Astrometric precision with AMOS and orbit determination

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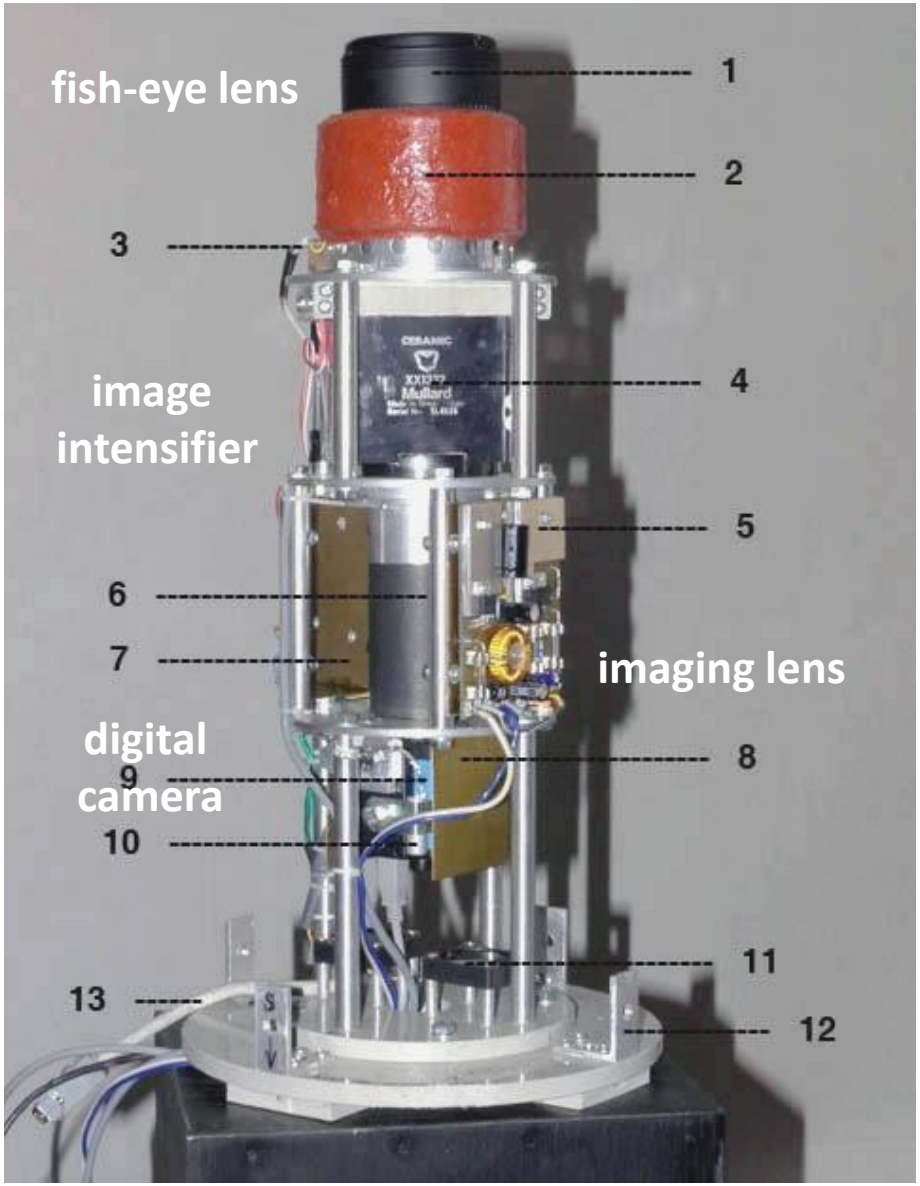
AMOS

- **All-sky Meteor Orbit System**
  - **Jan Amos Komenský – Comenius, 17th cent.**
  - **Czech pedagogue, father of education**
  - **Comenius University in Bratislava**

- **aim of AMOS system**
  - to monitor meteor activity
  - to obtain orbital and geophysical parameters

All-sky Meteor Orbit System - AMOS

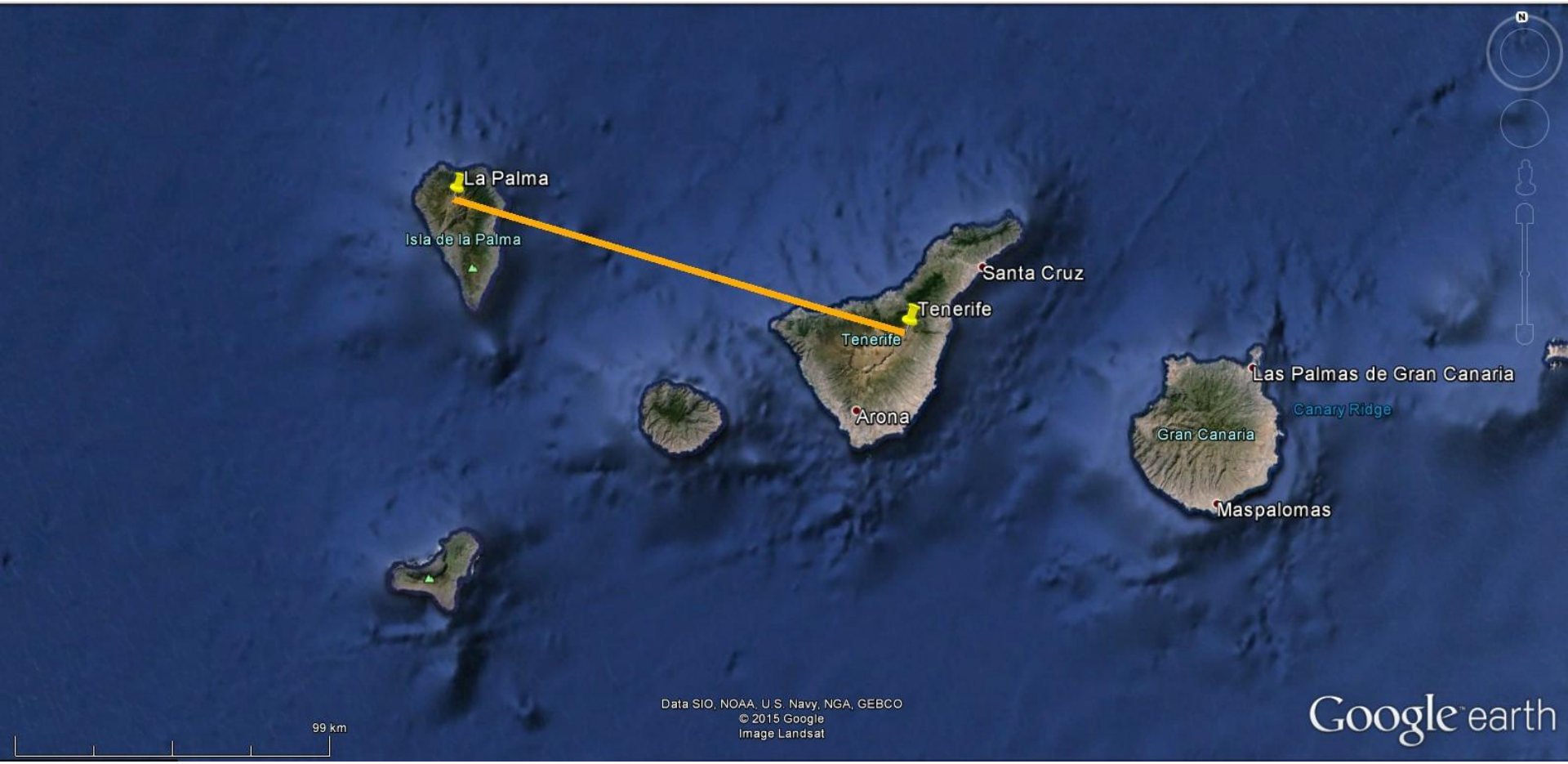
Developed and constructed at the AGO in Modra Comenius University



Zigo et al. 2013

Slovak Video Meteor Network

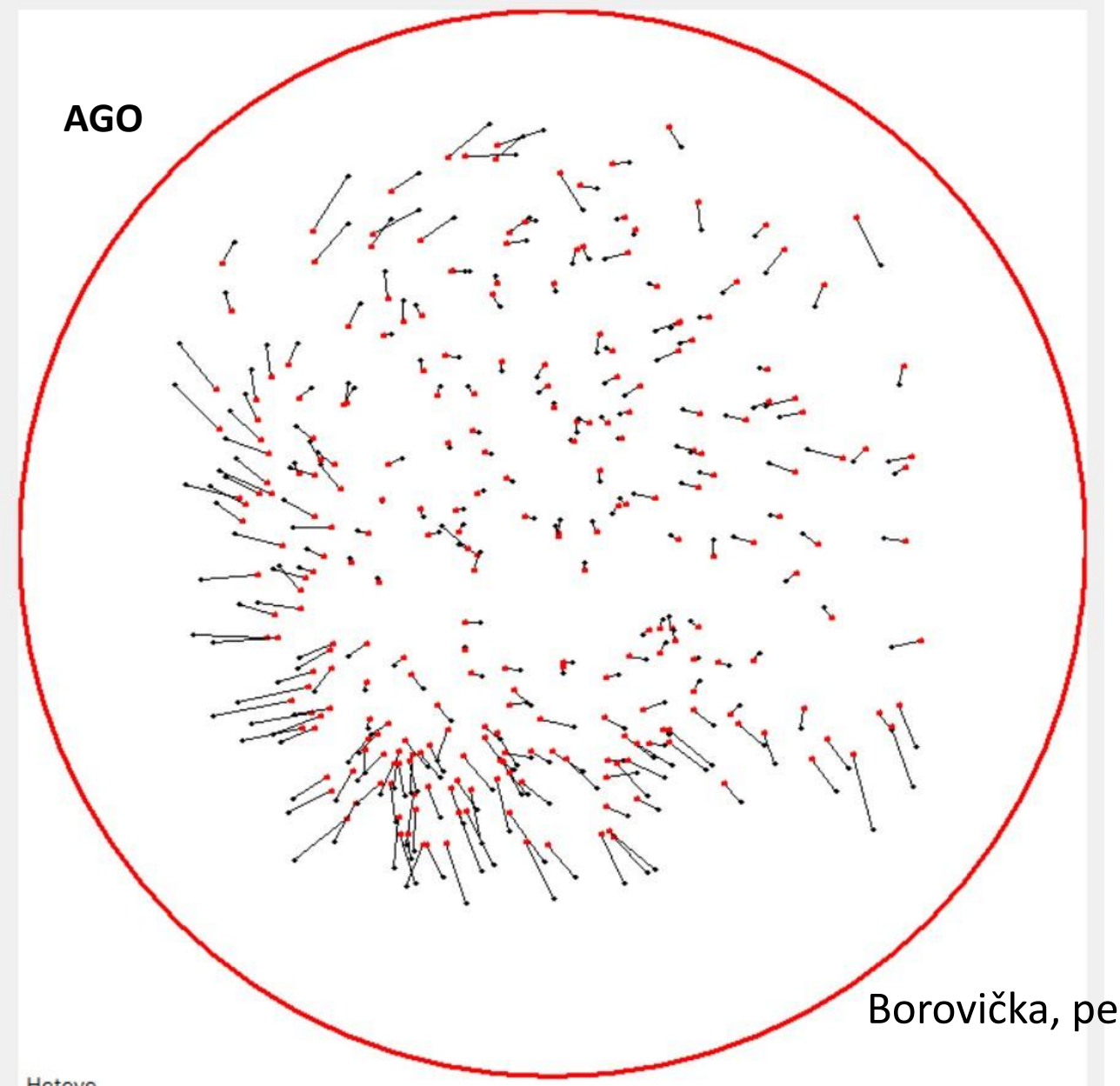
Canary Islands



AMOS

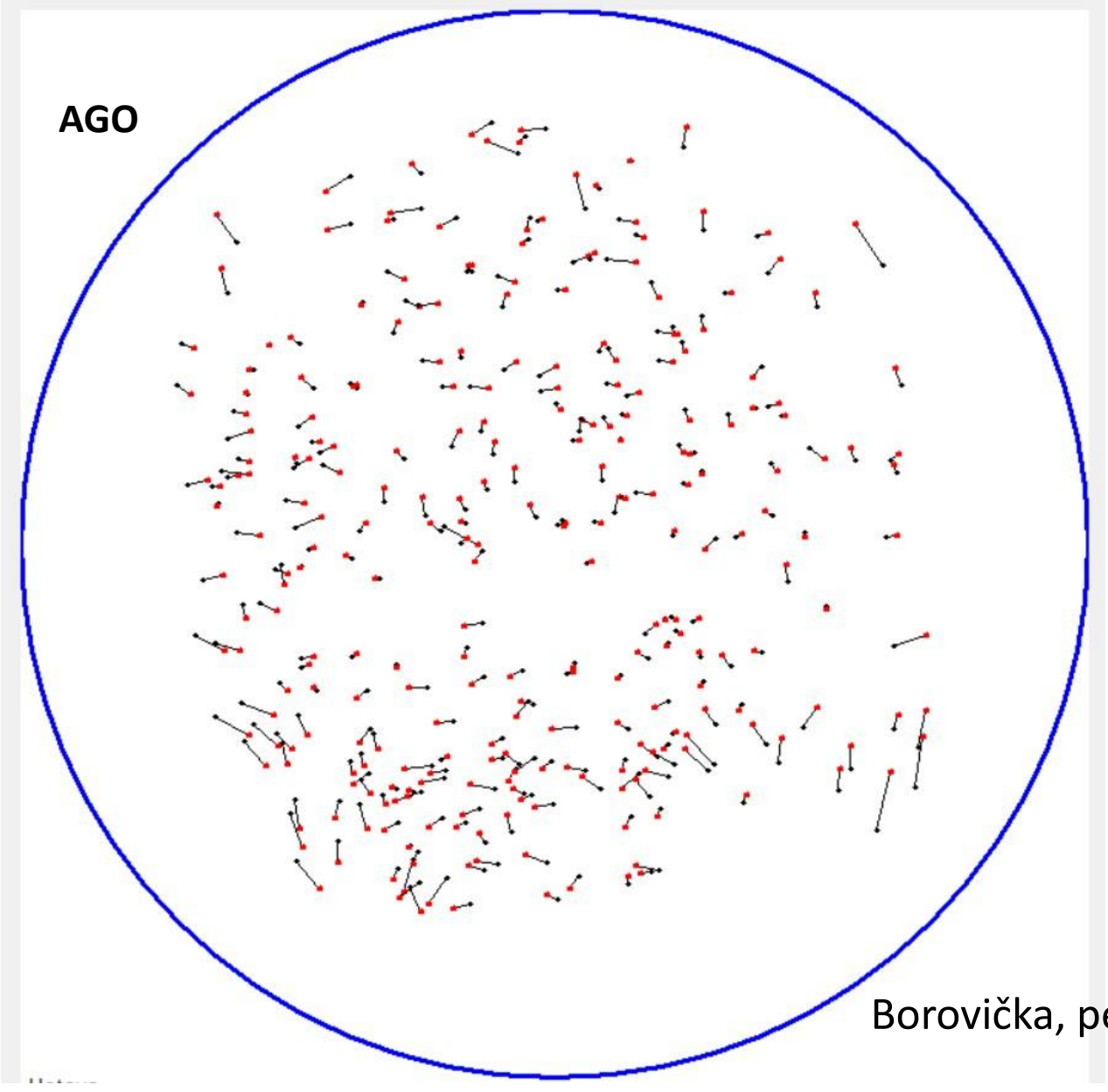
- **SVMN** cameras
  - 1280 x 960 pixel 8.43 arcmin/px 15 frames/s
- **Canary Islands** cameras
  - 1600 x 1200 px 6.75 arcmin/px 20 frames/s
- UFOCapture, UFOAnayzer, UFOOrbit are used (SonotaCo, 2009)

4th polynomial – UFO (SonotaCo, 2009)



Borovička, personal comm.

All-sky (Borovička, 1995)



Borovička, personal comm.

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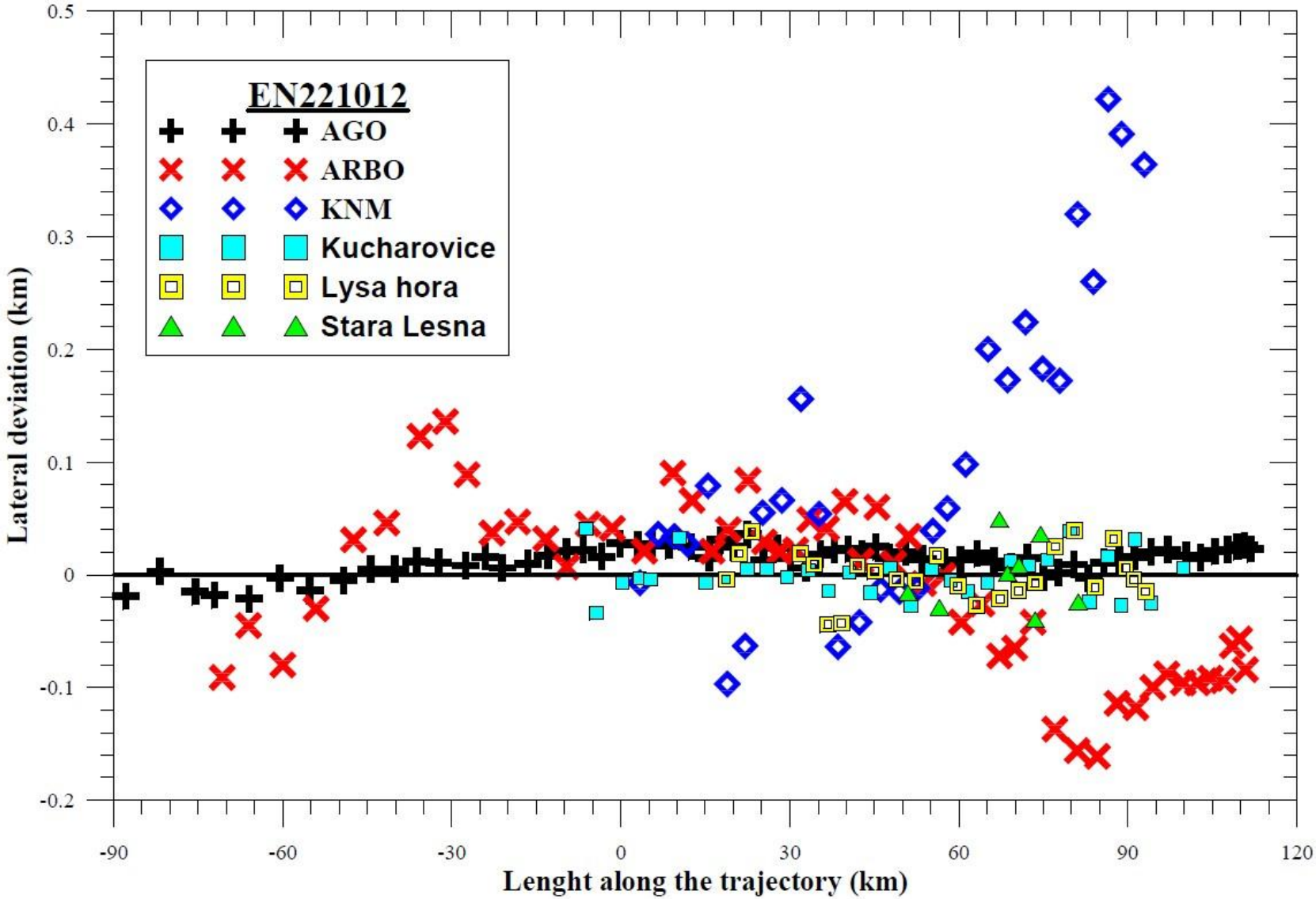
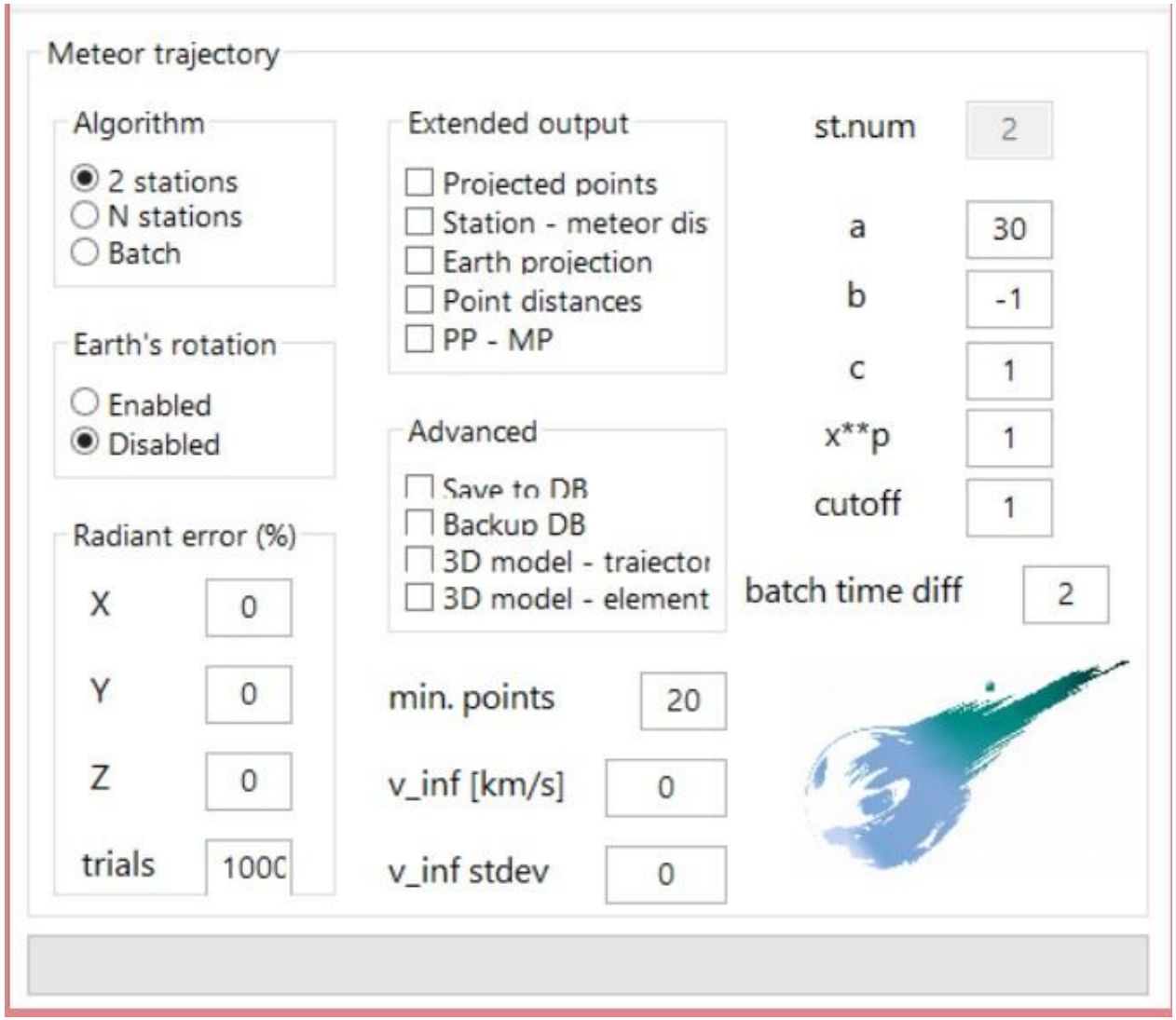


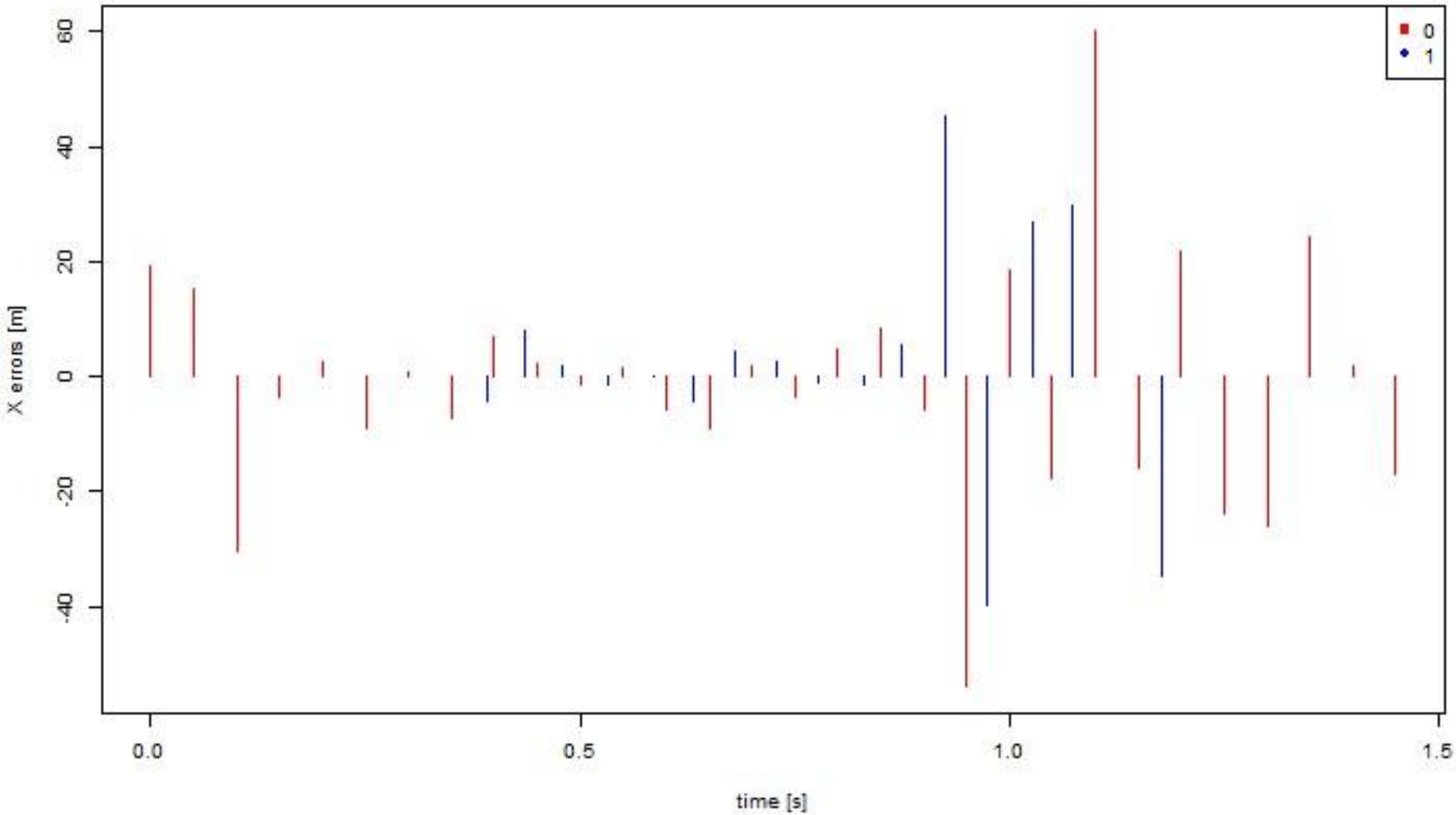
Computed by Spurný, personal comm.

Orbit determination

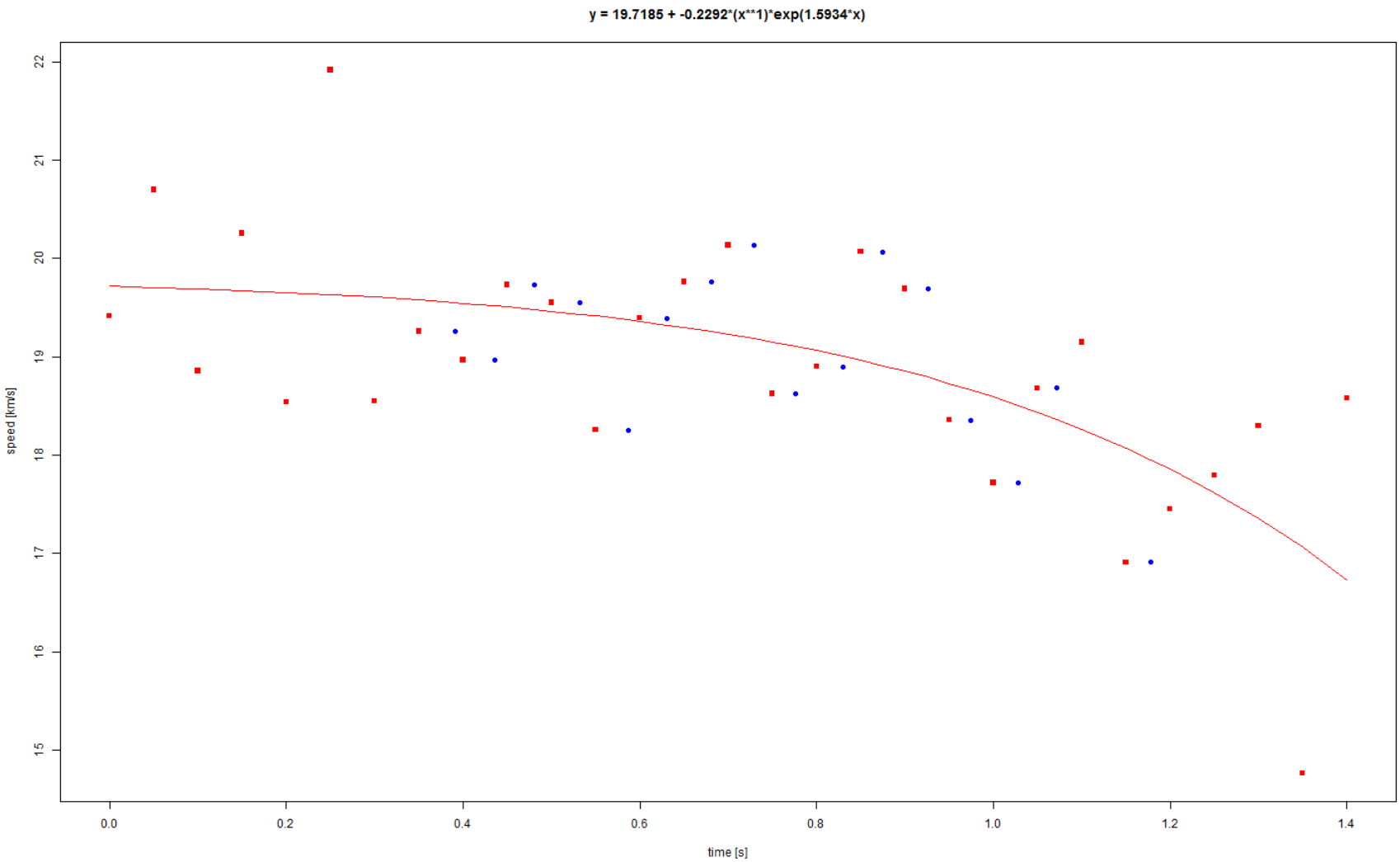


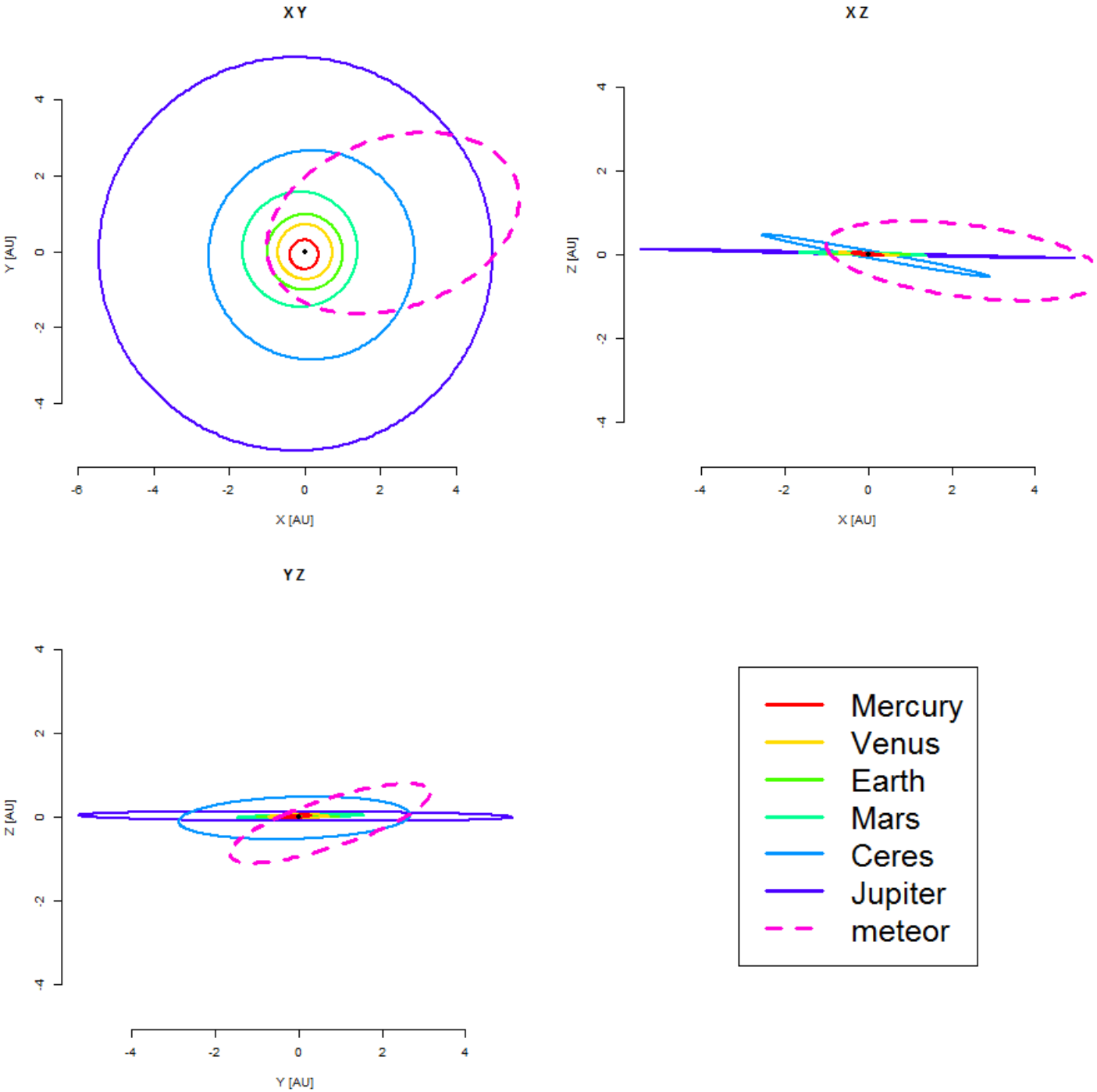
Based on Ceplecha, 1987

Lateral errors



Velocity fit




X Y
Y [AU]
X [AU]
X Z
Z [AU]
X [AU]
Y Z
Z [AU]
Y [AU]
Mercury
Venus
Earth
Mars
Ceres
Jupiter
meteor

Fit velocity

- The R Project for Statistical Computing
- exponential formula

$$y \sim a + b*(x^p)*\exp(c*x); \qquad (a, b, c, p)$$

- mean value
  - check for 3 sigma

- low number of points
- large spread

EFN – SVMN orbit determination

EN22102012

stations	RA	Dec	Vg	a	q	e	i	ω	Ω
3 stations	266.60	35.65	14.612	2.862	0.98230	0.6568	19.15	165.48	209.79975
EFN +/-	0.03	0.03	0.017	0.008	0.00005	0.0010	0.02	0.03	0.00000
AGO	266.59	35.44	14.64	2.89	0.98216	0.661	19.1	165.43	209.80450
ARBO +/-	0.05	0.09	0.09	0.04	0.00049	0.005	0.1	0.06	0.00002
AGO	266.79	35.68	14.75	2.94	0.98246	0.666	19.3	165.63	209.80447
ARBO +/-	0.06	0.10	0.10	0.05	0.00055	0.005	0.1	0.07	0.00002
KNM									

EFN – Kucharovice, Lysa Hora, Stara Lesna (computed by Spurný, personal. comm.)

Conclusions

- all-sky procedure is more suitable for AMOS
- atmospheric trajectory precision – several tens of meters
- fit of velocity is in process

- we introduced a new program for orbit determination
  - uncertainty of parameters (Monte Carlo method)
  - independent check of orbit determination
  - AMOS is suitable to provide orbital and geophysical characteristics in relatively high precision

- Next
- to recompute the database EDMOND also with errors
  - better analysis of the database

Thank you for your attention
2012/10/22 23:43:51.560 0056
V00002+092
AGO MODRA SLOVAKIA UFOCaptureV2