# ON ASTROMETRY OF VERY BRIGHT VIDEO METEORS

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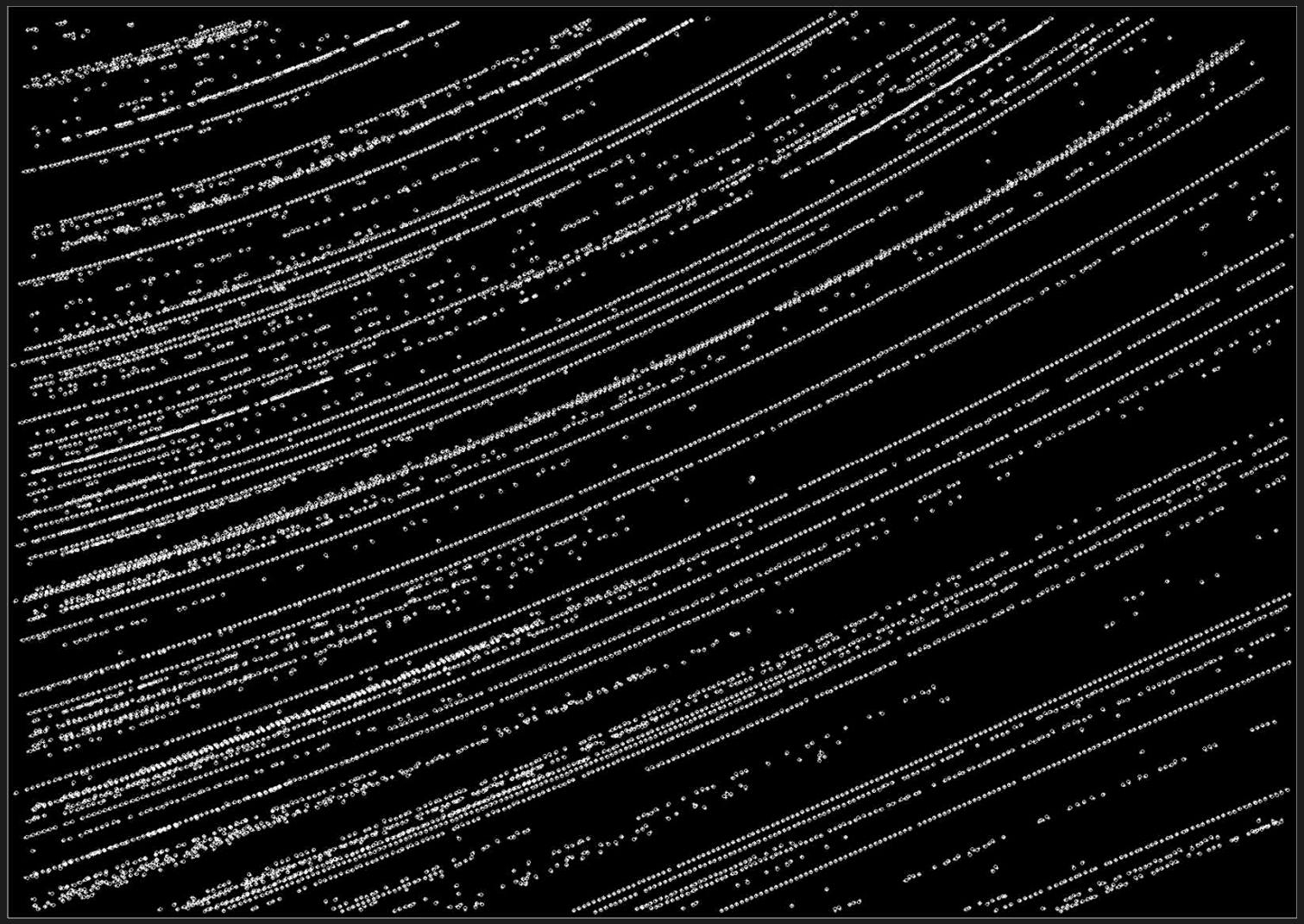
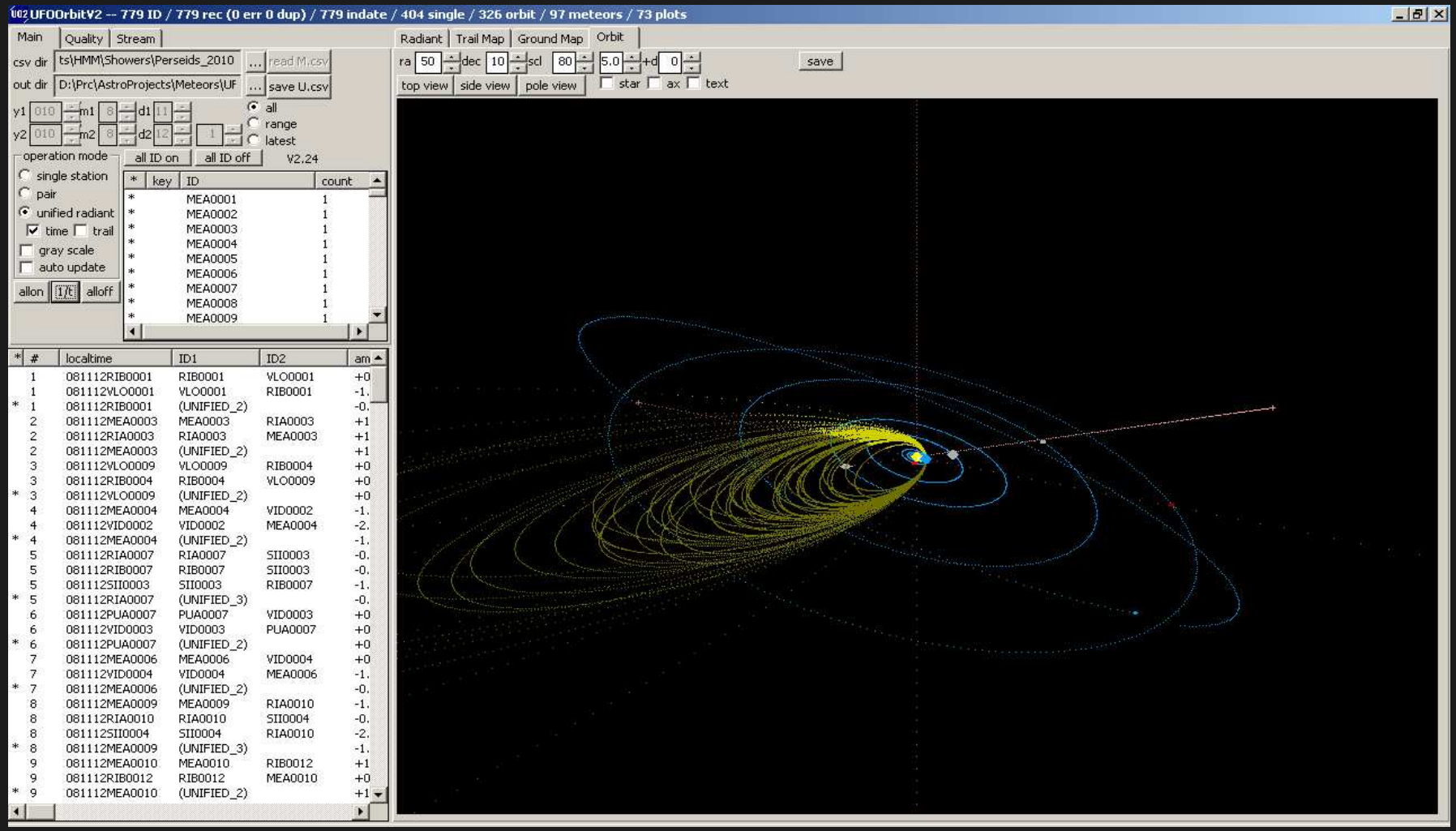
# Introduction : CMN Astrometry



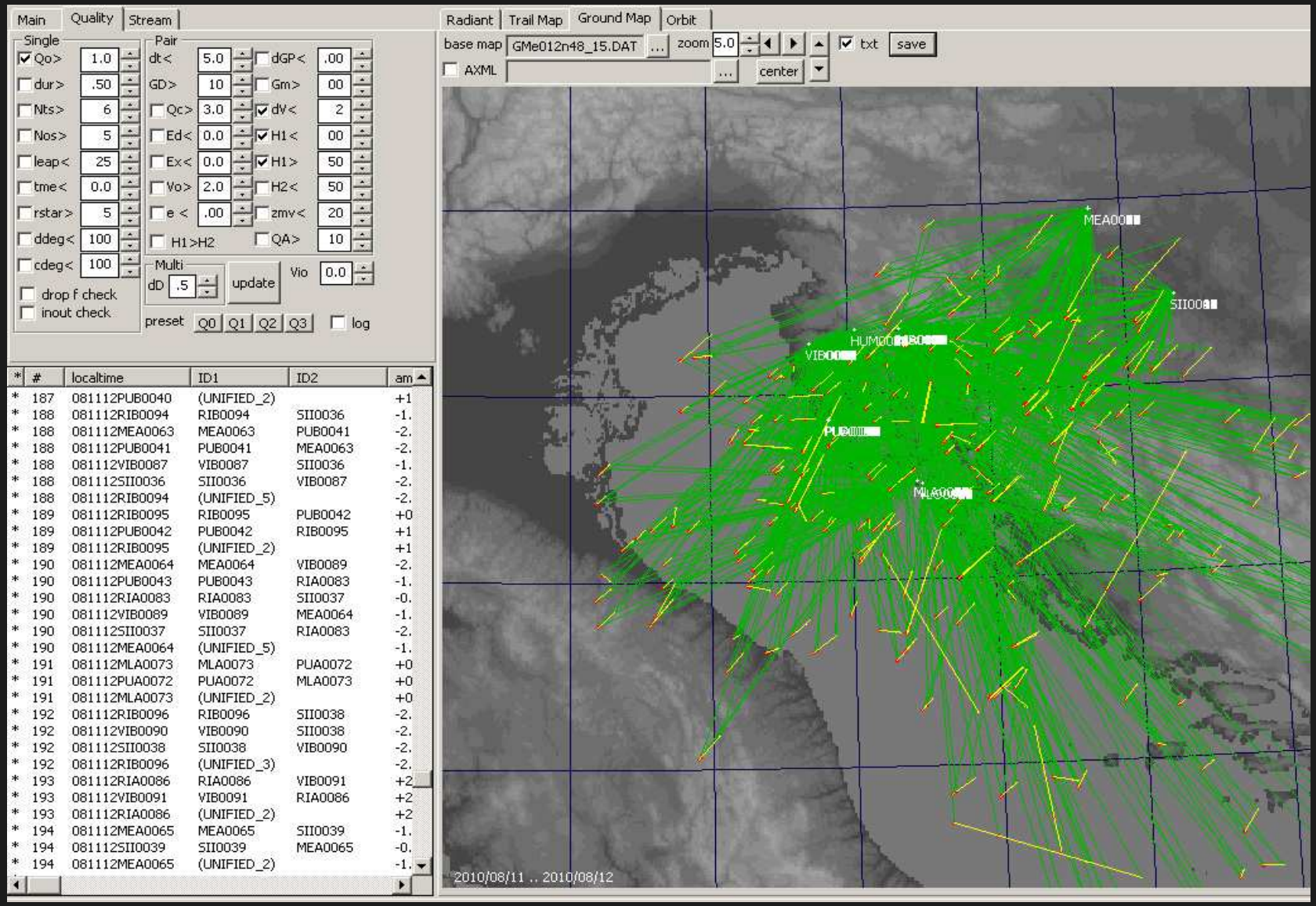
- good FOV calibration, typically 5.000 stars (+15.000) used for calibration
- typical astrometric error: 3-4', FOV calibration re-checking

# Introduction : CMN orbits –> UFOOrbit software



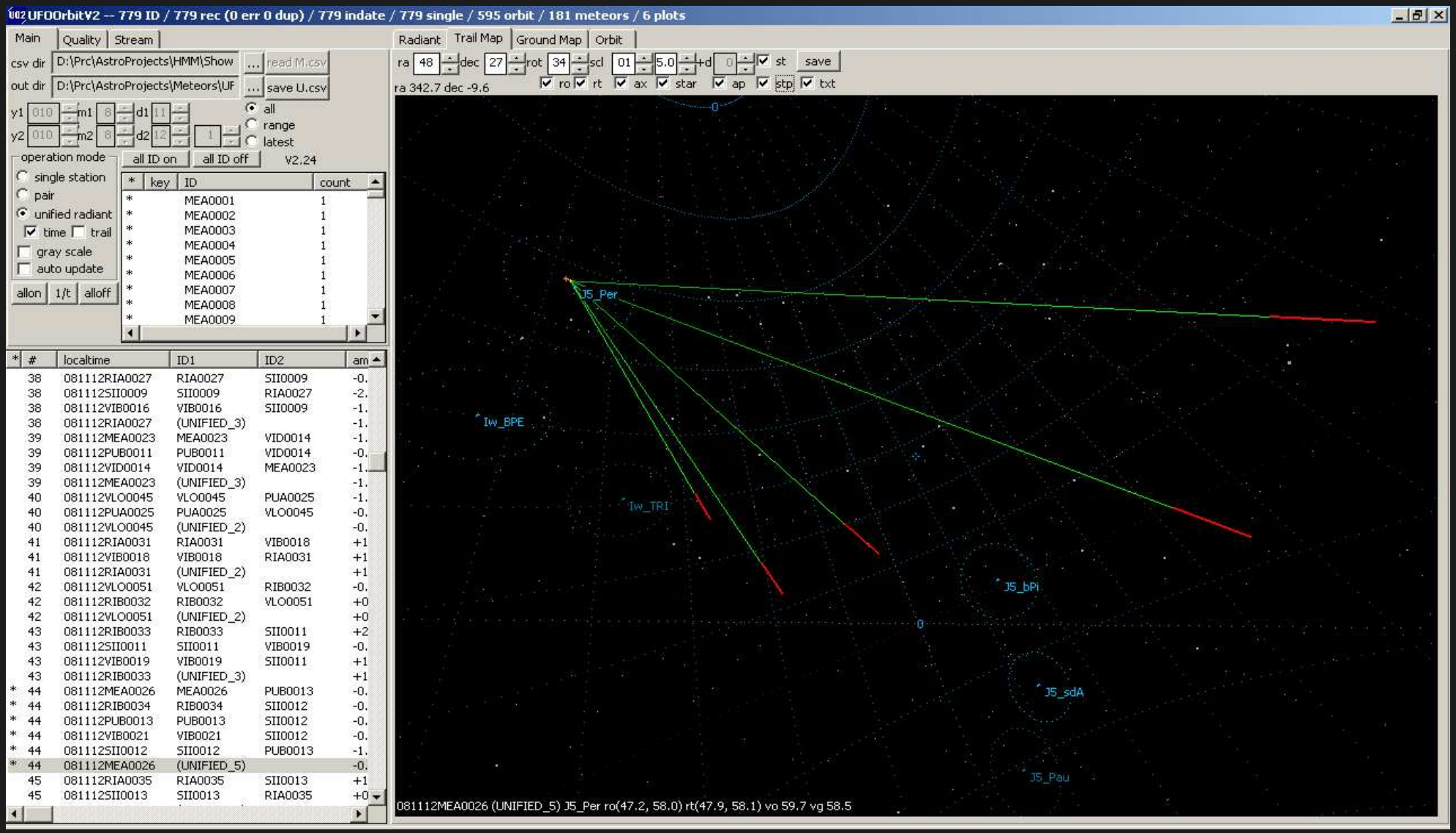

- orbits calculated via UO
- in very good agreement with other networks results (SonotaCo)
- still, unexpected errors in case of bright meteors

# Introduction : CMN multistation meteors - common



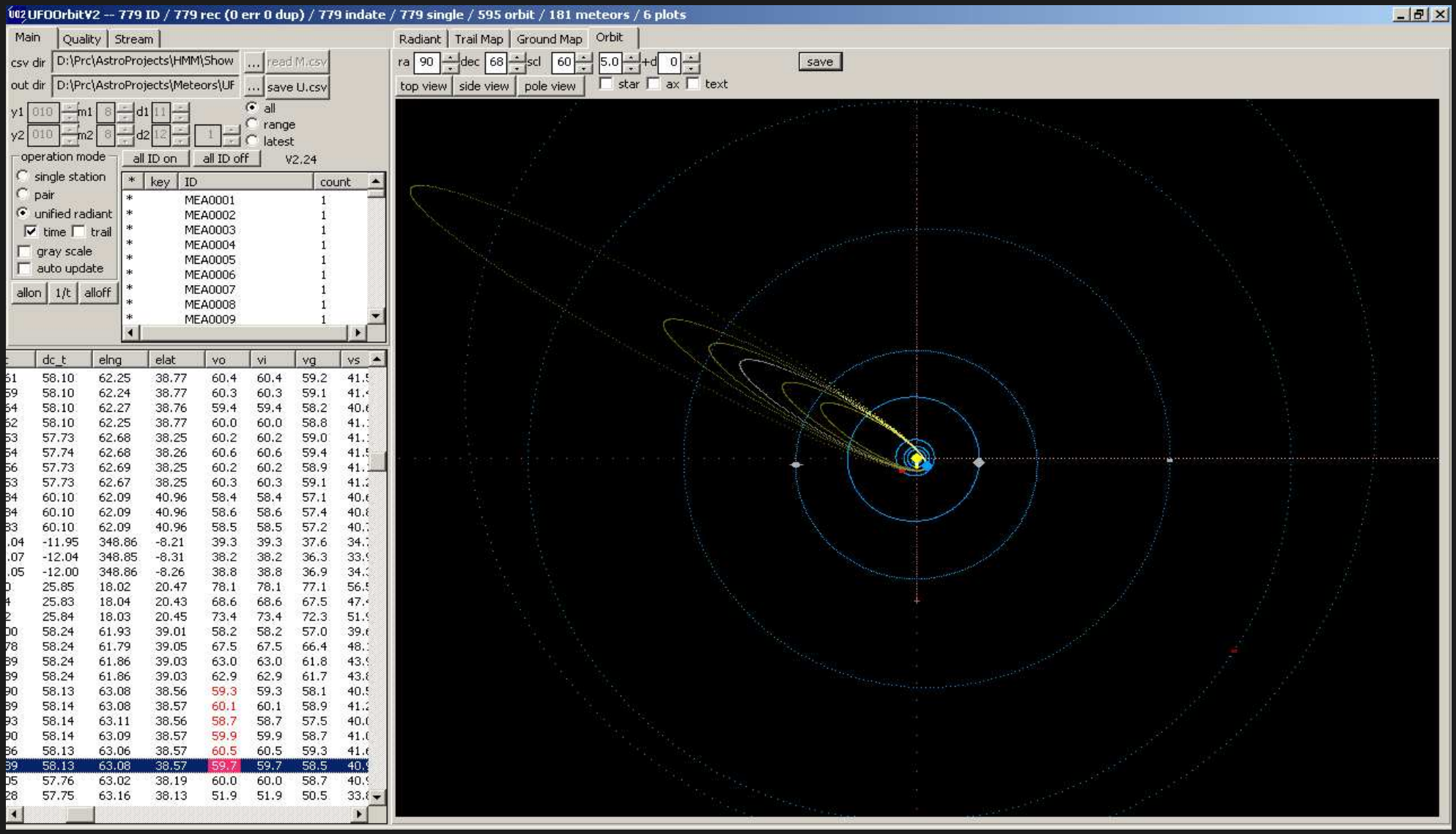

- “High density” sky coverage - multi-station meteors

# Orbit requirements: direction



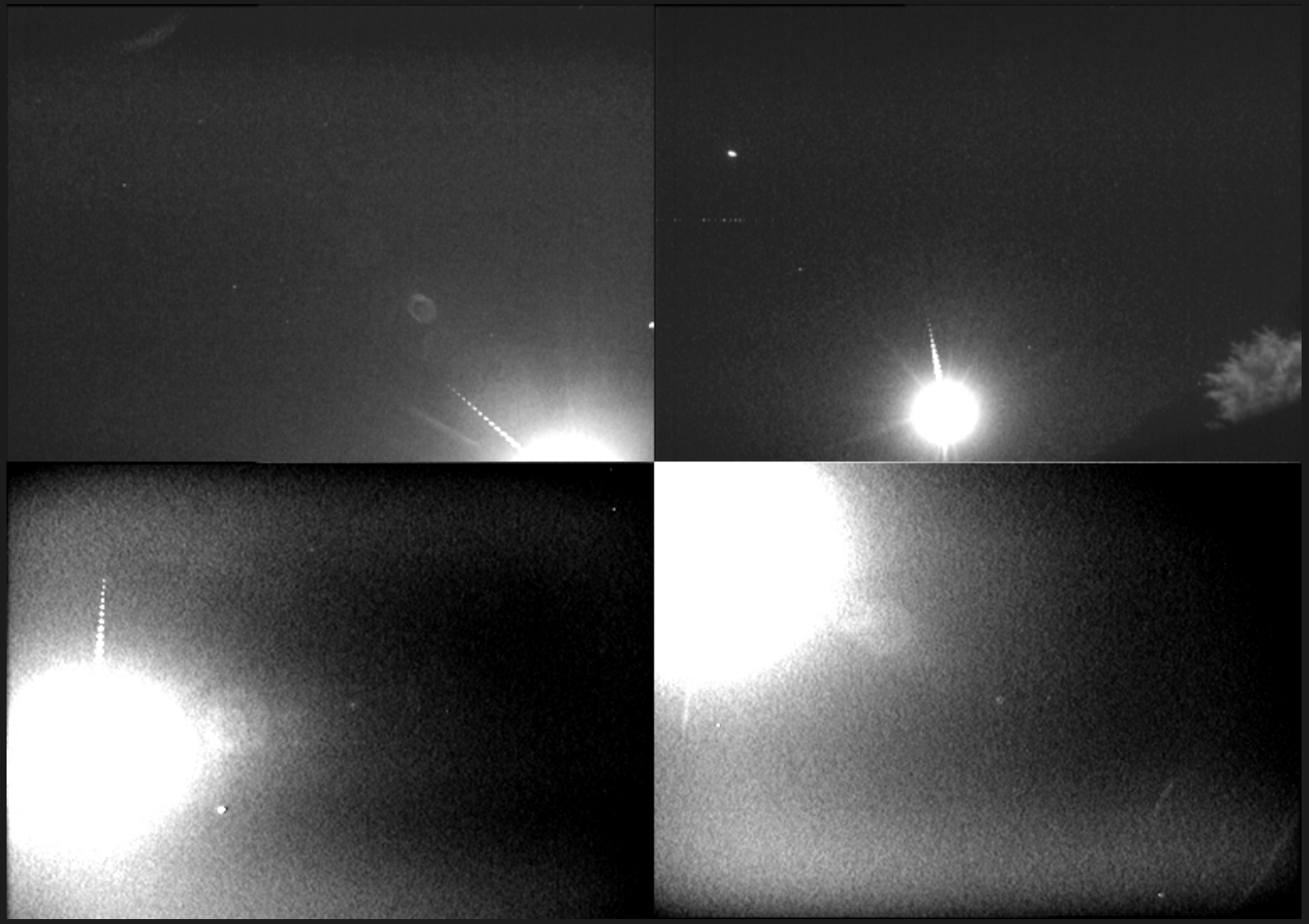

- vector direction (radiant postion) error not critical, if lenght>3 degrees

# Orbit requirements: velocity



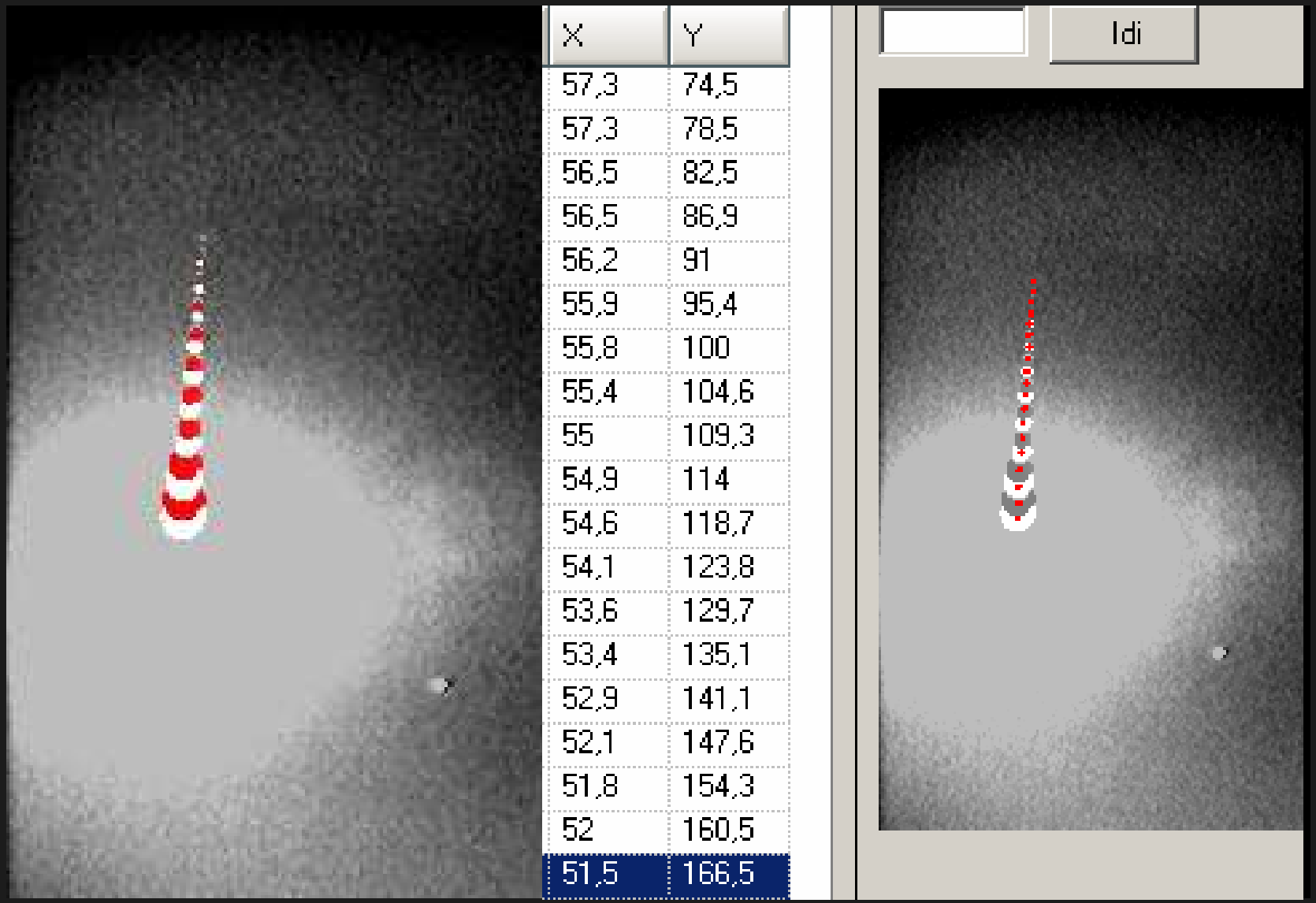

- estimated error of +/-0.5km/s, even bigger in case of bright meteors?

# Bright meteors : What is wrong?



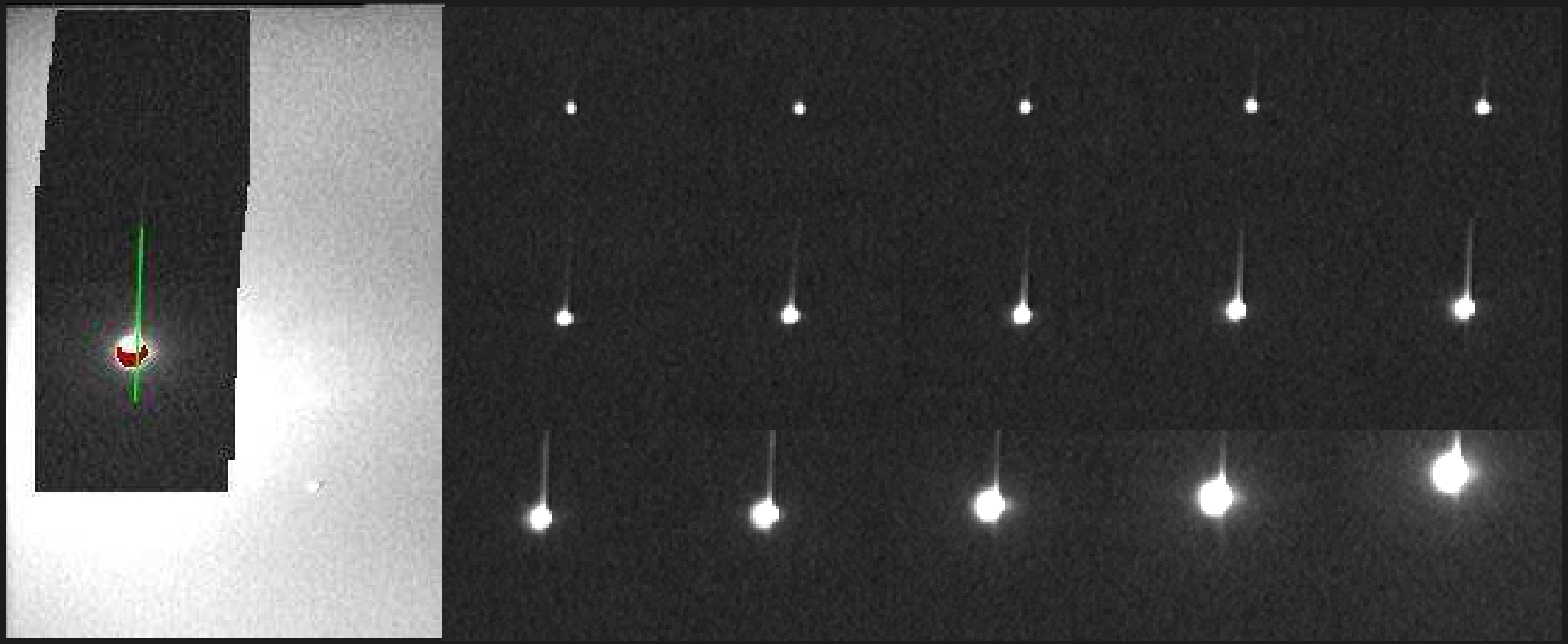
- captured from 7 stations, long enough, good angle
- velocity error larger than for fainter meteors of similar geometry

# Bright meteors : error not due to poor detection quality...



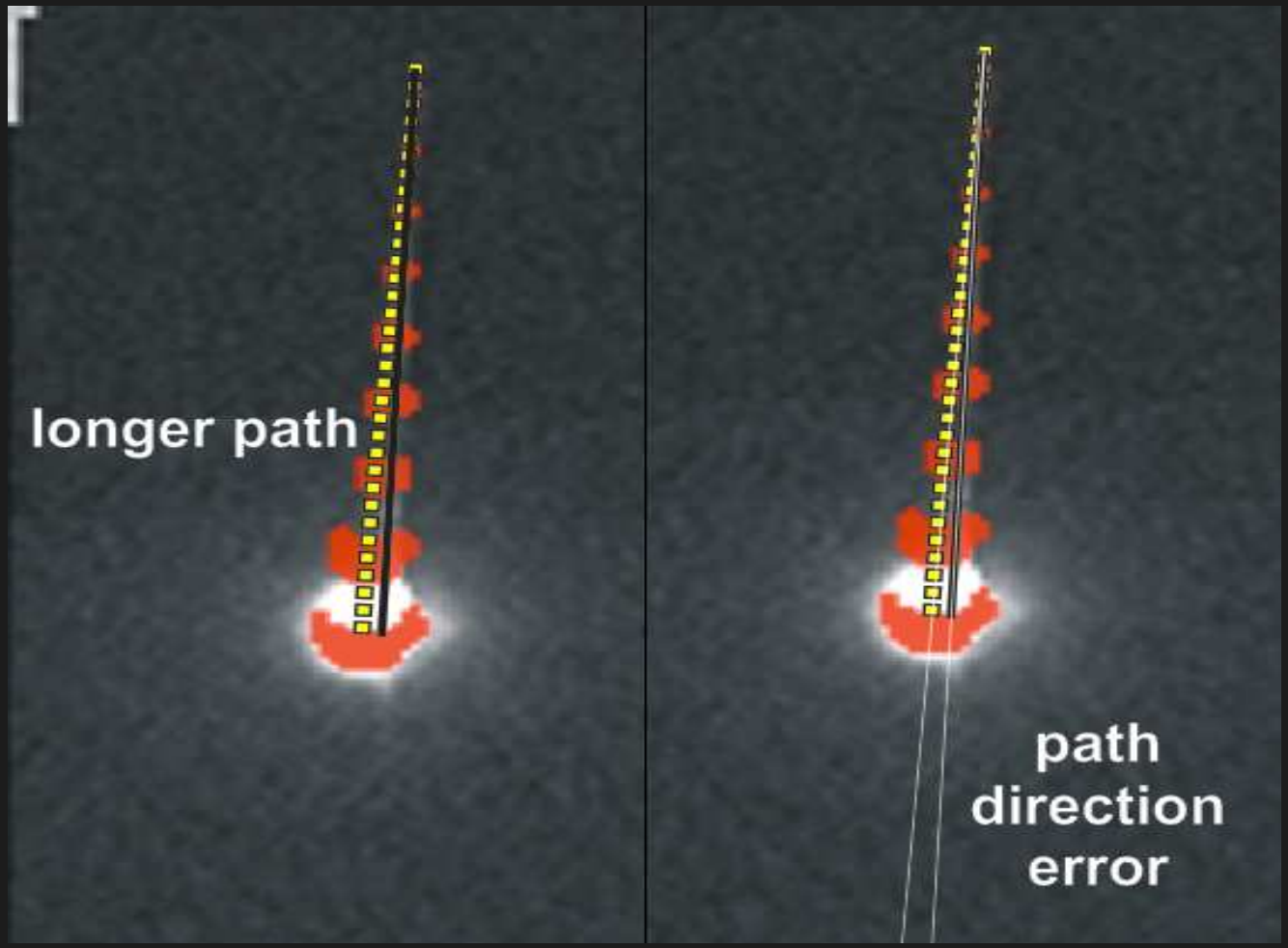

- extracted frames show good centroid positions

# Bright meteors : ... but centroid displacement



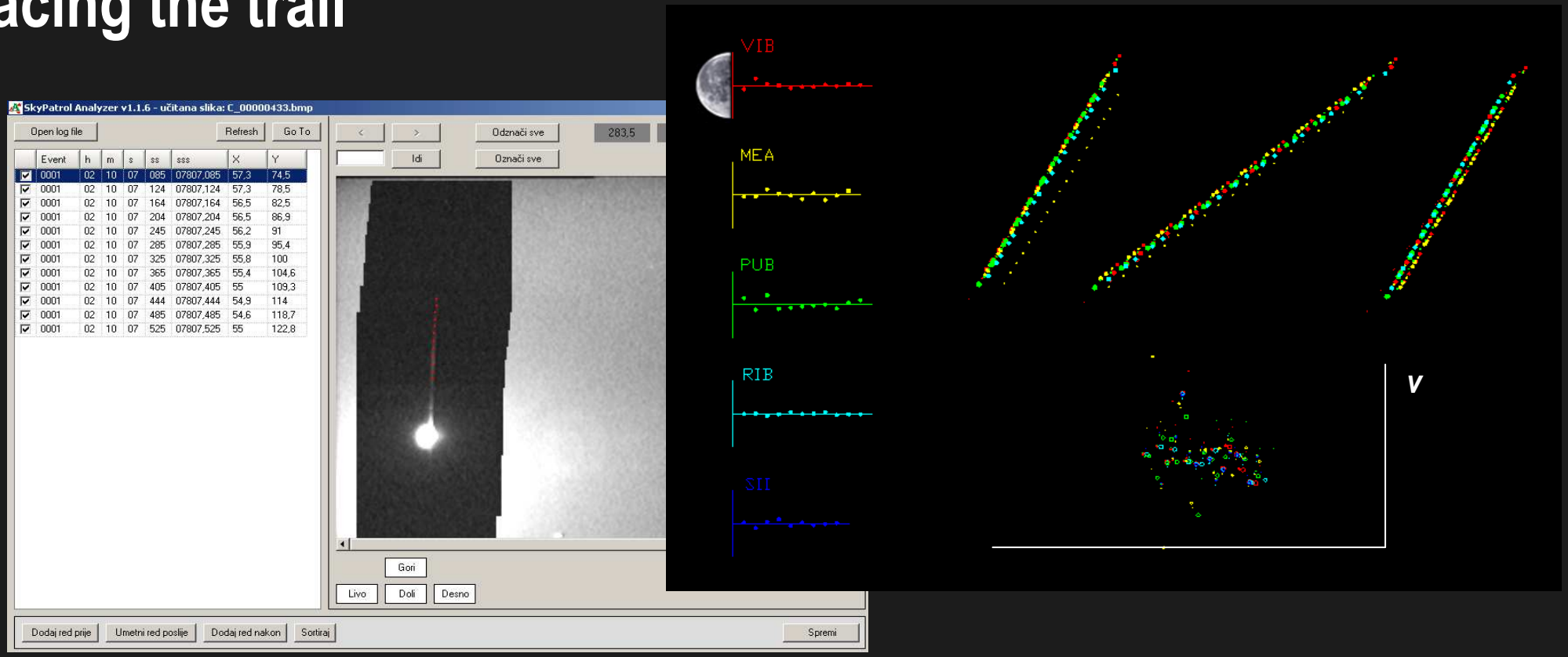
- real meteor path can be seen as meteor trail
- displacement depends on brightness and distance from center
- displacement affects angular speed of “path unaffected” meteors
- caused by optical aberrations in whole (front cover + lens)

# Bright Meteors: this is what is wrong...



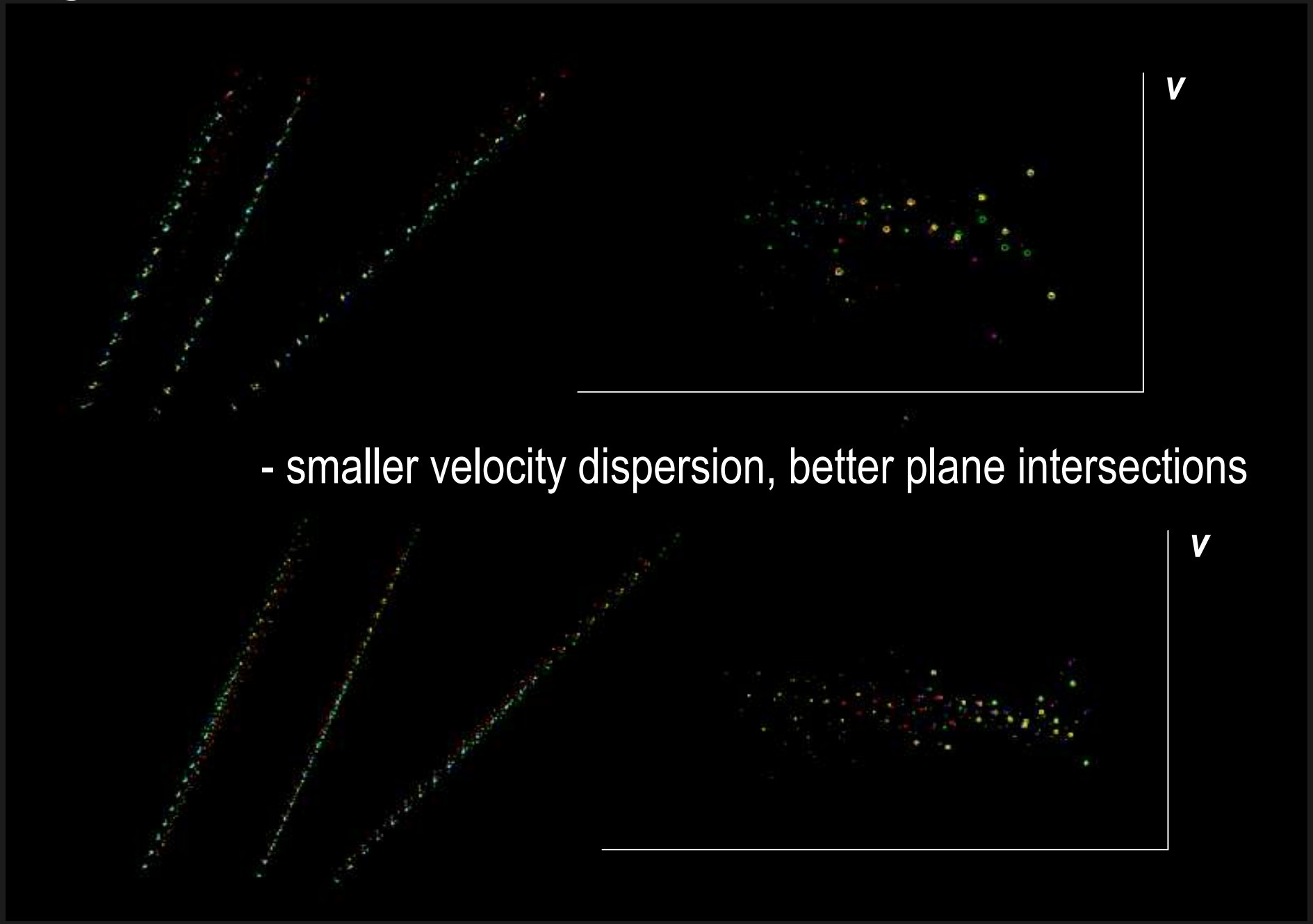

- due to displacement of whole path, larger error in radiant position
- due to “longer path”, meteor results to be faster than it really is

# Tracing the trail



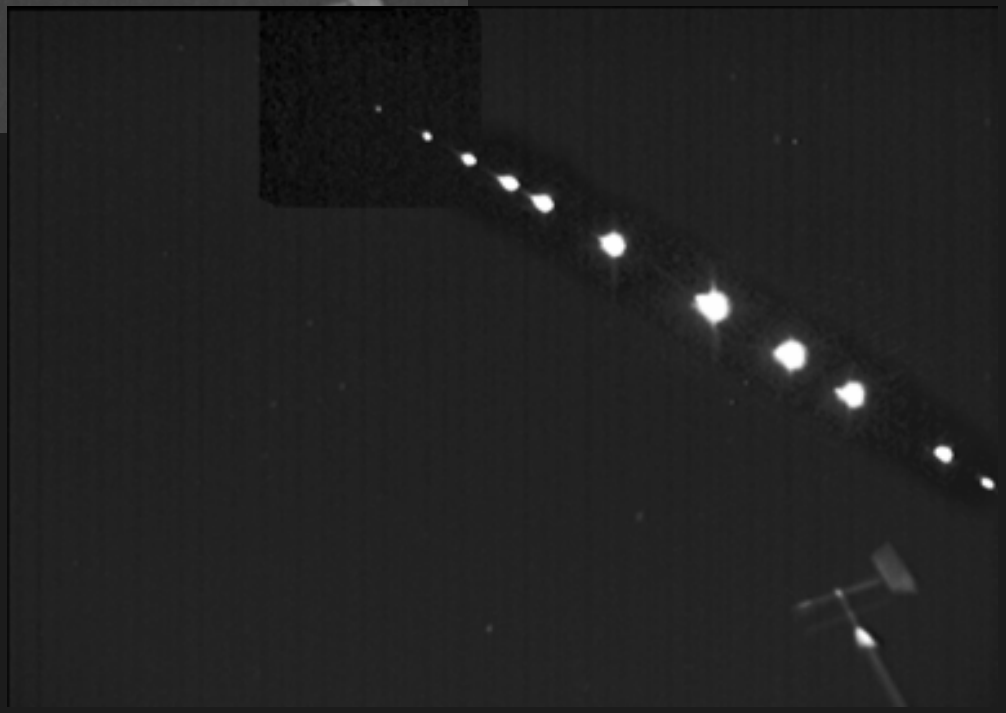

- CMN SkyPatrolAnalyzer software used for correcting displacement by following meteor trail from several frames
- manualy corrected and least-squares adjusted path used as direction, original detections (projected on that same path) for velocity estimation
- new software used for trajectory/velocity calculation (still testing)

# Tracing the trail: fast fireball



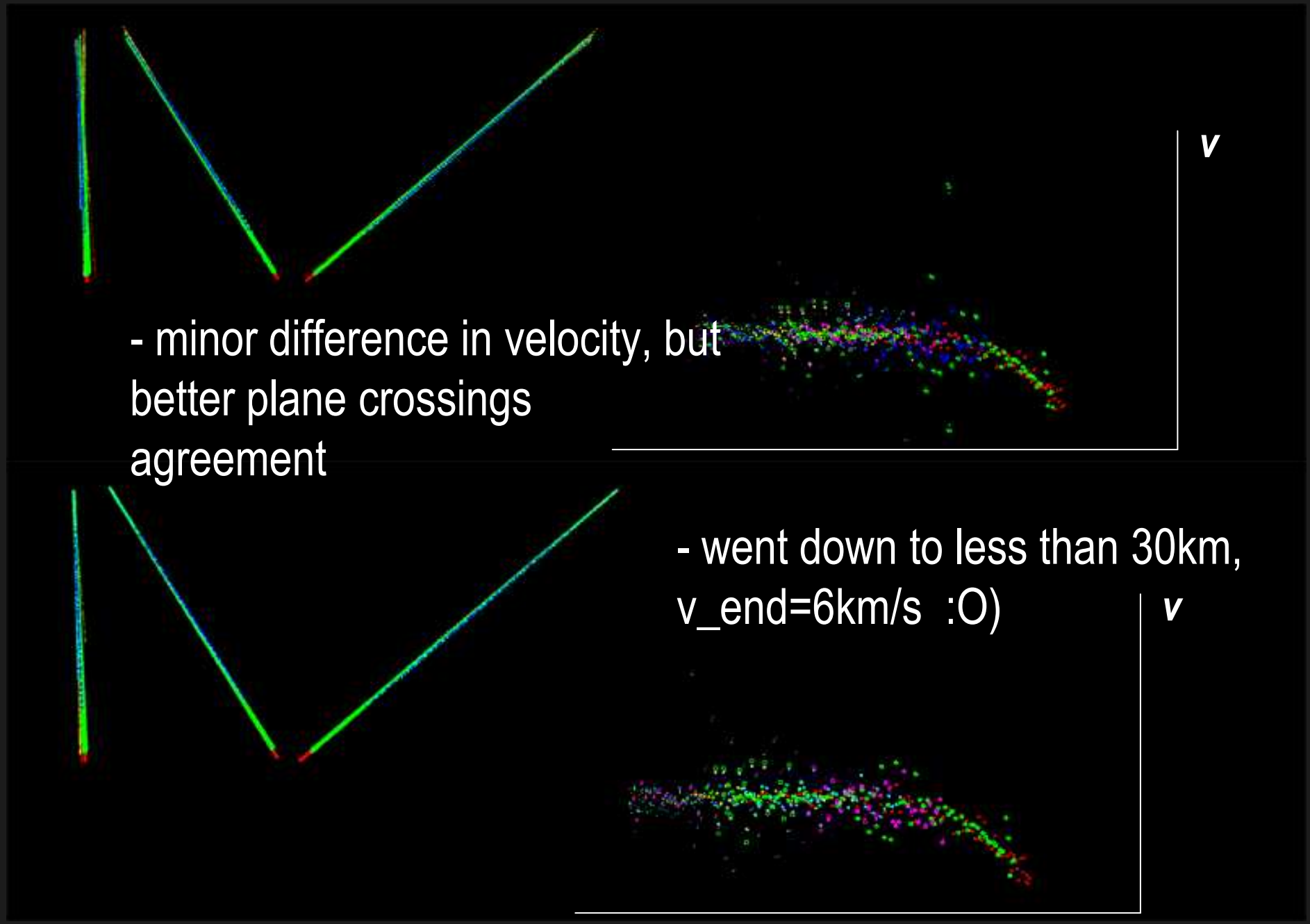
# Tracing the trail : very slow fireball

- lasted more than 4s
- captured from 7 stations



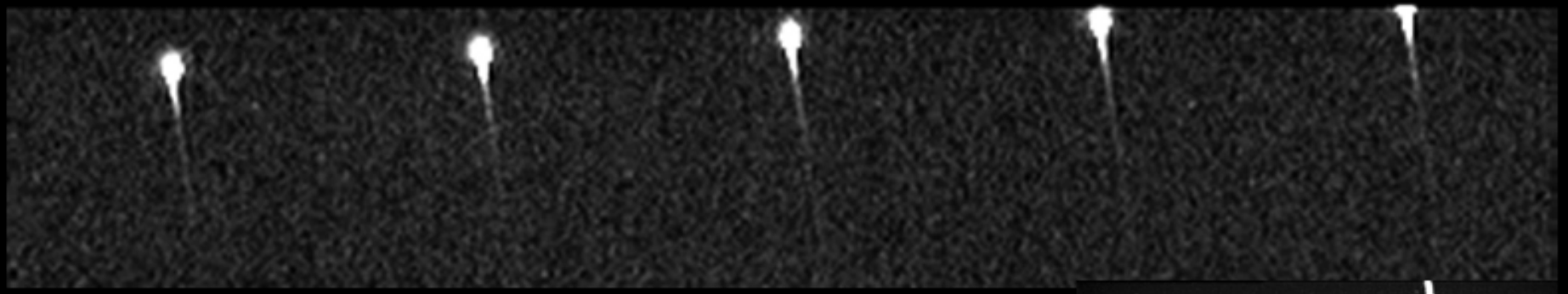
- image used for manual tracing

# Tracing the trail : very slow fireball

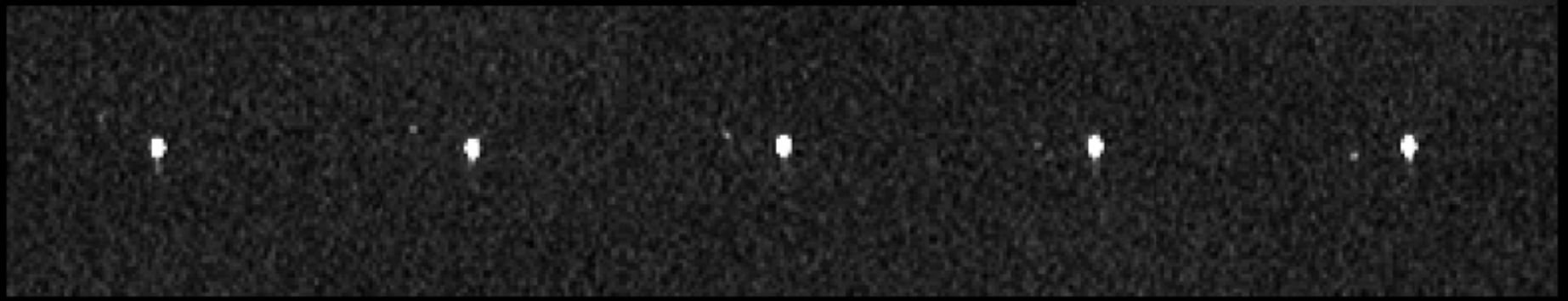


# Where is the limit of displacement's infulence?

- displacement on the edge of FOV



- easily seen on brighter meteors, how about fainter ones?



- displacement on r~ 50% of FOV

# Consequences on resulting orbits
## (if astrometry is done automatically)

- positional error bigger than in case of “ordinary” meteors

- bright meteors tend to result faster than they really are

- responsable for a part of shower meteors on hyperbolic orbits?

# Further investigations (and possible solutions?)

Goals:

- find relation between detection's intensity and displacement
- find up to which level this displacement affects "ordinary" meteors

HOW:

- calibration on stars including intensity
- use planet positions for calibration?
- calibration using artificial stars
- use very bright meteors for calibration

# Conclusions

- in some cases it is possible to do good astrometry on very bright video meteors (at least manually)

- optical system aberrations cause centroid displacement on CMN's video images

- if relation describing this displacement could be found, it could be possible to process very bright meteors automatically, at least with better precision than now

- further investigation will show if not too bright meteors suffer from same problem

# Thank you for your attention!

# Questions?