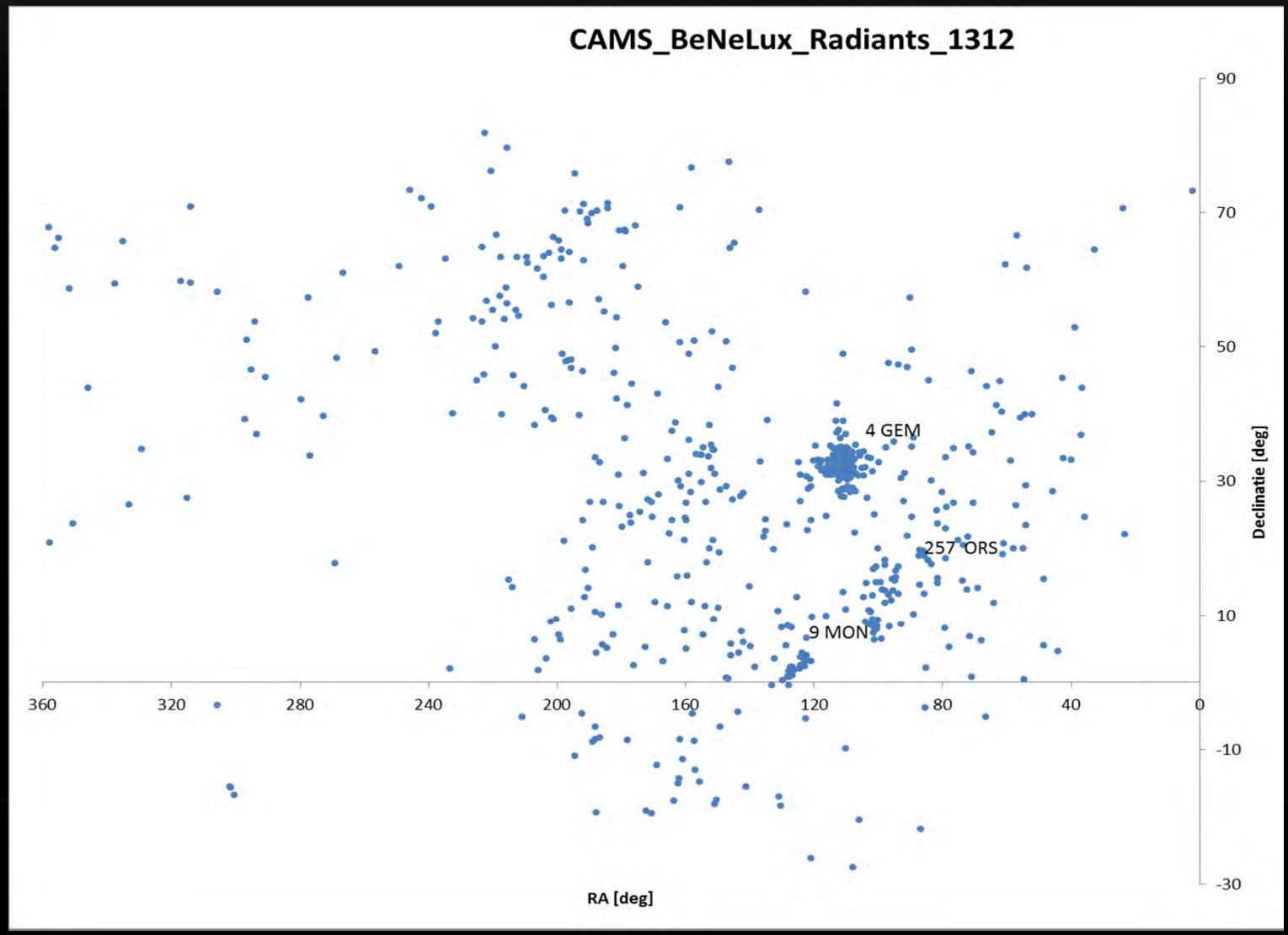
Results until: Sep. 15, 19:00 UT

		September 2014																													
		30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
# sim.	655																	66	26	59	114	37	1	23	43	7	27	17	107	119	9	655
311																		x		x	x	x		x	x		x	x	x	x		Carl
312																		x		x	x	x		x	x		x	x	x	x		Carl
313																		x		x	x	x		x	x		x	x	x	x		Carl
321																		x	x	x	x		x	x	x	x	x	x	x	x	x	Martin
322																		x	x	x	x	x	x	x	x	x	x	x	x	x	x	Martin
323																		x	x	x	x	x		x	x	x	x	x	x	x	x	Martin
324																		x	x	x	x		x	x	x	x	x	x	x	x	x	Martin
325																			x	x	x						x	x	x	x	x	Martin
326																																Martin
331																		x	x	x	x	x		x	x	x			x	x		Klaas
332																		x	x	x	x	x		x	x	x			x	x		Klaas
337																		x	x	x	x	x		x	x	x			x	x		Klaas
338																		x	x	x	x	x		x	x	x			x	x		Klaas
341																		x	x	x	x	x	x	x	x	x			x	x	x	Piet
342																		x	x	x	x	x	x	x	x	x			x	x	x	Piet
346																																Marc
347																		x	x	x	x	x		x	x	x	x	x	x	x	x	Erwin
351																		x	x	x	x			x	x			x	x	x	x	Koen
352																		x	x	x	x			x	x			x	x	x	x	Koen
356																		x	x	x	x	x		x	x	x	x		x	x	x	Paul L.
361																		v	v	v	v			v	v	v	v	x	x	x		Robert
362																		v	v	v	v			v	v	v	v	x	x	x		Robert
363																		v	v	v	v			v	v	v	v	x	x	x		Robert
364																		v	v	v	v			v	v	v	v	x	x	x		Robert
371																		x	x	x	x	x			x				x	x		Hans
372																		x	x	x	x	x			x				x	x		Hans
373																		x	x	x	x	x			x				x	x		Hans
376																			x	x	x				x				x			Felix
381																		x	x	x	x	x		x	x		x		x	x		J-M
382																		x	x	x	x	x		x	x		x		x	x		J-M
383																		x	x	x	x	x		x	x				x	x		Paul R.
384																		x	x	x	x	x		x	x				x	x		Paul R.

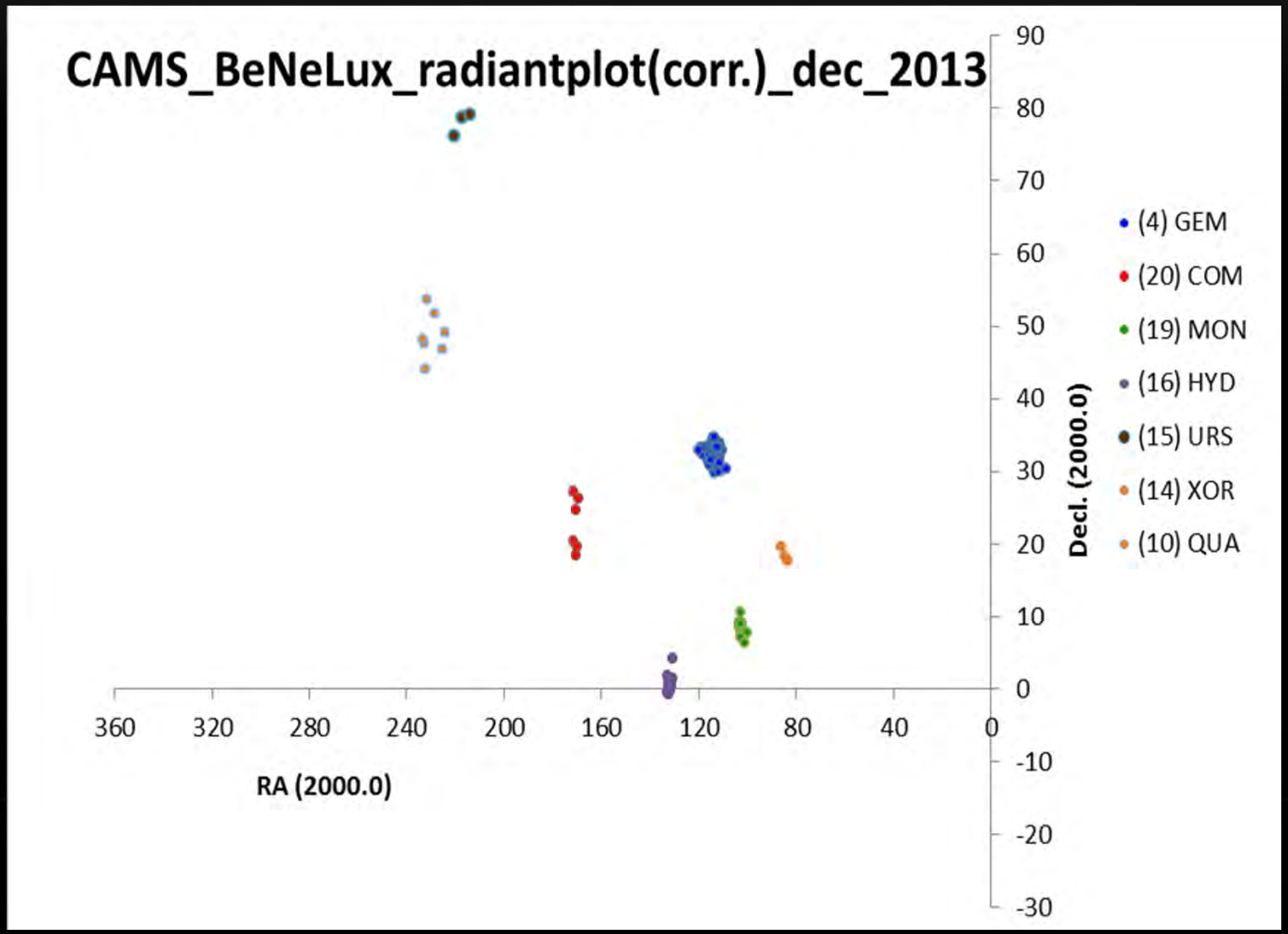
STATISTICS


Simultaneous meteors CAMS_BeNeLux (1203 - 1408)
Currently half the size of US CA network: ~100-120 double station meteors / night
Number
Month
2500
2000
1500
1000
500
0
1203 1204 1205 1206 1207 1208 1209 1210 1211 1212 1301 1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1401 1402 1403 1404 1405 1406 1407 1408
9 11 15 0 57 293 173 220 158 117 48 38 84 141 69 102 494 1937 705 866 142 1053 513 601 793 421 430 379 651 2102

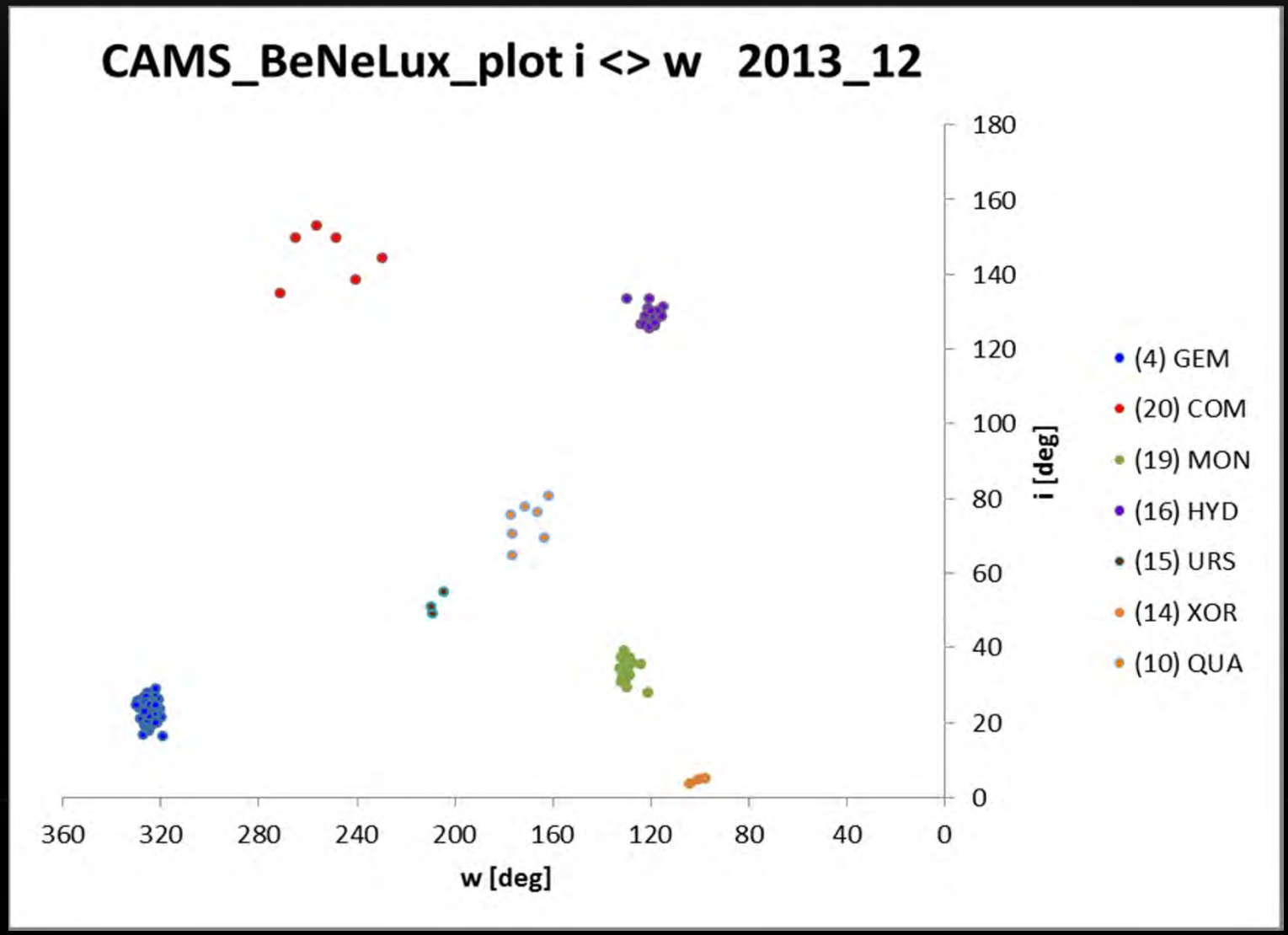
RESULTS


CAMS_BeNeLux_Radiants_1312
4 GEM
257 ORS
9 MON
360
320
280
240
200
160
120
80
40
0
90
70
50
30
10
-10
-30
RA [deg]
Declinatie [deg]

RESULTS


CAMS_BeNeLux_radiantplot(corr.)_dec_2013
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
Decl. (2000.0)
360
320
280
240
200
160
120
80
40
0
RA (2000.0)
(4) GEM
(20) COM
(19) MON
(16) HYD
(15) URS
(14) XOR
(10) QUA

RESULTS


CAMS_BeNeLux_plot i <> w 2013_12
180
160
140
120
100
80
60
40
20
0
i [deg]
360
320
280
240
200
160
120
80
40
0
w [deg]
(4) GEM
(20) COM
(19) MON
(16) HYD
(15) URS
(14) XOR
(10) QUA

CAMELOPARDALIDS

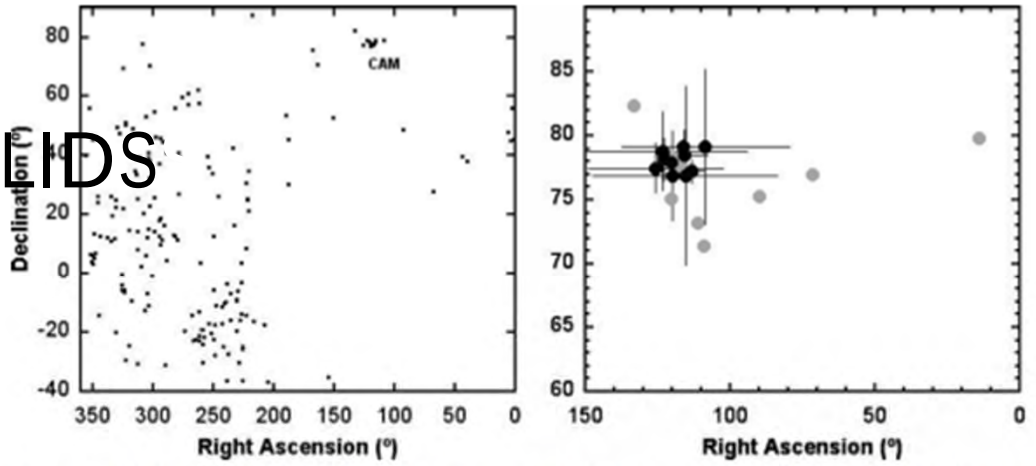


Figure 4 – CAMS-measured geocentric radiant positions on 2014 May 23 and 24. Gray: Meteors with short V-shaped lightcurves.

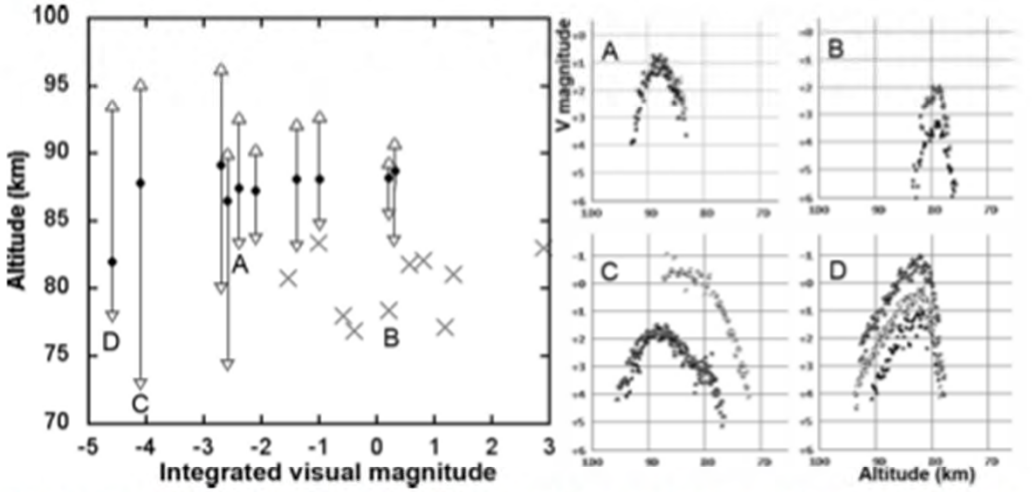
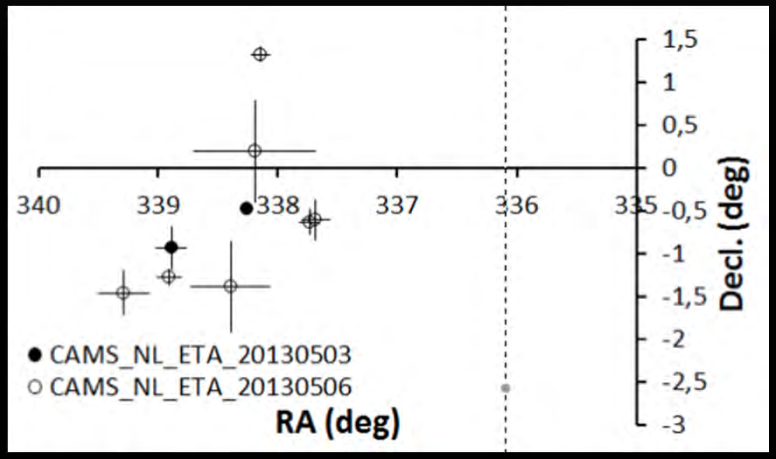
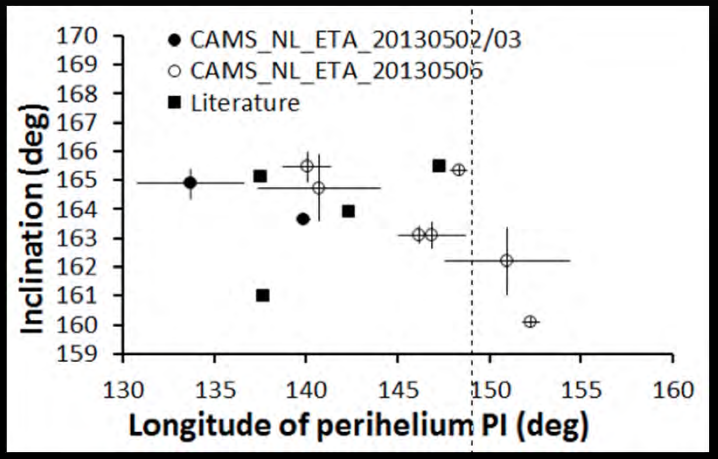


Figure 5 – Example meteor lightcurves and altitude range (• and × mark peak brightness) plotted as a function of the integrated meteor brightness. A: Typical case at $04^h41^m02^s$ UT; B: Likely incorrect, sharply peaked result at $05^h15^m59^s$ UT; C: Single-CAMS result at $06^h41^m13^s$ UT; D: Large meteoroid at $11^h34^m14^s$ UT.

ETA-AQUARIIDS





Time (UT) May 2013	RA_{geo} [°]	DEC_{geo} [°]	V_g [km/s]	q [AU]	$1/a$ [1/AU]	i [°]	ω [°]	Ω [°]	Stations
2.12328	338.887±0.127	−0.927±0.245	65.197±0.762	0.53364±0.01636	0.0892±0.0649	164.873±0.509	92.021±2.893	41.6792±0.0027	362,322
3.09958	338.256±0.051	−0.478±0.062	66.244±0.089	0.56864±0.00213	0.0057±0.0080	163.630±0.122	97.268±0.332	42.6270±0.0004	362,322
6.09439	338.902±0.098	−1.269±0.089	68.115±0.130	0.59820±0.00328	−0.1620±0.0123	165.345±0.168	102.807±0.464	45.5279±0.0006	312,351
6.10061	338.189±0.510	0.195±0.590	68.569±1.074	0.61574±0.02187	−0.2168±0.1000	162.194±1.156	105.449±3.411	45.5364±0.0044	362,322
6.11028	338.394±0.331	−1.381±0.536	65.426±0.875	0.56288±0.01964	0.0984±0.0752	164.734±1.127	95.148±3.330	45.5439±0.0053	312,351
6.11063	339.287±0.215	−1.451±0.257	65.778±0.318	0.54999±0.00874	0.0447±0.0270	165.467±0.525	94.509±1.291	45.5436±0.0019	312,351
6.11334	337.680±0.120	−0.001±0.234	66.787±0.550	0.60130±0.01039	−0.0199±0.0499	163.098±0.437	101.340±1.837	45.5482±0.0024	341,332,331
6.11822	338.143±0.076	1.329±0.091	69.043±0.155	0.62027±0.00309	−0.2876±0.0145	160.085±0.182	106.727±0.472	45.5382±0.0005	331,366
6.11822	337.732±0.086	−0.001±0.154	66.602±0.297	0.59704±0.00647	−0.0040±0.0254	163.116±0.290	100.625±1.068	45.5529±0.0013	341,331
Lindblad (1990)	337.60	−1.60	65.90	0.61	0.03	165.50	101.50	45.80	

CONCLUSIONS

CAMS is:

- Very easy to do: 1) simple setup 2) easy operation. Black box
- Delivers entire orbital data set
- Excellent coordination, key to success.
- Scientific results
- Fun

bettonvil@astron.nl if you are interested to join