Simulation of dust tails

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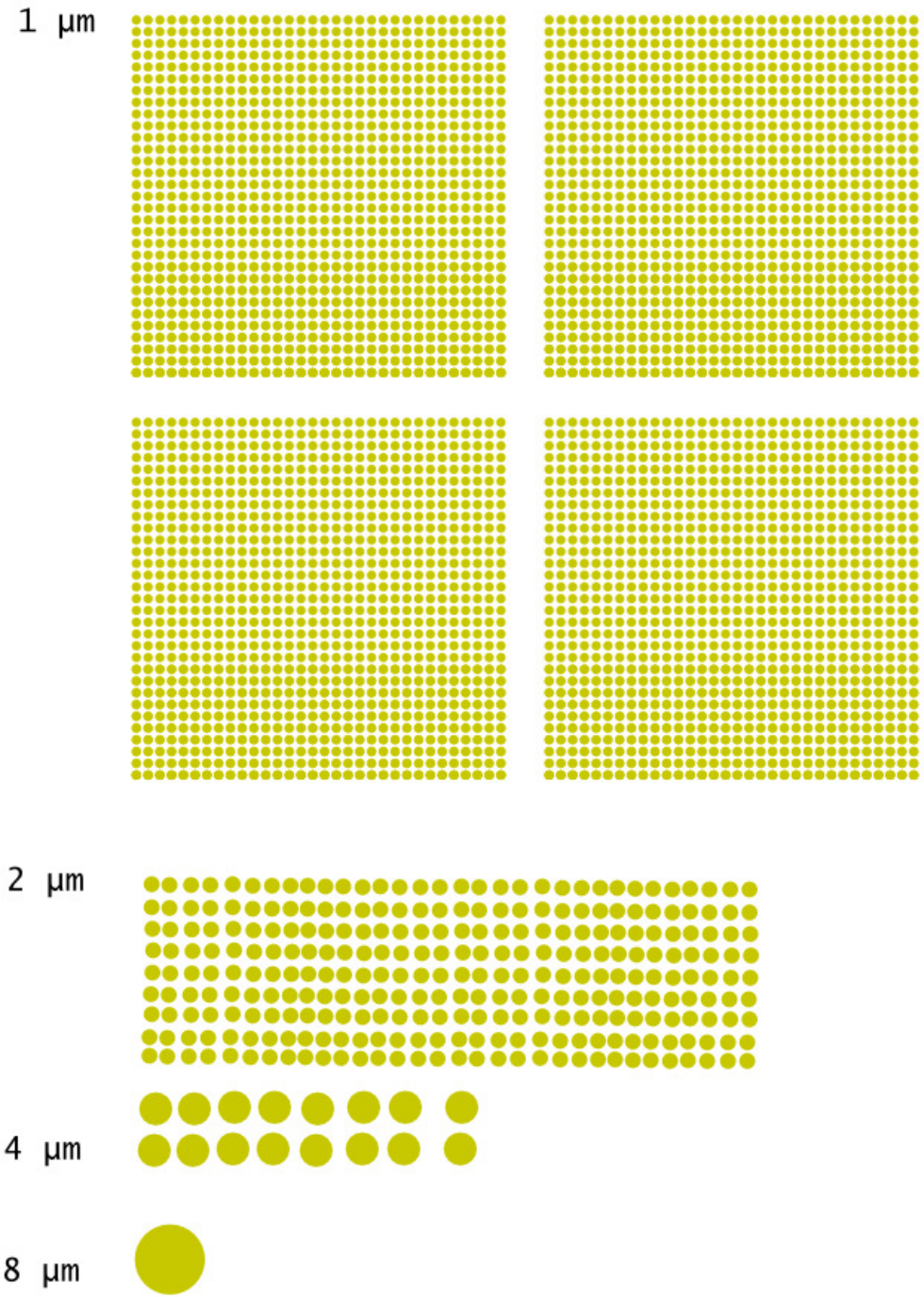
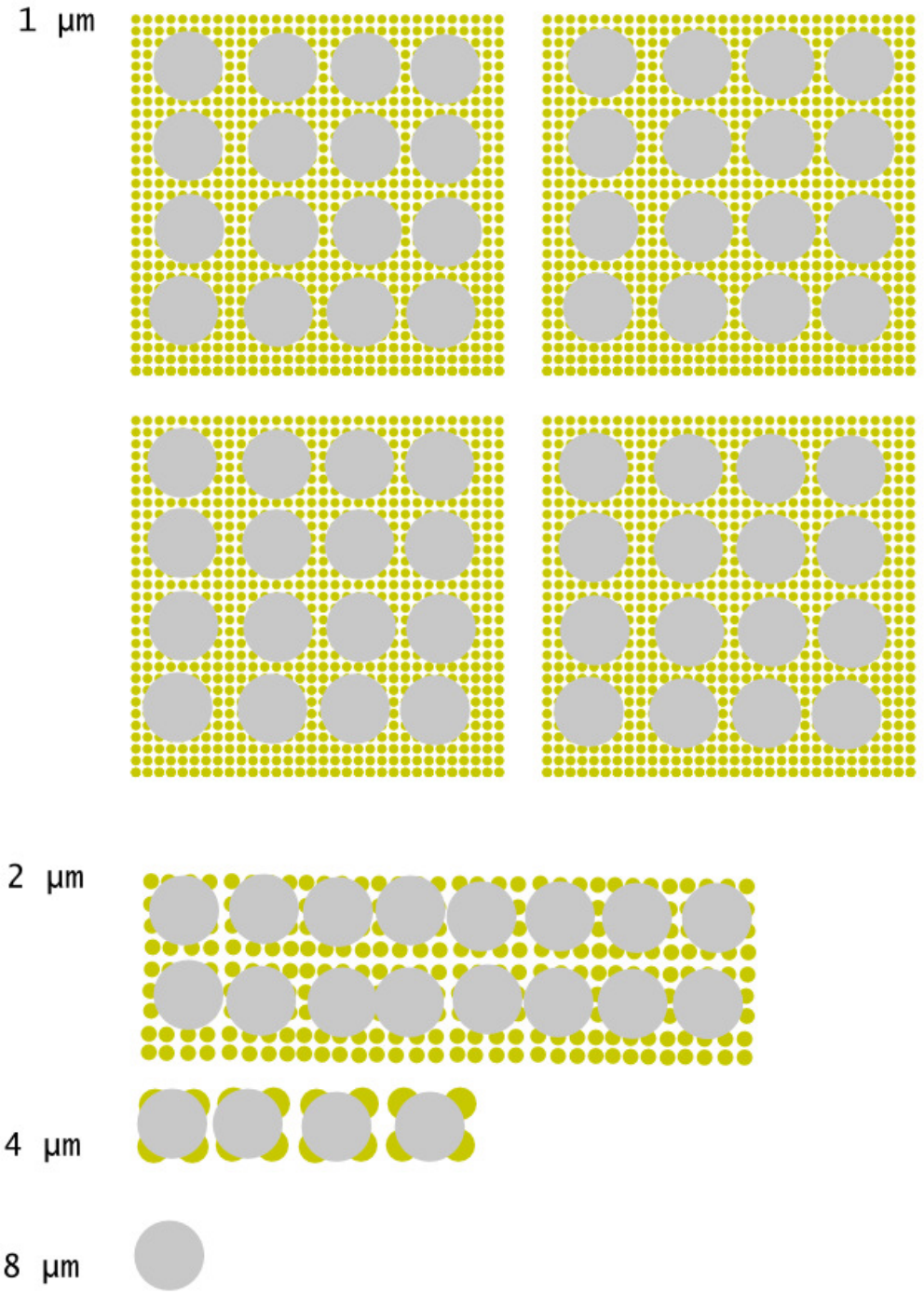
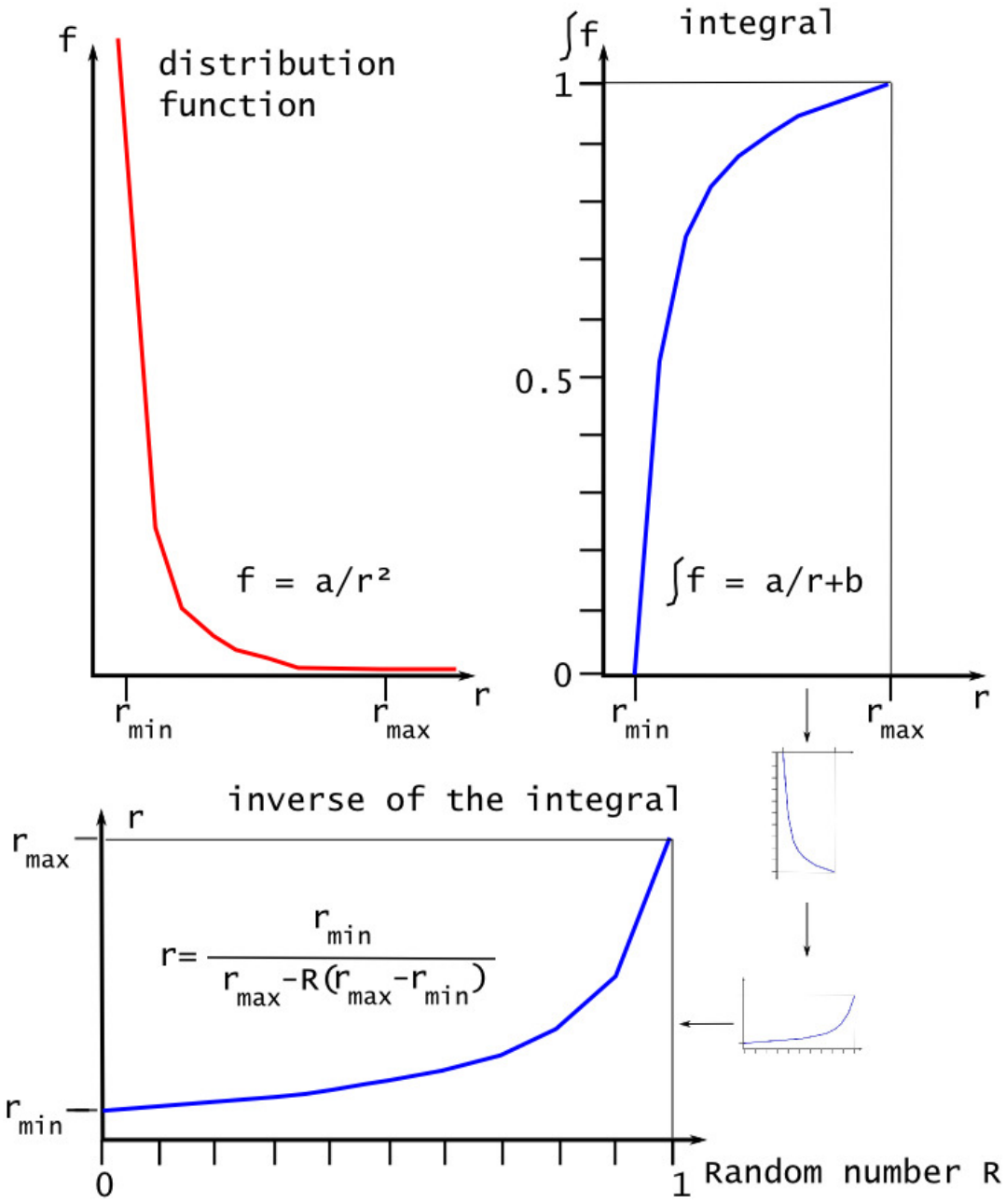


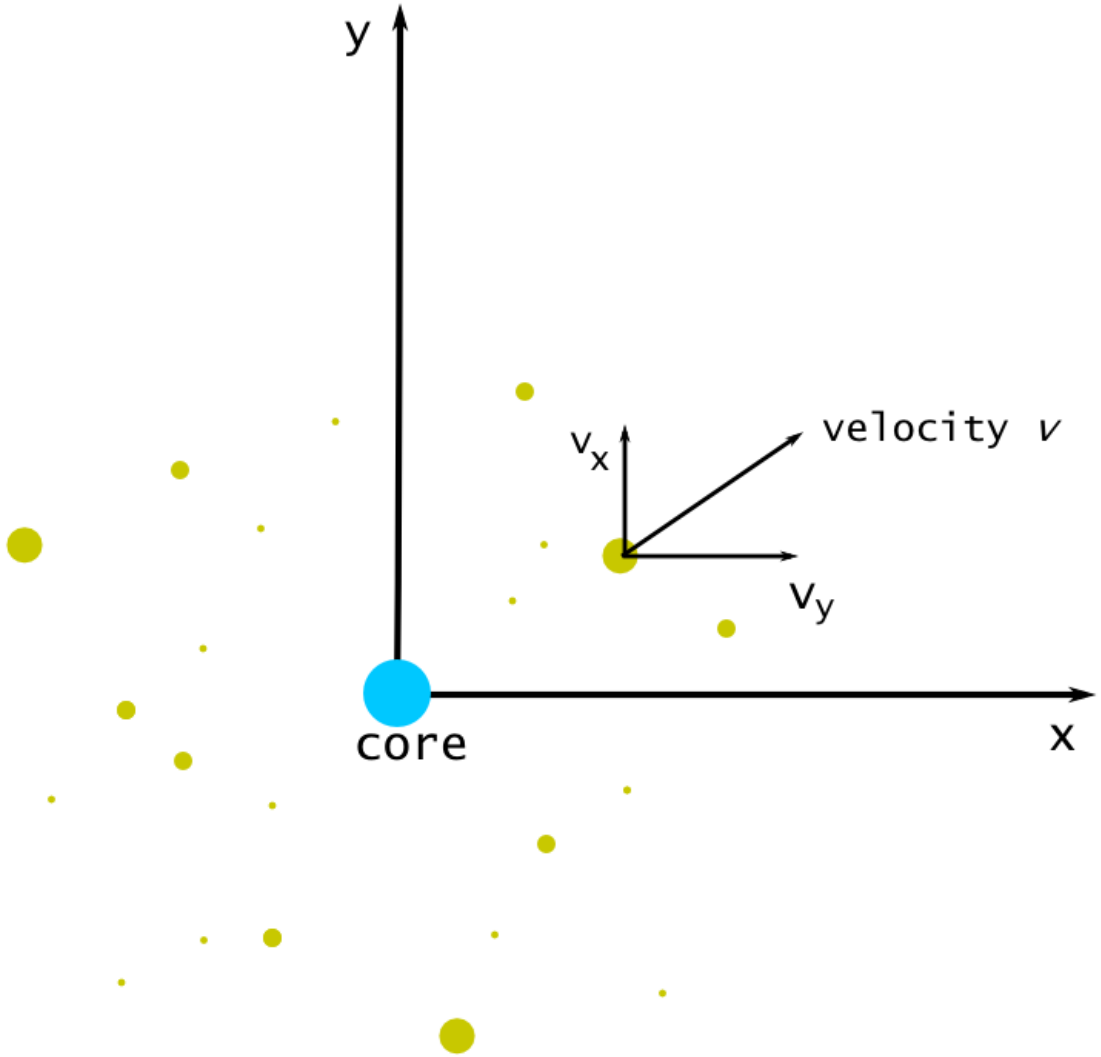
Distribution of particles sizes: 4th power



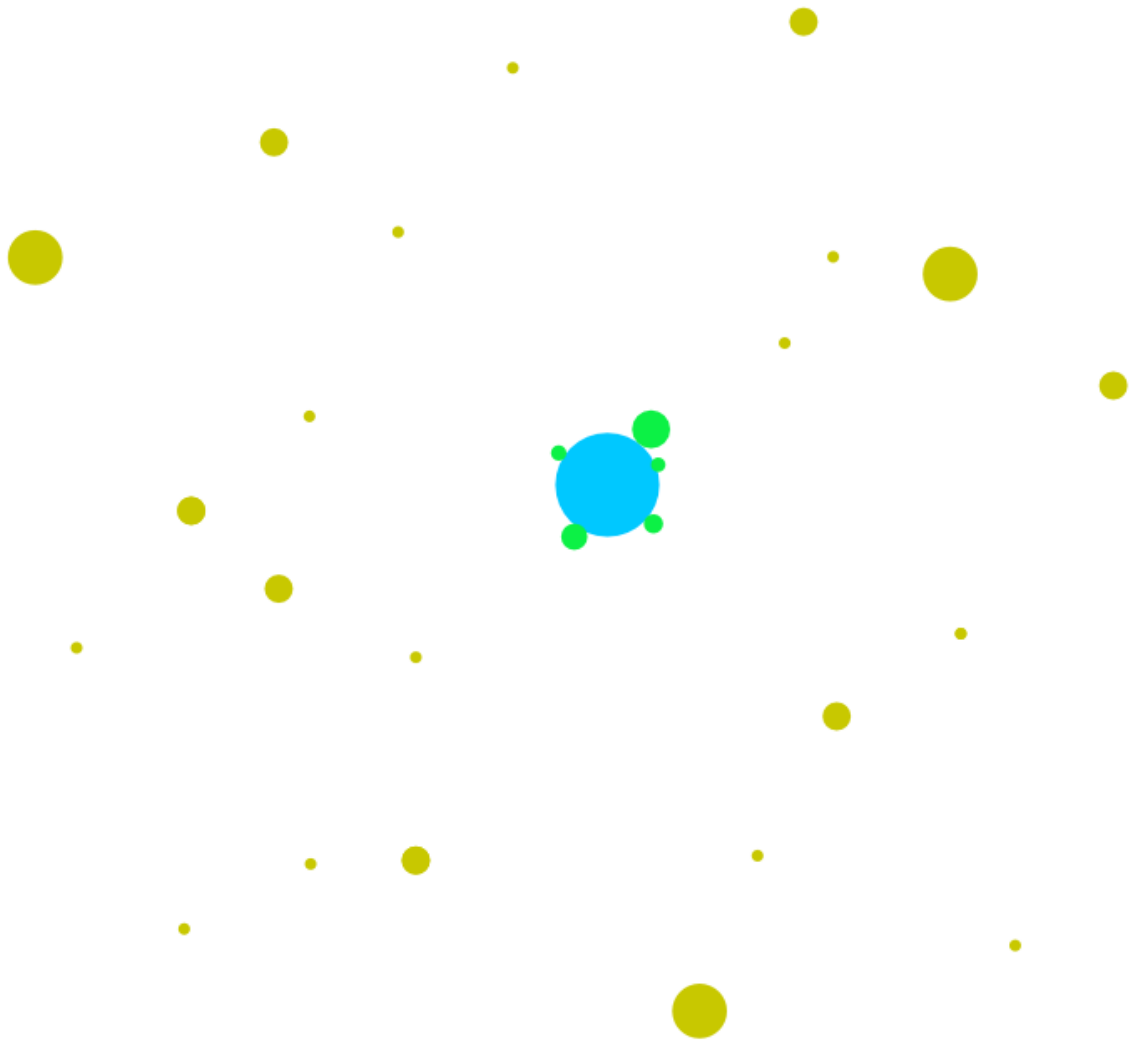
reflection equivalent sizes, 2nd power



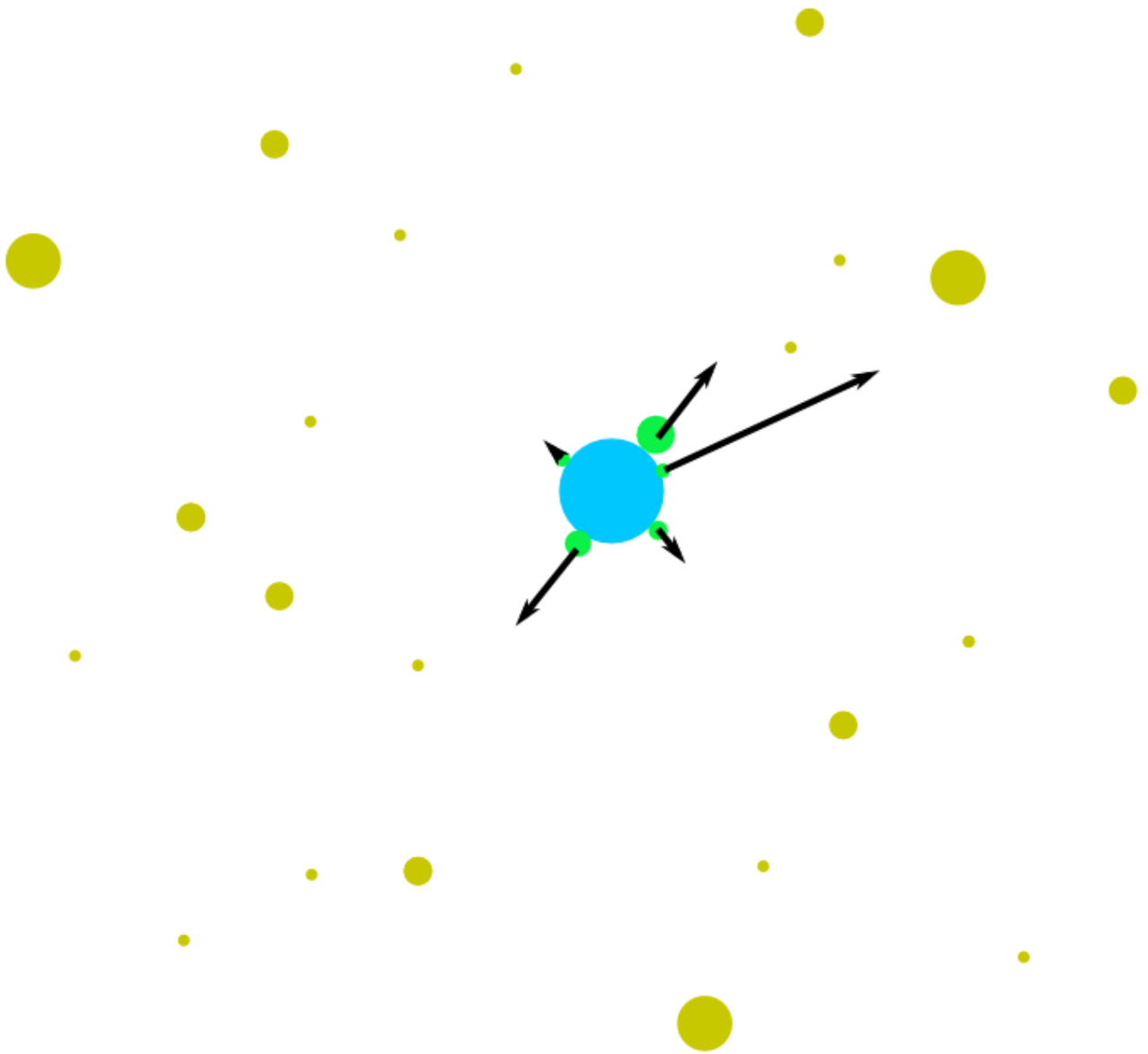
1/r² distributed random numbers



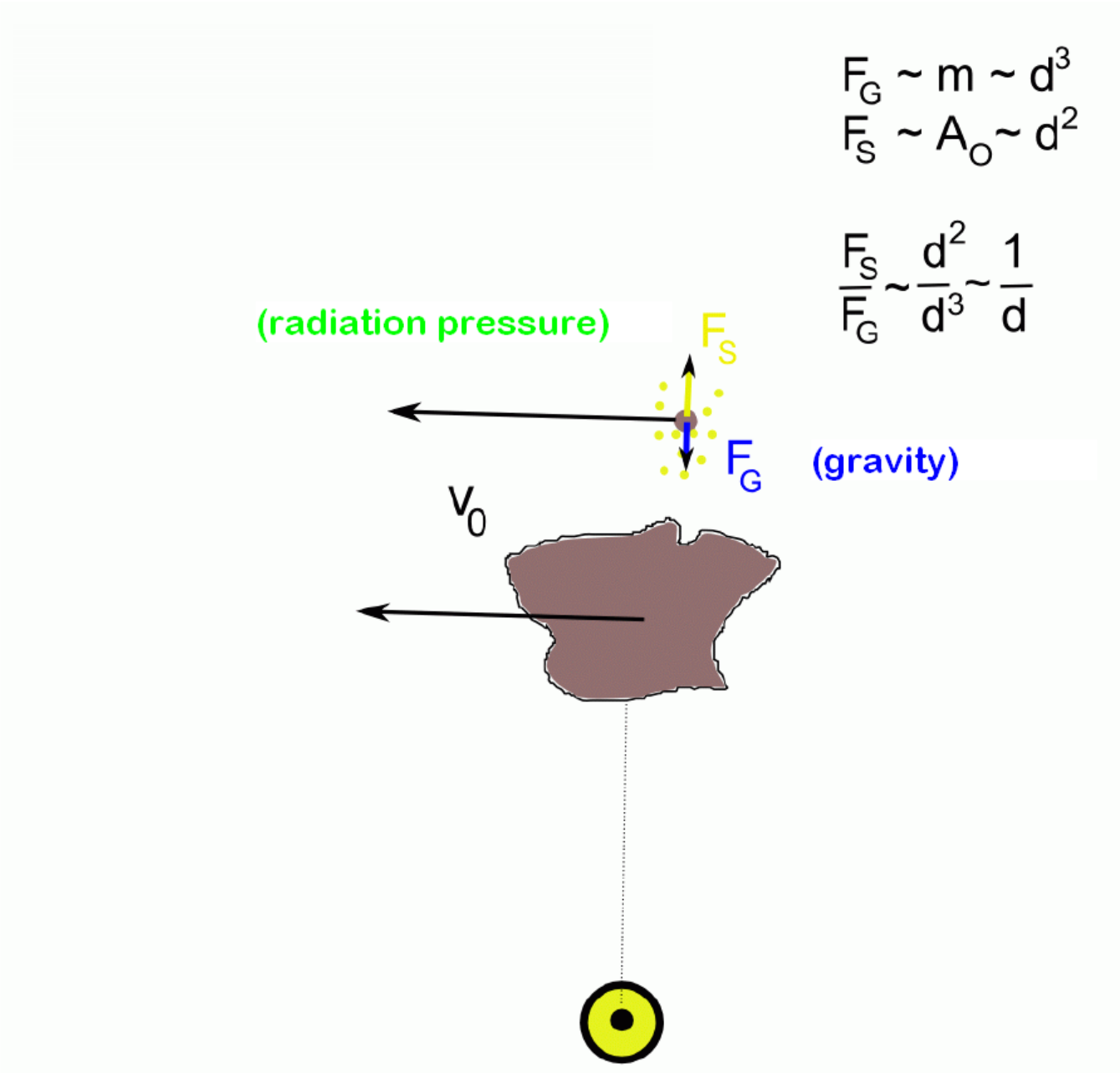
The coordinate system moves with the comet.



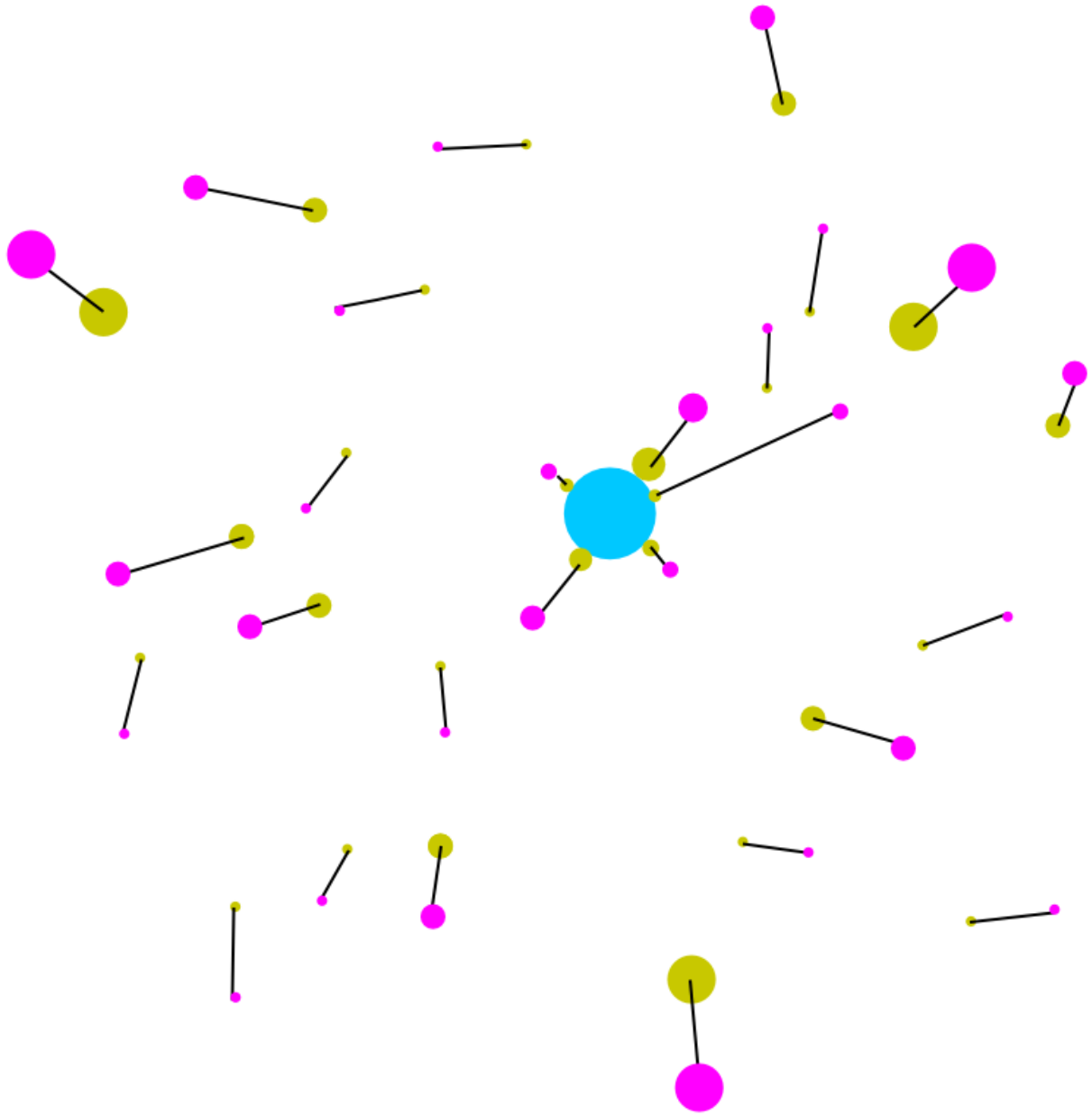
at each time step: 1) generate new particles with the spectrum of sizes



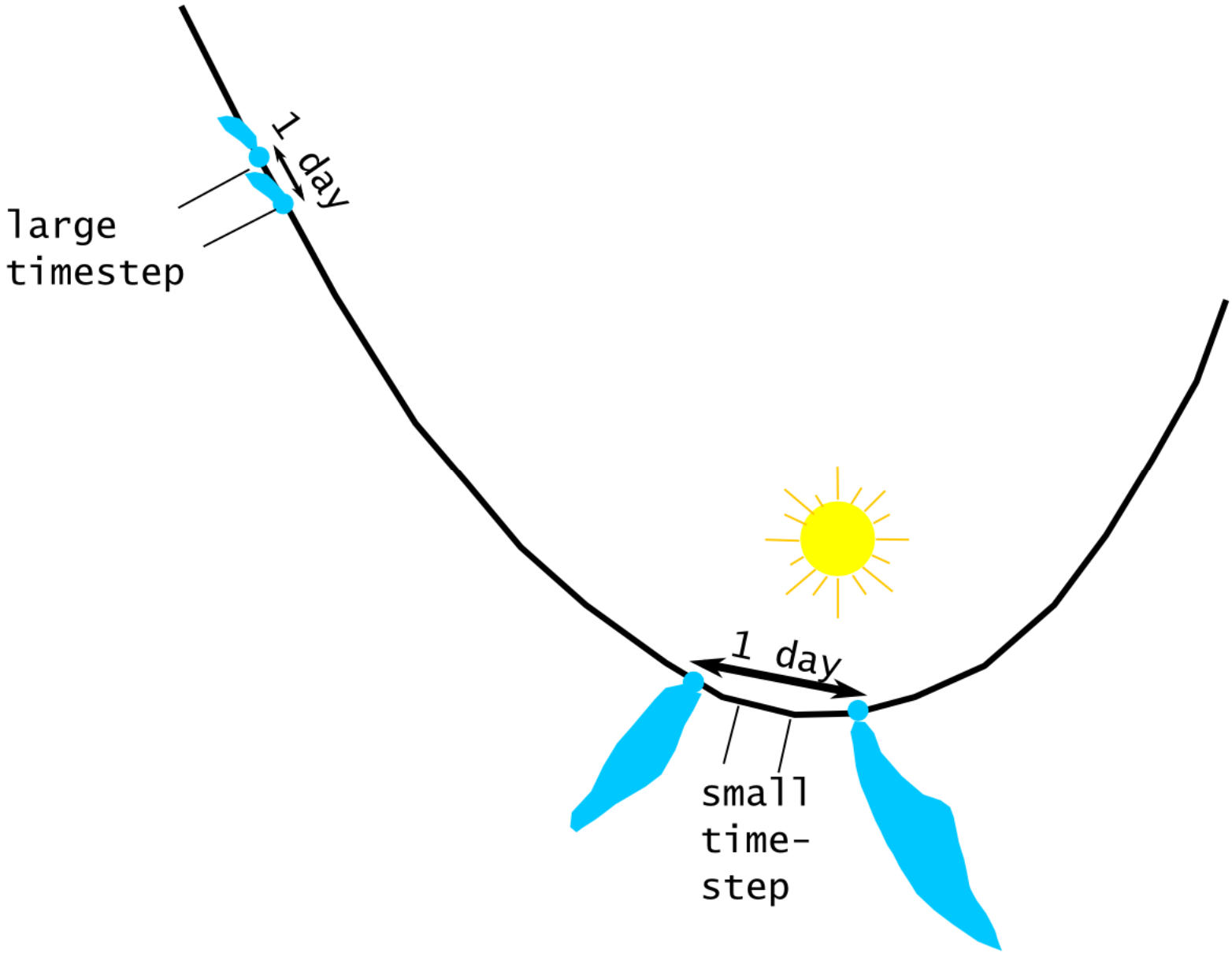
2) Generate velocities in the settled range



3) Calculate forces and accelerations. Smaller particles are faster „blown away“



4) move all particles to their new positions



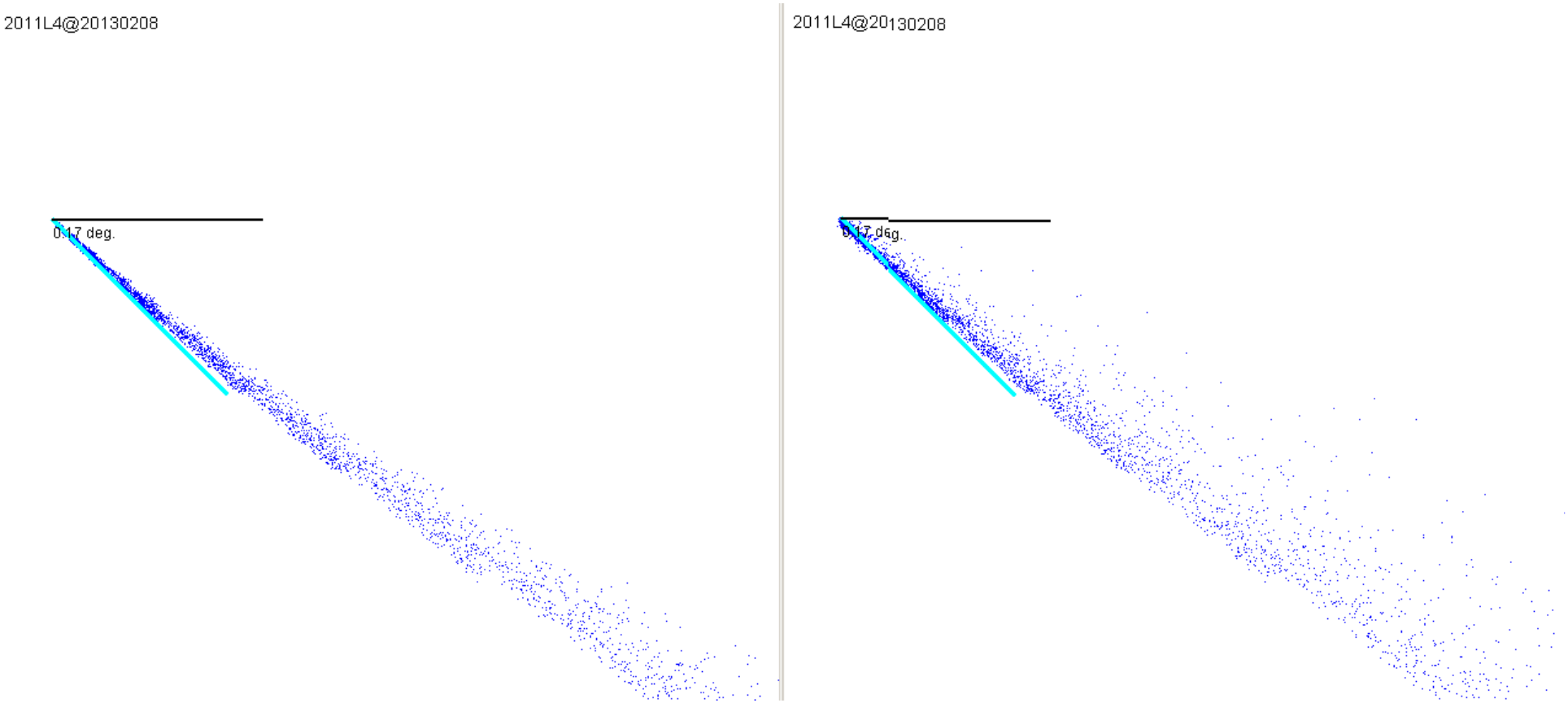
Length of time steps has to be controlled, depends on the position in orbit.

```
Tails of comets, v2.5g
Options, mandatory
  -k comet
  -T <yyyymmdd> calculation to which time
Options for calculation, defaults in []
  -O <file>  orbital elements [c:/guide9/comets.dat]
  -w allow warnings reading ICQ file [disallowed]
  -p lower limit of particle size [0.5]
  -P upper limit for particle size [2.5]
  -d particle size for synDyne. 0=none (narrow syndyne: reduce -v) [0]
  -D fraction of particles which have this size, 0...1 [0.3]
  -c mass production factor of outbursts, 0=none [0]
  -C frequency of outburst in days [1]:
     Leading 00: Irregularely
     Negative (_): Single synchrone xx days before destination time
  -N number of particles per megaton dust [10]
  -n max. difference in anomaly for a time step in degree (1)
  -L duration of Life for a particle in days [10]
  -t simulated period in days [100]
  -1 Comet generates dust only during the first day (only one synchrone) [OFF]
  -v set starting velocity for particles in km/s [0.3]
  -m NNNppPPNNNppPP... multiple Syndynes. Given pp/PP has to be 10x
Options for graphics/display:
  -W width  of window [800]
  -H height of window [600]
  -x origo x for orbital plane [1/4 -W]
  -y origo y for orbital plane [1/4 -H]
  -X origo x for geocentric plane [1/2 -W]
  -Y origo y for geocentric plane [1/2 -H]
  -s scale for orbital plane in px per Mio km [10]
  -S scale for geocentric plane in px per degree [15]
  -b scale bar for orbital plane in Mio km [10]
  -B scale bar for geocentric plane in degree [1]
  -I length of the suggested ion tail [1]
  -o enable output for orbital plane [disabled]
  -M enable progess messages [disabled]
```

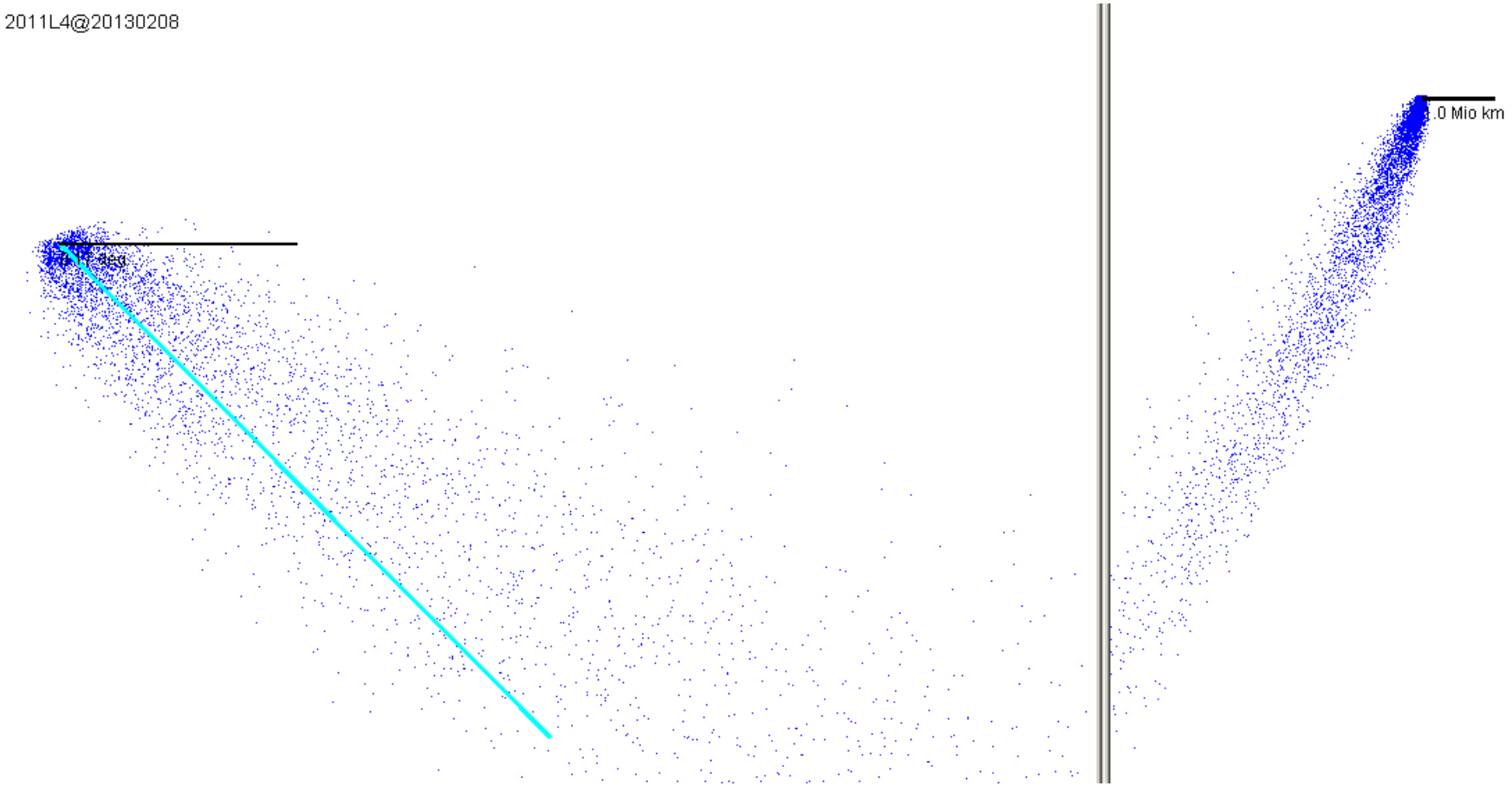
Again a command line application

- the comet; the time
- range of particle sizes
- max. emitting velocity of particles
- duration of life for particles
- difference of true anomaly per time step

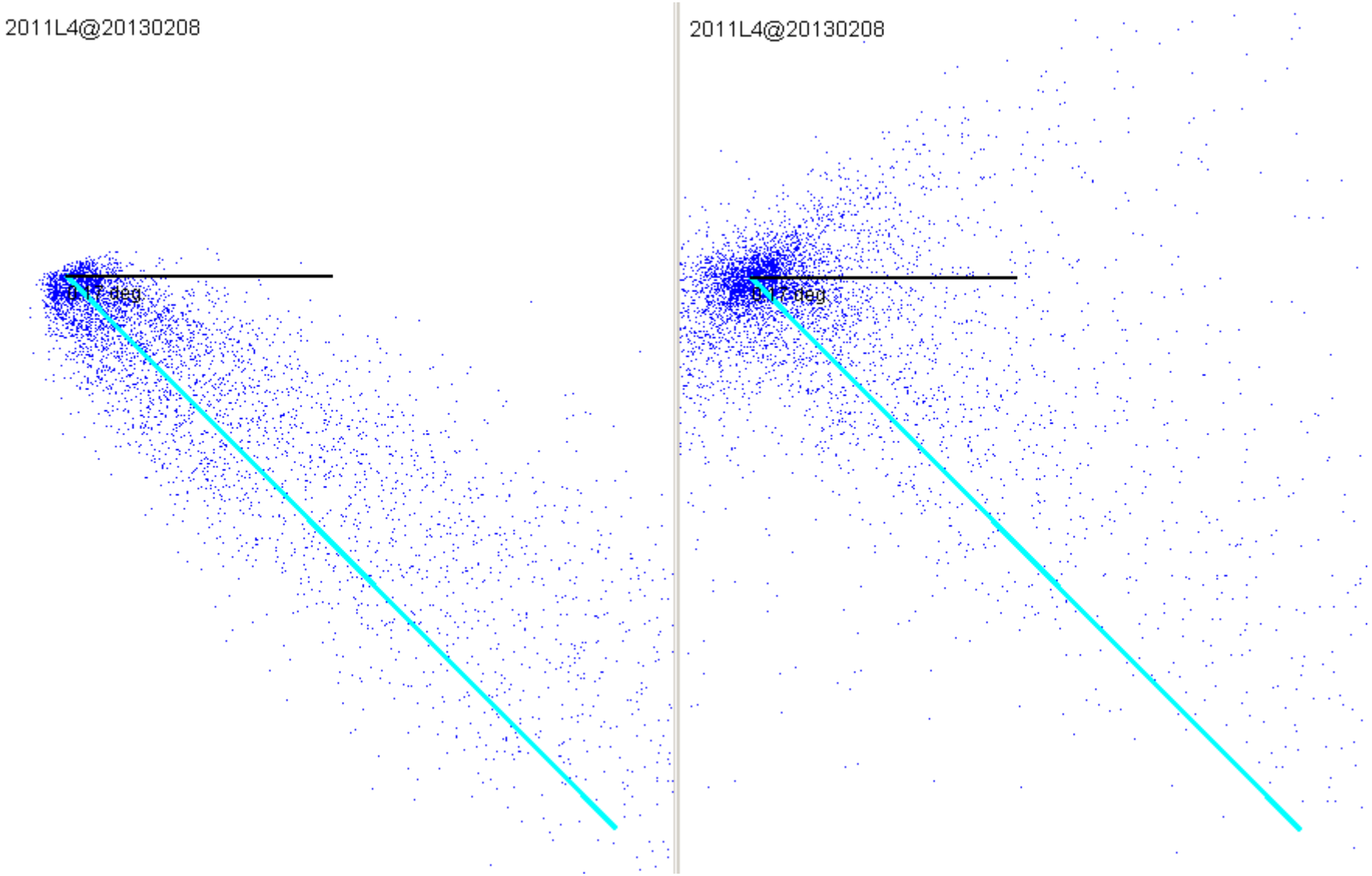
Parameters for calculation



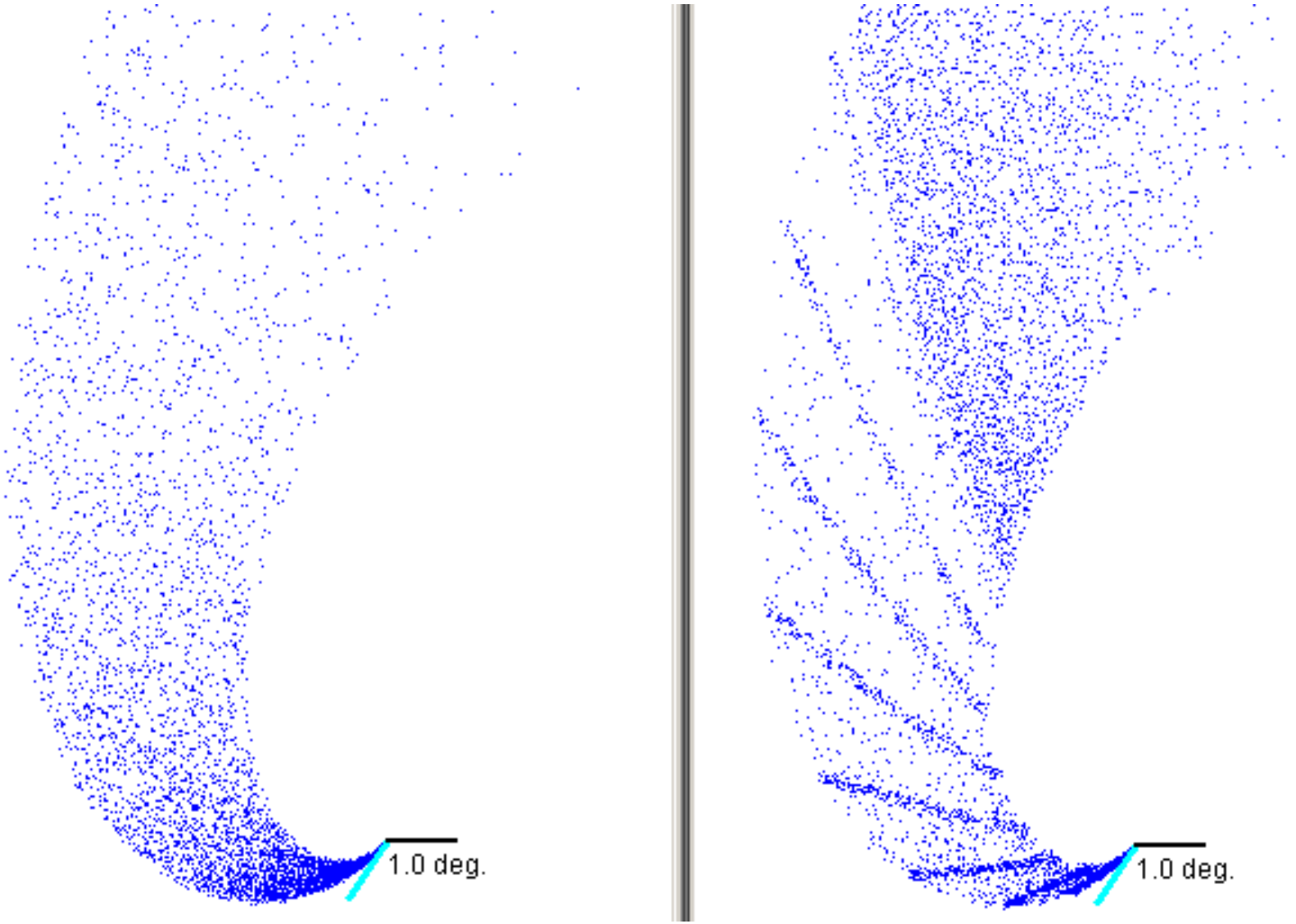
More large particles



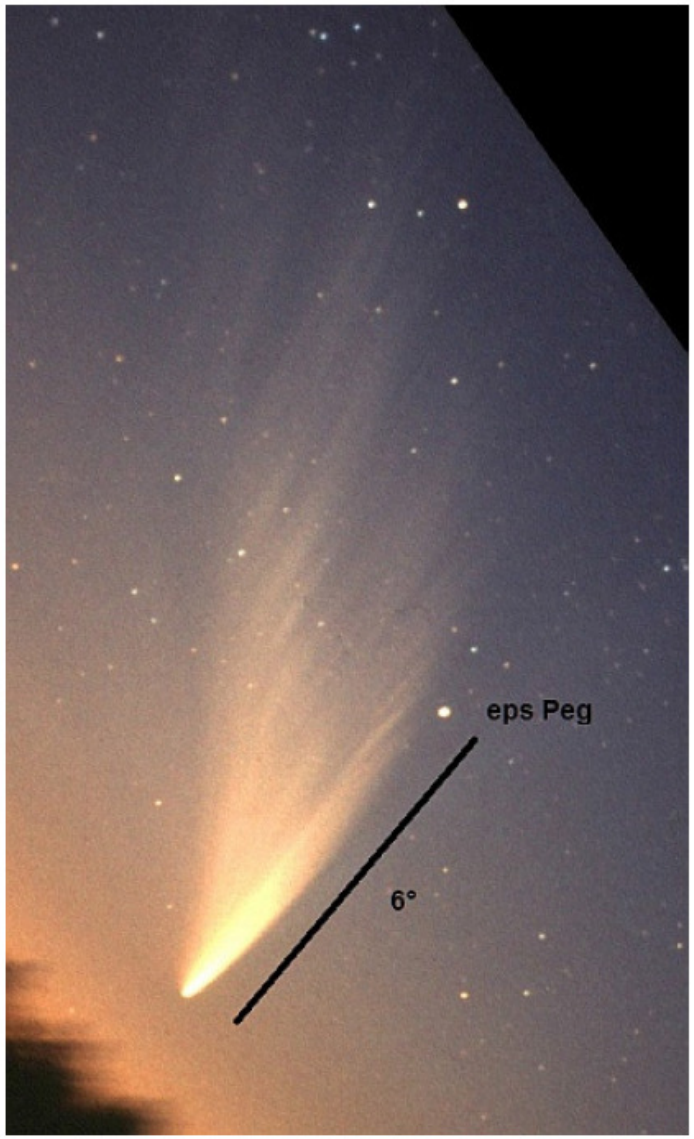
What happens in the orbital plane?

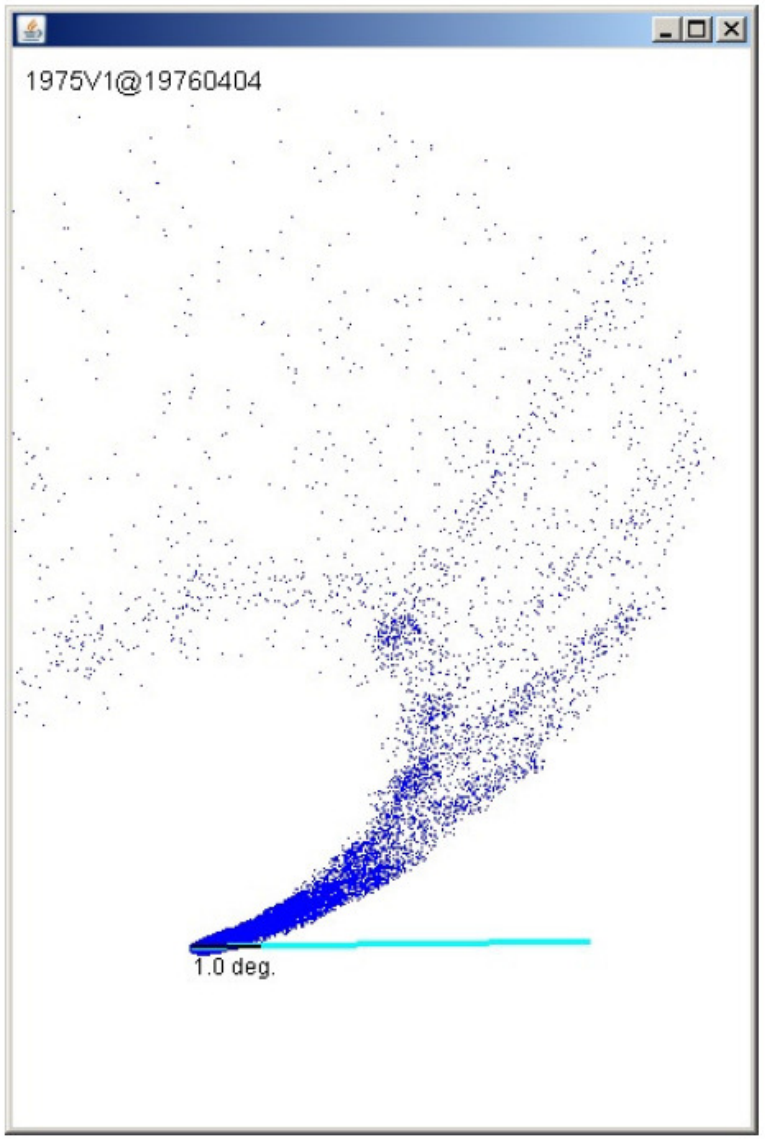


Special effects: Syndyne (more large particles, in the example: 15 µm)

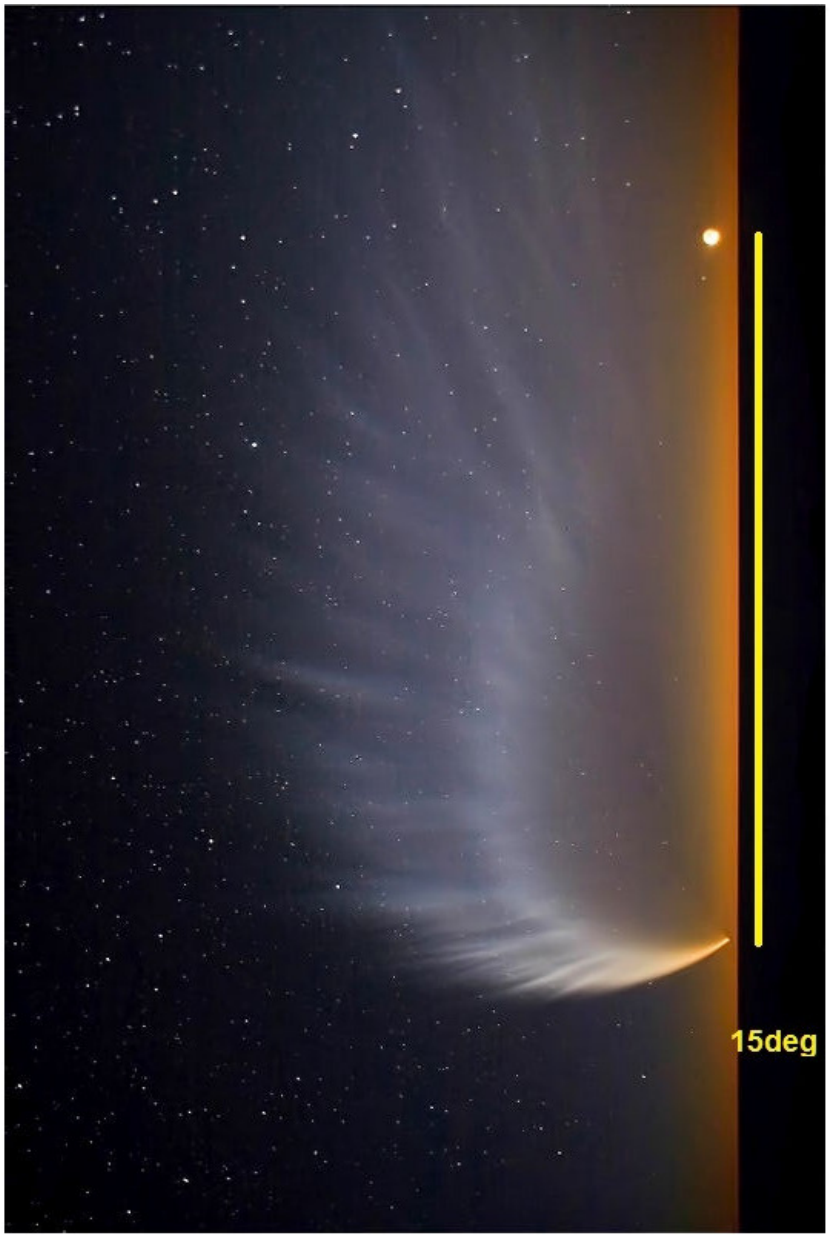


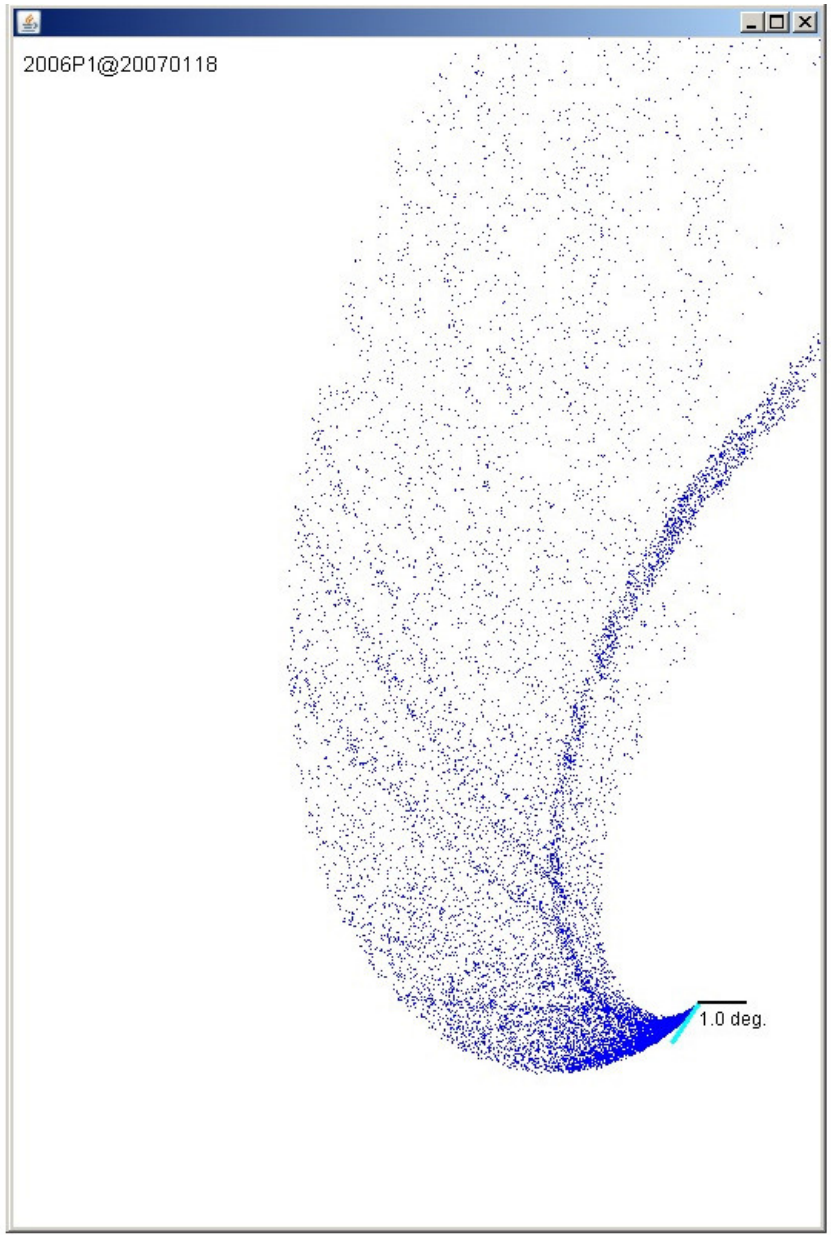
Special effects: Synchrones



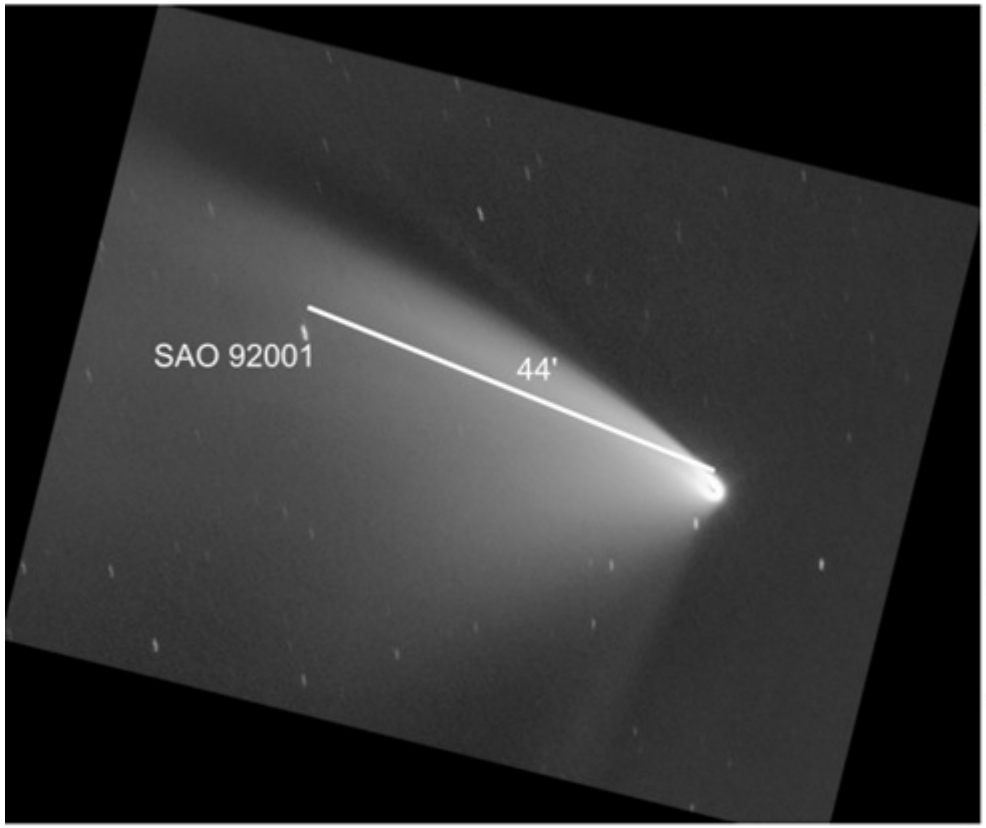


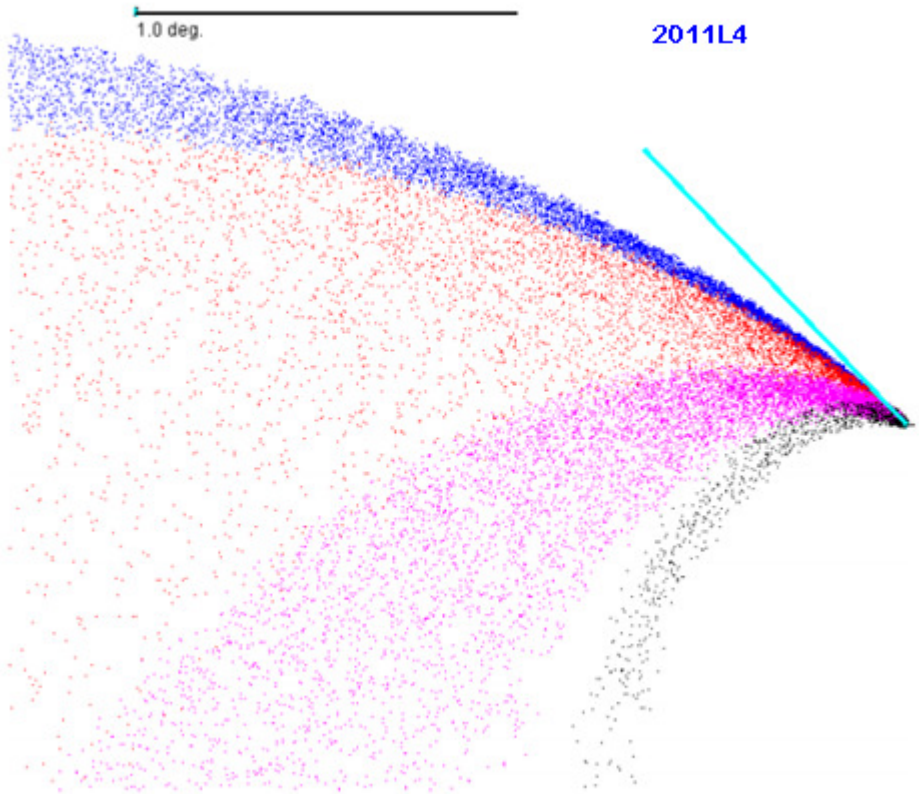
Comet West, April 4th 1975. Syndyne@1.3µm; synchrones 1 day



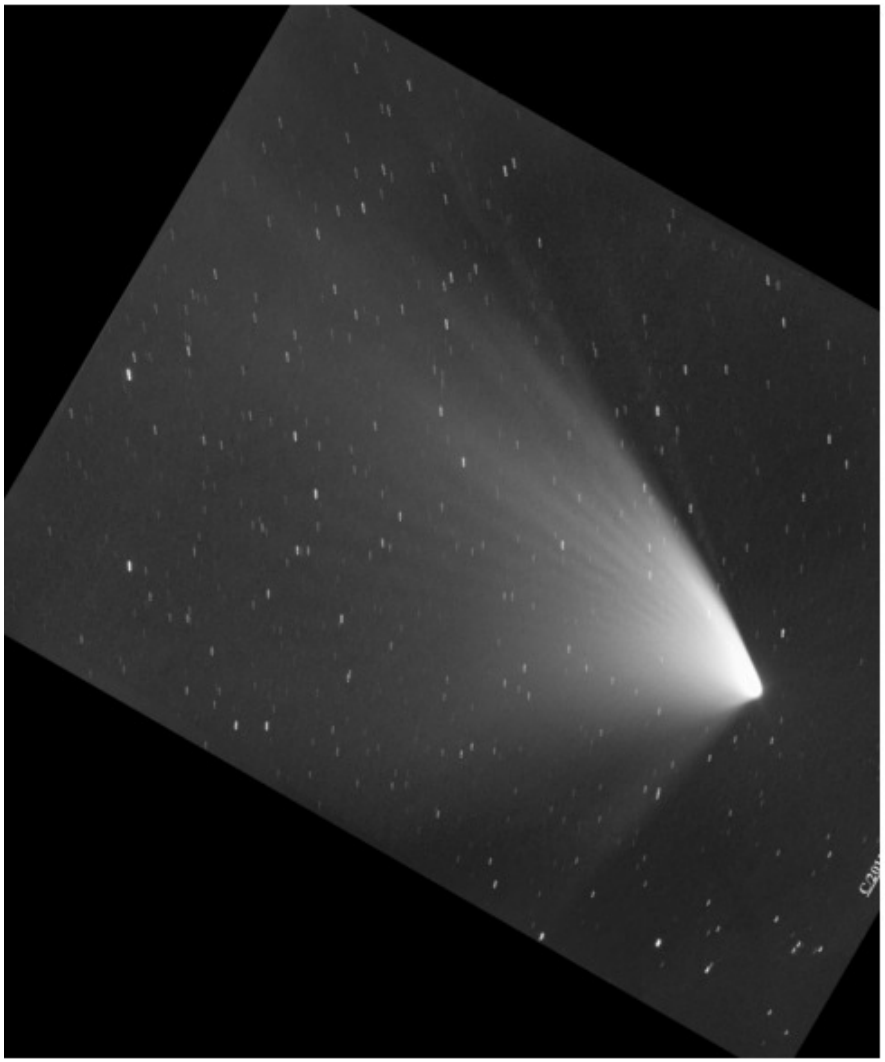


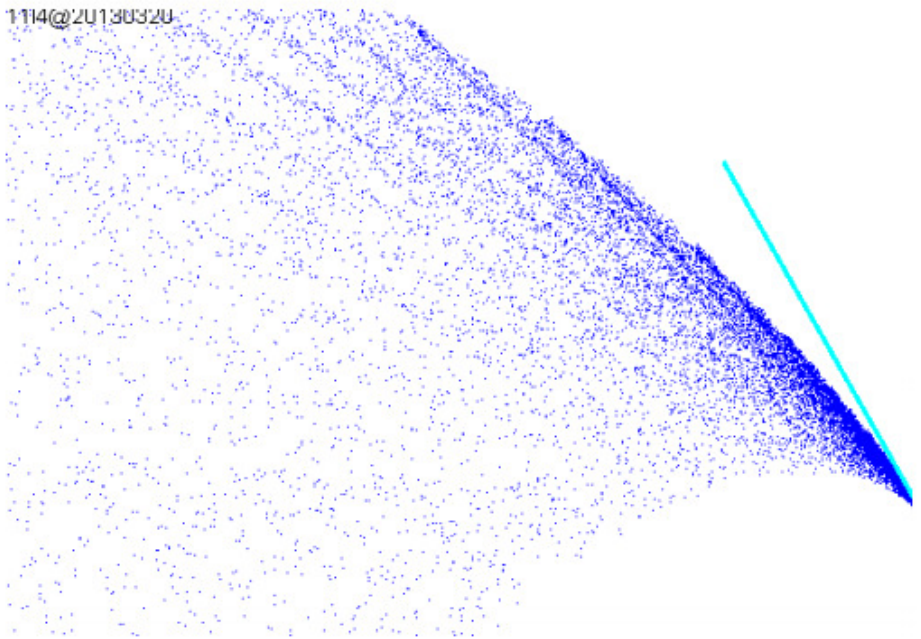
McNaught, January 18th, 2007. Syndyne@1.6µm; synchrones 8hrs.





PANSTARRS: Syndyne 0.3 µm, broad tail 2…6µm, syndyne at 9 µm





PANSTARRS without the syndyne at 9µm, but with synchrones of 0.6 days