Light curves from double-station video observations

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Light curves (LC)

Time dependence of meteor brightness

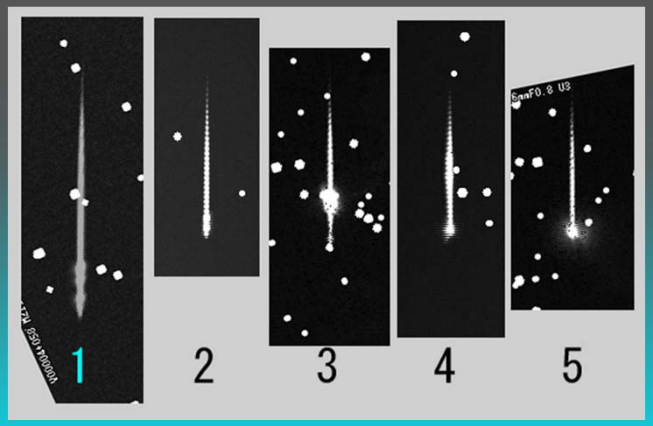
Height

Motivation of the research

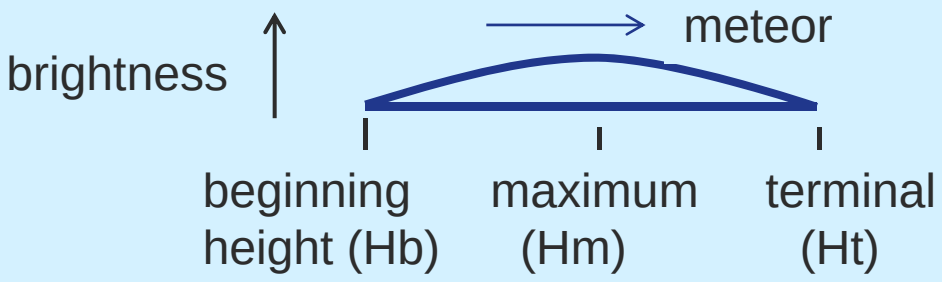
- Light curves would characterize shower and sporadic meteors.

Light curve ⟵ ablation of grains

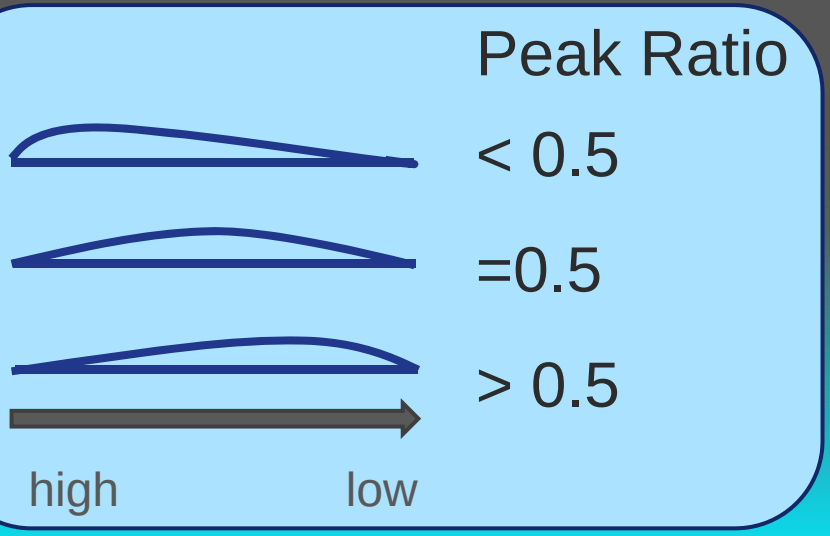
property of grains
weakness (fragility) of meteoroids
history of meteoroids



Peak Ratio (PR) of LC



Peak Ratio (PR) = (Hb - Hm) / (Hb - Ht)



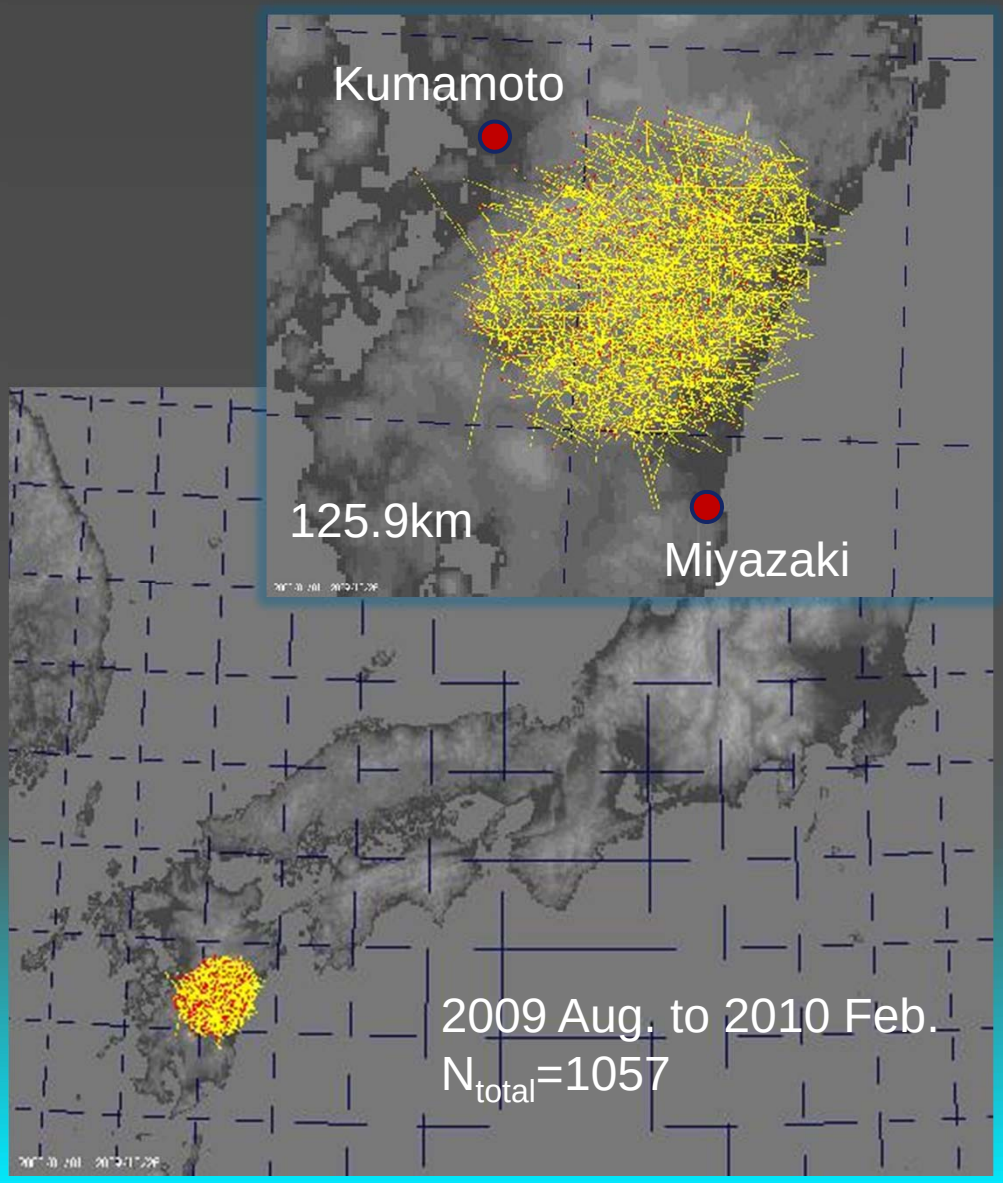
one of the index of LC

(not F parameter)

double-station observation

- Miyazaki station
  (K. Maeda)
  8mmF0.8 h48°
  25mmF0.95 h59°
- Kumamoto station
  (H. Kageyama)
  8mmF0.8 h60°

h: angle of elevation



Observation and Analysis

Observation : UFOCaputre V2

Analysis:

- naked eye (Meteor or not, How the meteor trail and cloud is in the field of view?, dawn time)
- UFOAnalyzer V2 (peak ratio, observed magnitude in each field of meteor, …)
- UFOOrbitV2 (beginning height, terminal height, shower, absolute magnitude, Vg, orbital parameters)

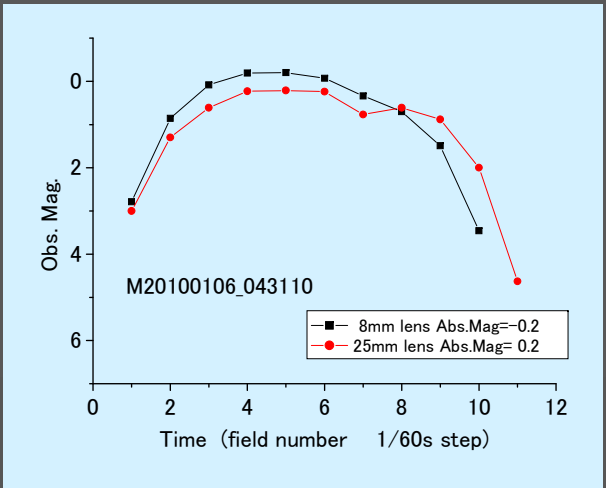
Outline of results

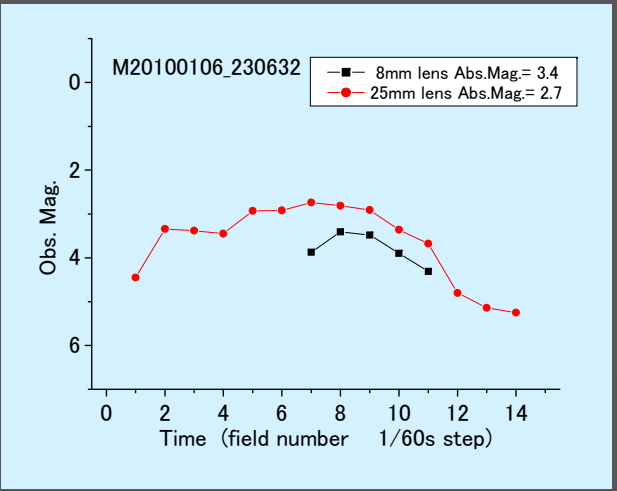
1, Effect of lens

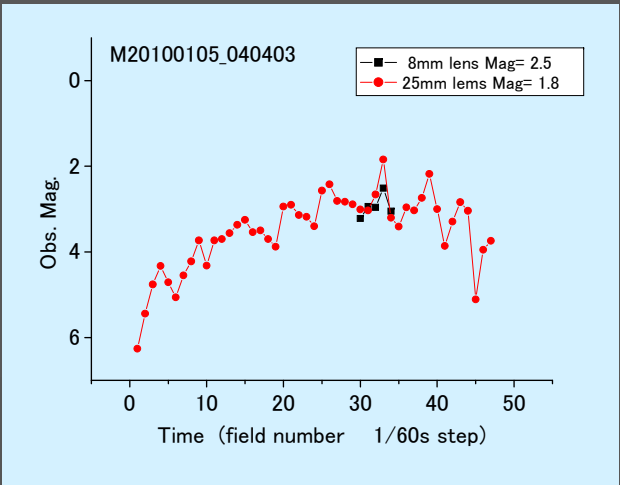
2, Peak Ratio of Light Curve

3, Light Curve Shapes

1.Light Curves on equipment







limit of mag.

8mm lens 3.5 Mag.

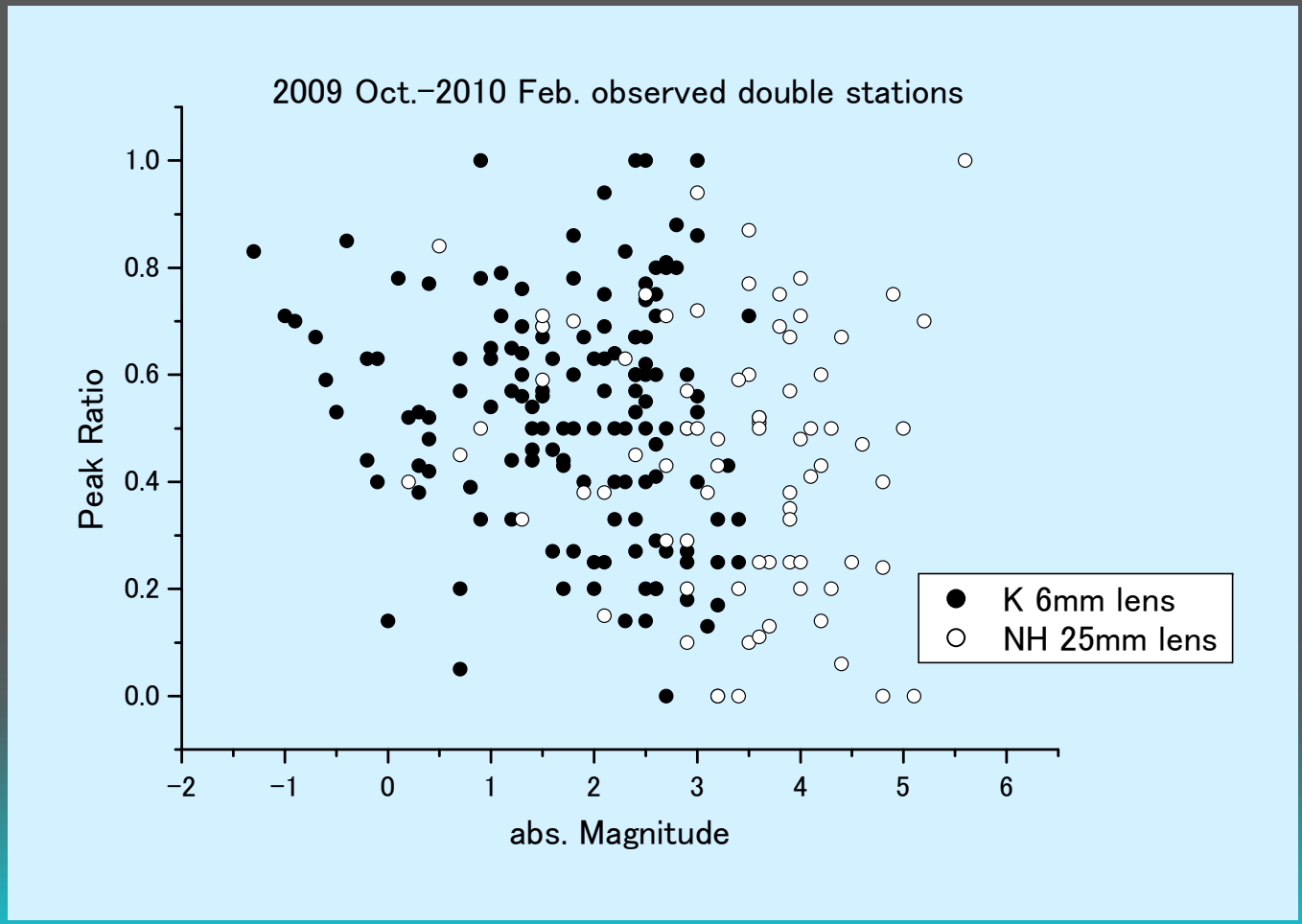
25mm lens 5.5 Mag.

LC, and PR are depend on a equipment.

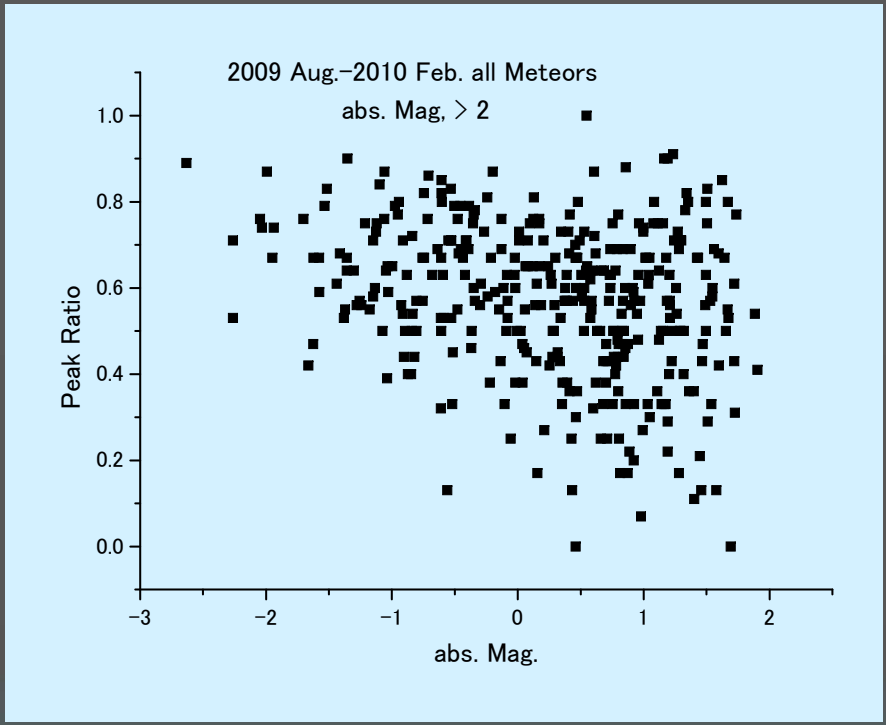
I selected 1.5 mag. smaller meteors than the limit mag. of system only.

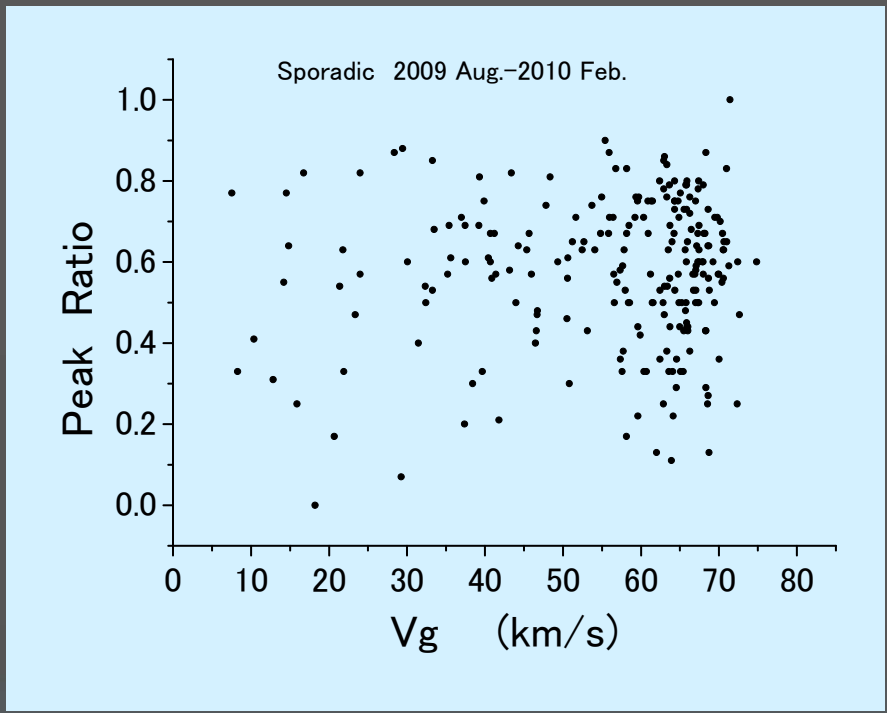
> 2 mag. for 8mm lens

Peak Ratio on equipment



2.Peak Ratio in Sporadic



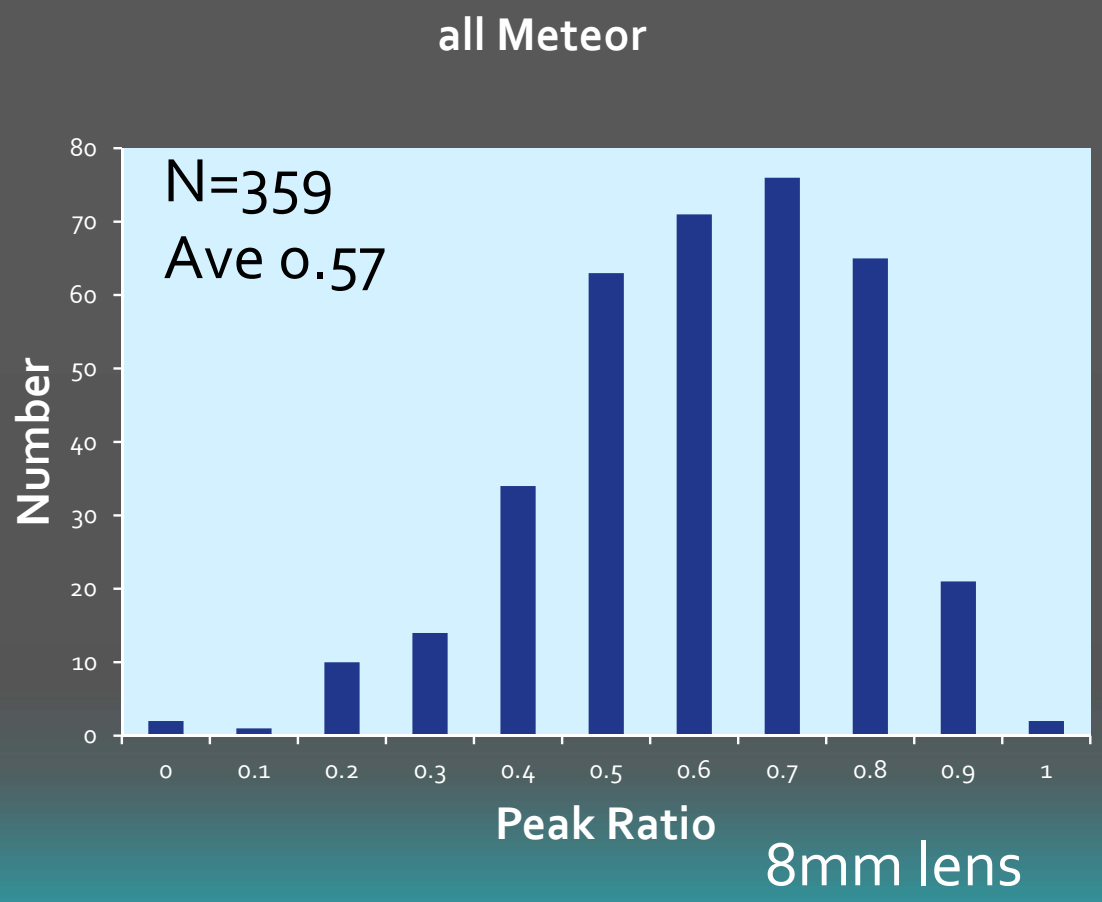


- strong dependence on Mag. ➡

brighter value ➡ higher P.R.

P.R. dose not depend on the velocity strongly.

Peak Ratio of all meteor

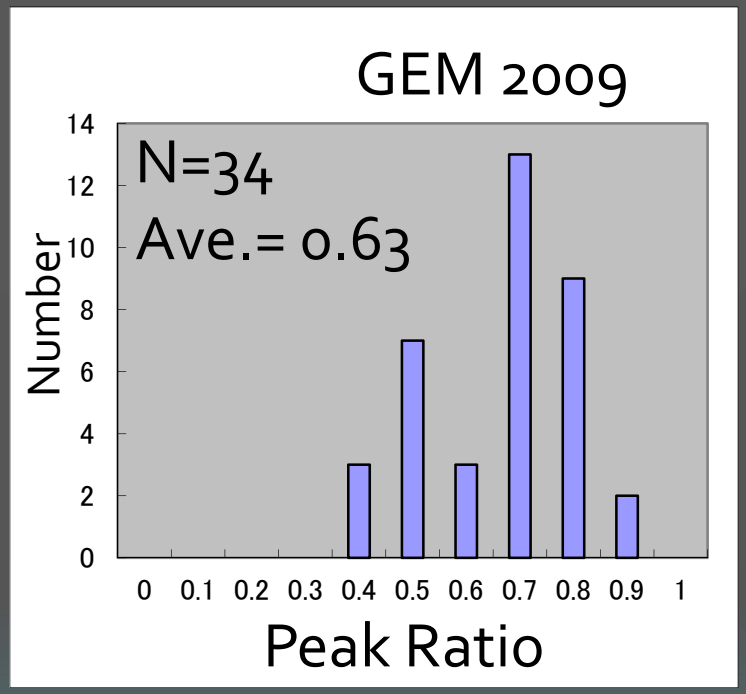


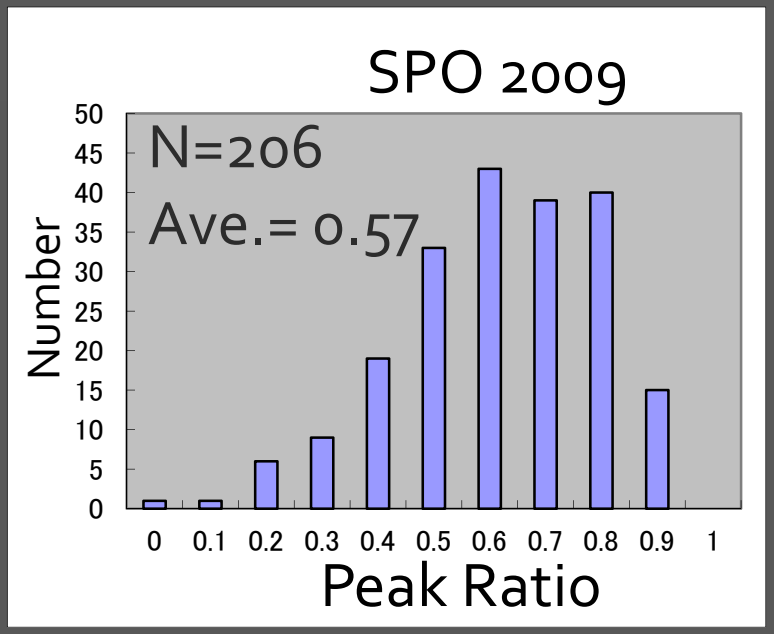
8mm lens

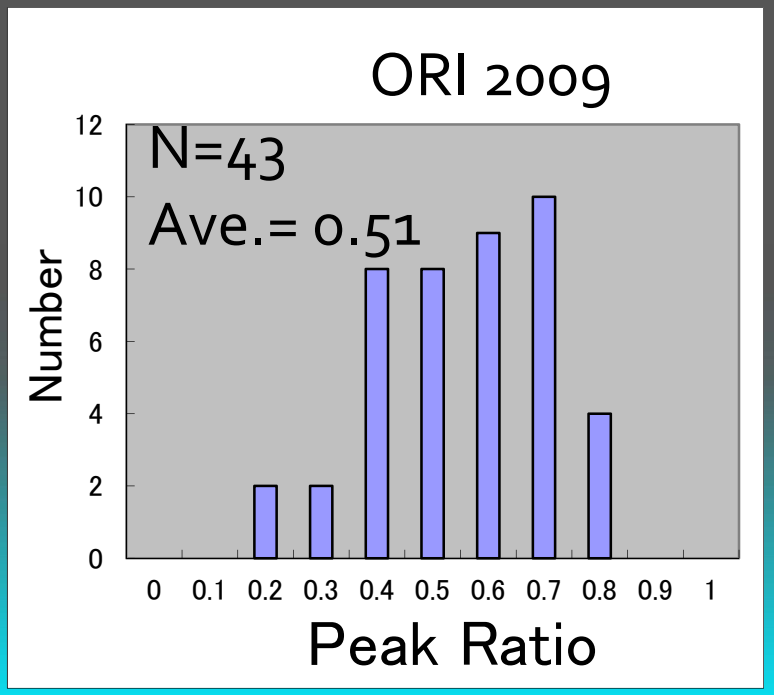
wide range

Max. 0.7-0.8 range

Peak Ratio in shower





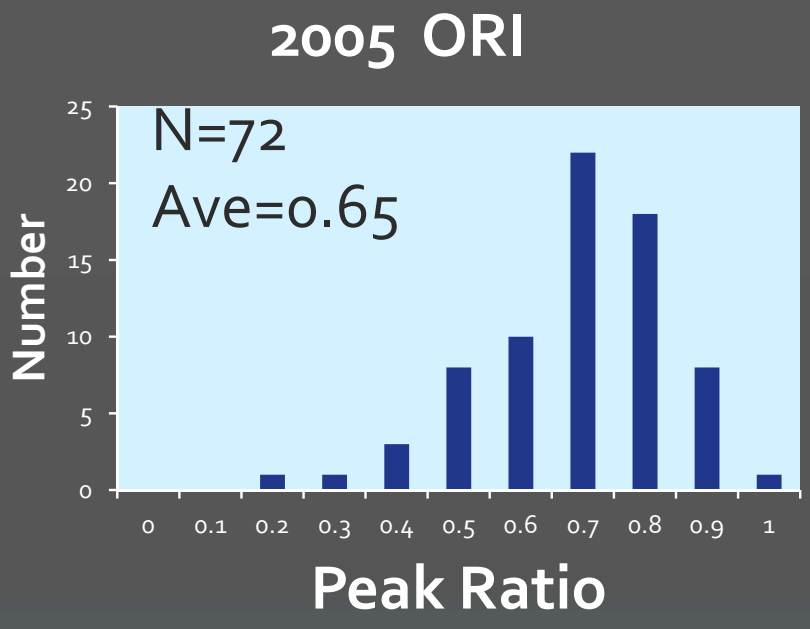


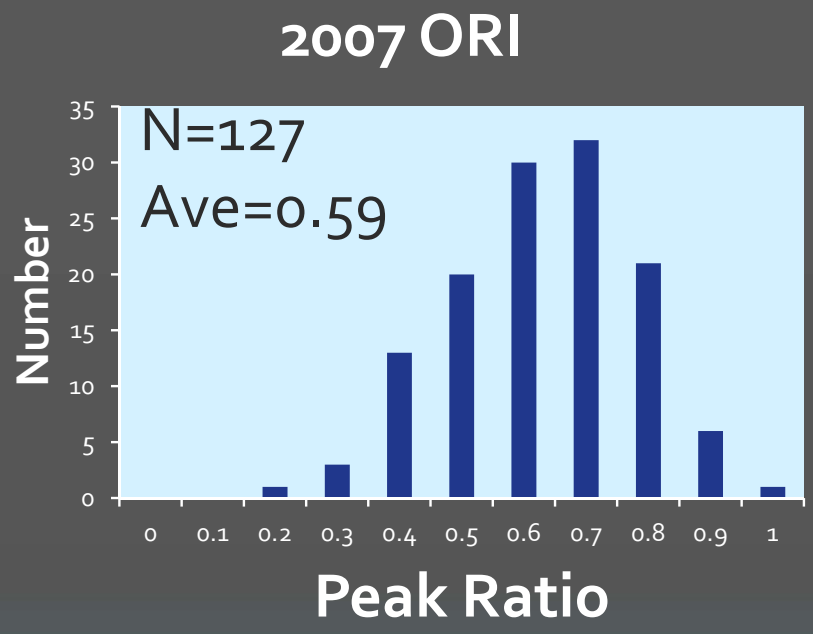
- ORI : likely to SPO.
- GEM :shifted to higher side

These distribution of P.R. value would be depended on shower.

Peak Ratio in ORI

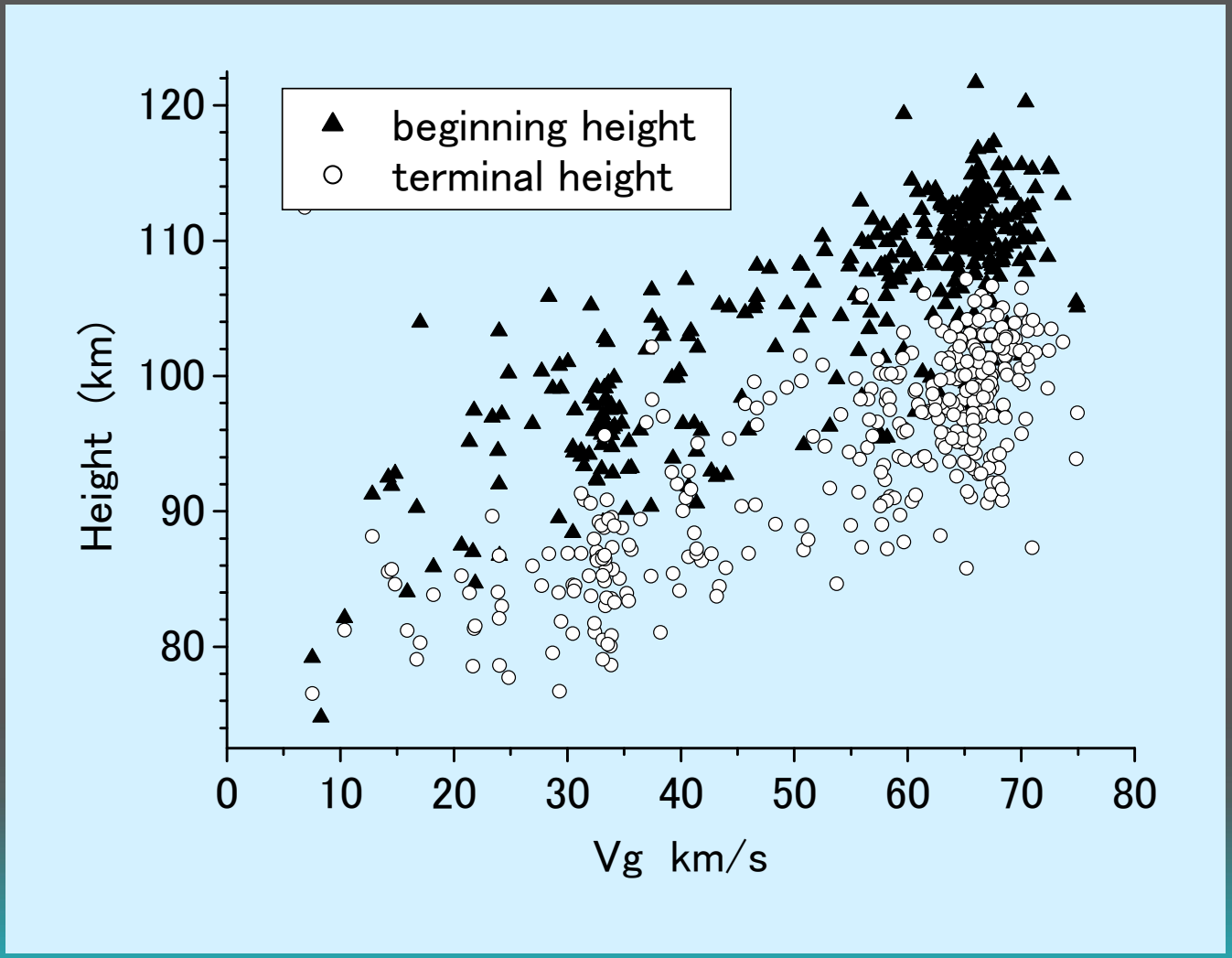
(from a single station results)





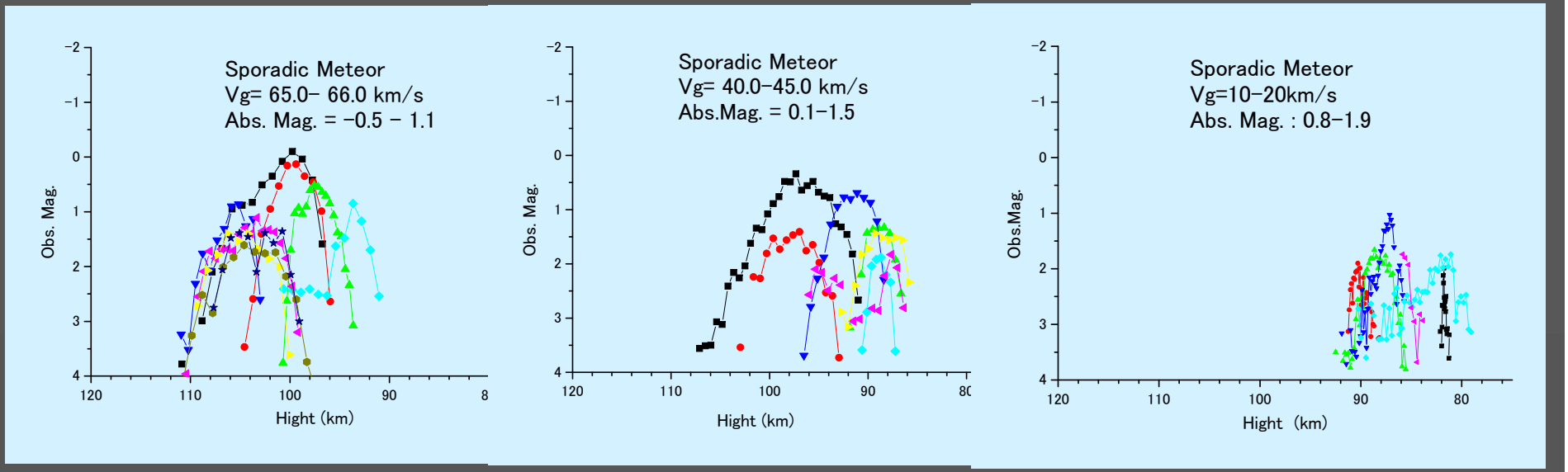
- The distribution of each year's ORI looks different.

3.Light Curve shapes



Beginning and terminal height vs. Velocity

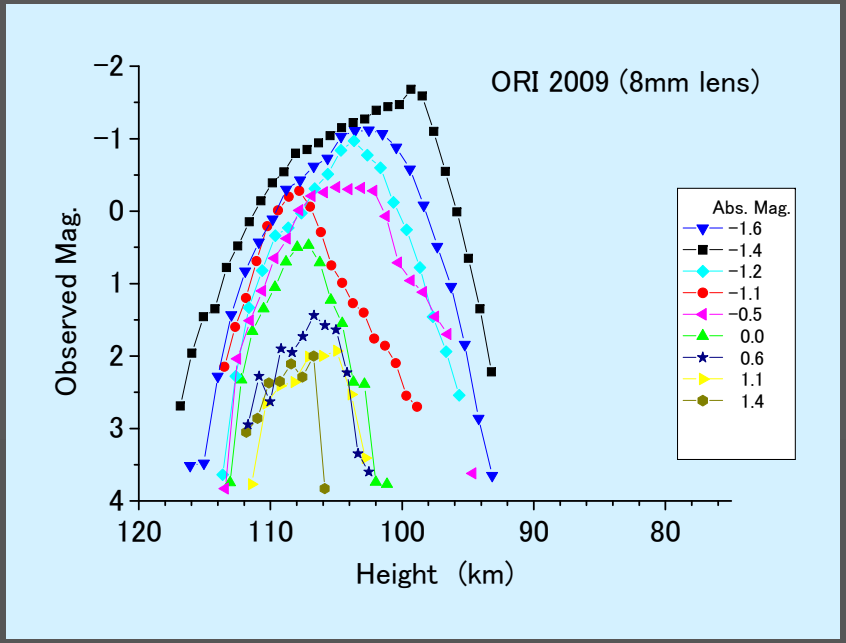
LC shapes as a function of velocity

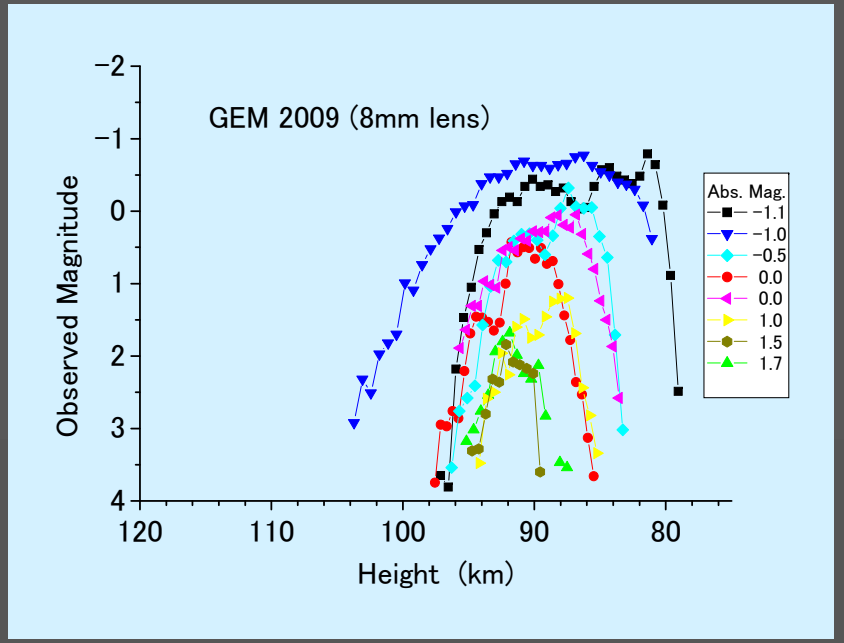


Sporadic meteor

Beginning heights are scattered in each velocity.

LC shapes for showers 1





meteor mag. ➡ small

beginning height (Hb) ➡ higher

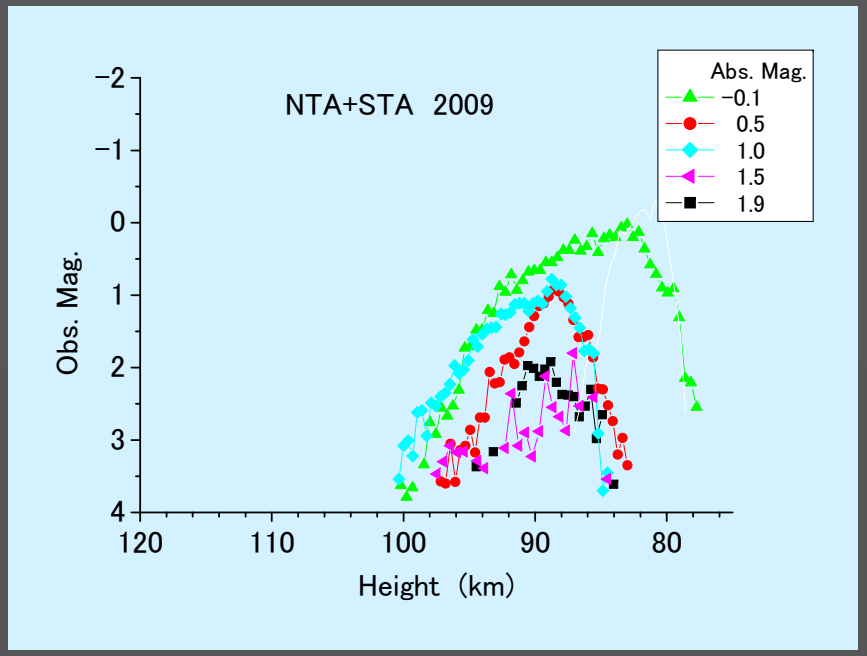
terminal height (Ht) ➡ lower

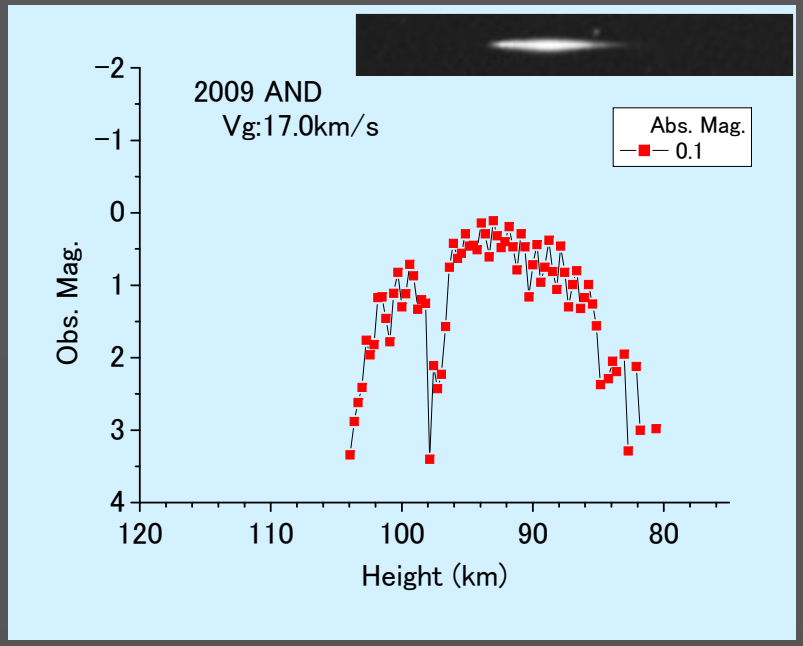
beginning height (Hb) ➡ about 95km constant

terminal height (Ht) ➡ lower

These characterizations are depended on shower. (not depend on velocity)

LC shapes for showers 2





- Taurids
- sample < 10

Andromedids

only one

conclusions

- Light curve of peak ratios and shapes are depended on showers.
- Light curve analysis become one of method for shower characterization.
- Possibility of light curve observation using head echo.

- reference

P.Koten, J.Borovicka, P.Spurny, H.Betlen, and S.Evans, “Atmospheric trajectories and light curves of shower meteors”, A&A 428, 683-690(2004)