Meteor light curves. F and T factor.

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Motivation

- Find a different way than F factor to determine at which point does the meteor release the most of its energy.
- Find potential difference between meteors with high and low radiant elevation.

Method

- Extending the number of frames using the method of interpolation.
- Smoothing curves using a method of moving average for every three dots, while maintaining the area below the light curve constant in hopes of conserving the energy.

Formulas used:

$$F_{\Delta M} = \frac{H_{B\Delta M} - H_{MAX}}{H_{B\Delta M} - H_{E\Delta M}}$$

$$T = \frac{H_T - H_B}{H_E - H_B}, H_T = \frac{1}{A}\sum H_i \cdot A_i$$

Main Problems

- Problem of making a curve smooth without losing a lot of information within it, eg. moving the point of the maximum and so changing its value. This was especially a problem for short meteors with small amount of data.
- Problems with limited sensitivity of the camera. We are able to see only a part of the light curve and determine the F factor for that part.

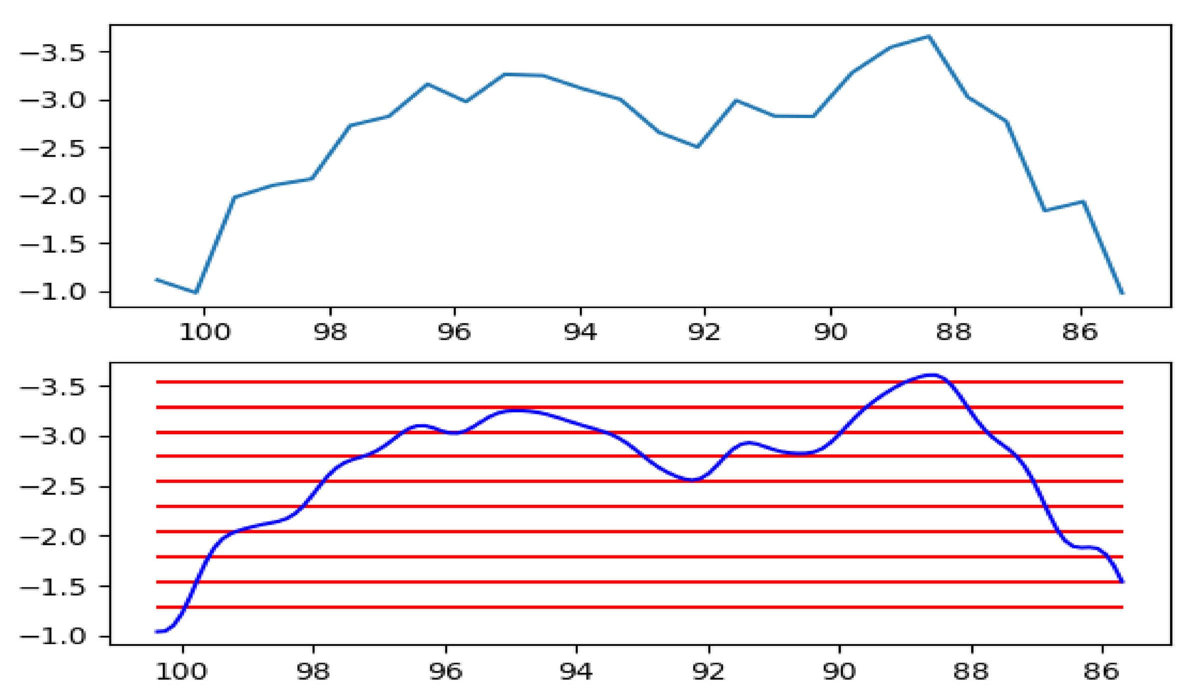

Figure 1: First graph: Original light curve, Second graph: Smoothed light curve with steps

Results

We used meteors from three different stations in: Padina (SRB), Debelo Brdo (SRB), Maruska (CZ), ValMez (CZ) and tested for four showers: Perseids, Geminids, Orionids and Quandratids. The number of samples exceeded 300 for each shower, except Quandratids. The results are as follows:

Shower	F factor	T factor
Per	0.515474	0.565733
Gem	0.500947	0.542910
Ori	0.542321	0.545909
Qua	0.502347	0.514864

Table 1: Table comparison of F and T for different meteor showers

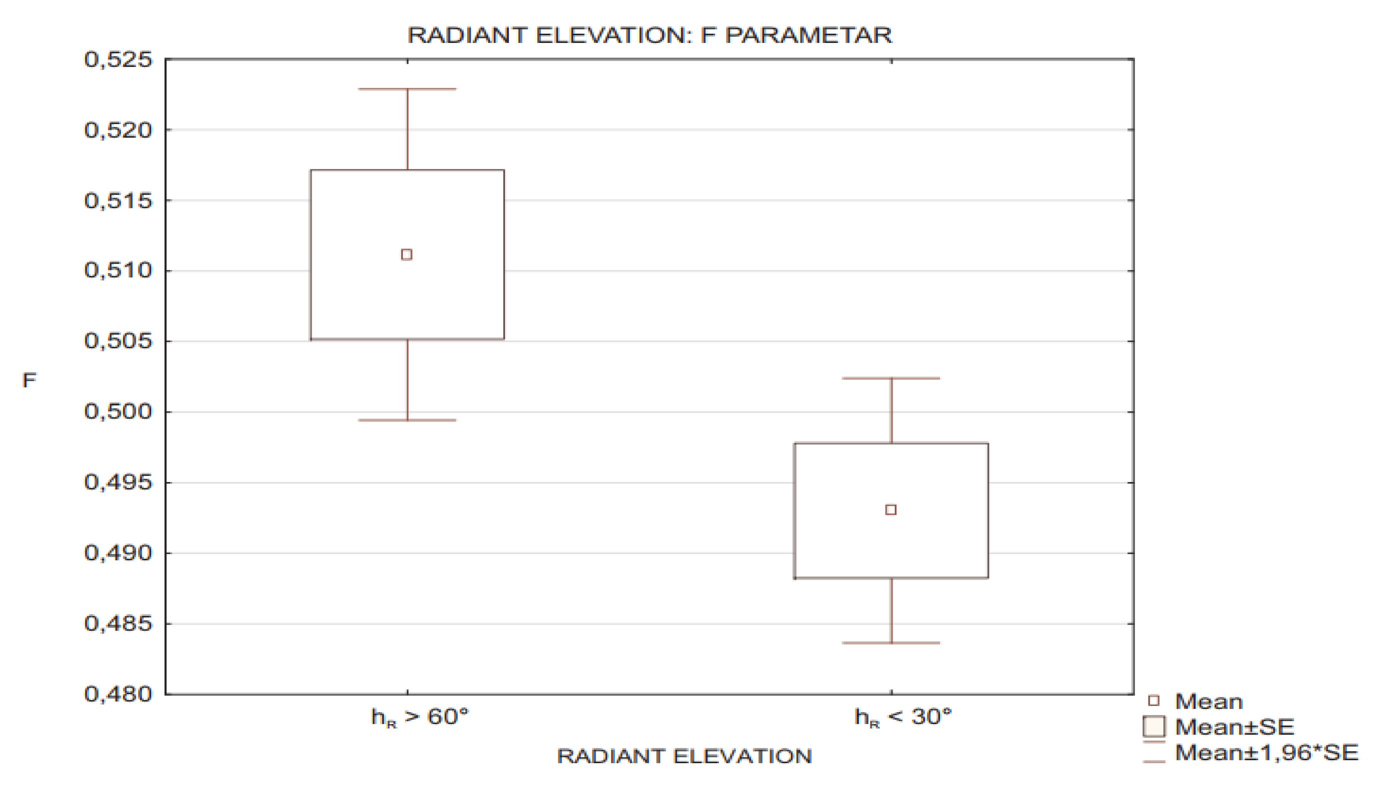

Figure 2: Graphical representation of radiant elevation influence on F factor

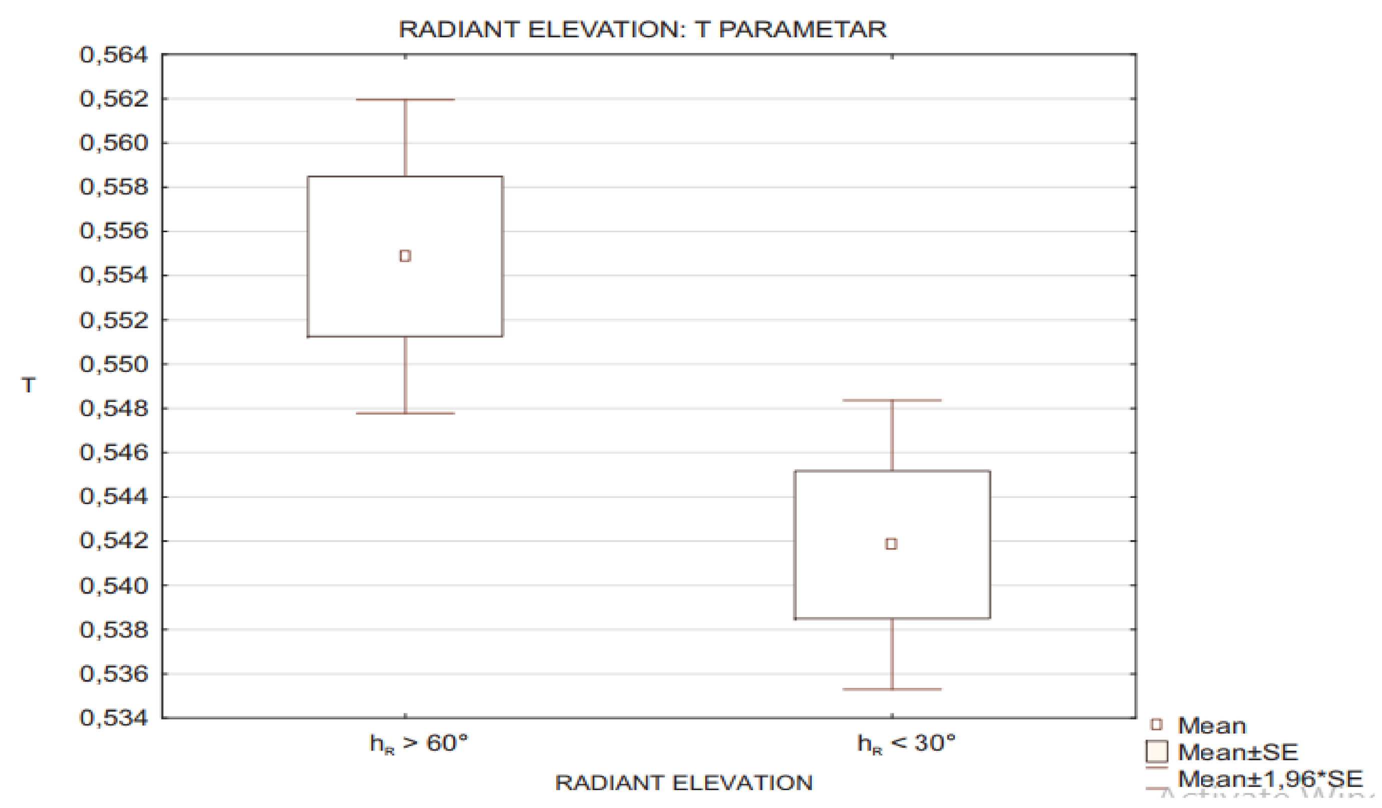

Figure 3: Graphical representation of radiant elevation influence on T factor

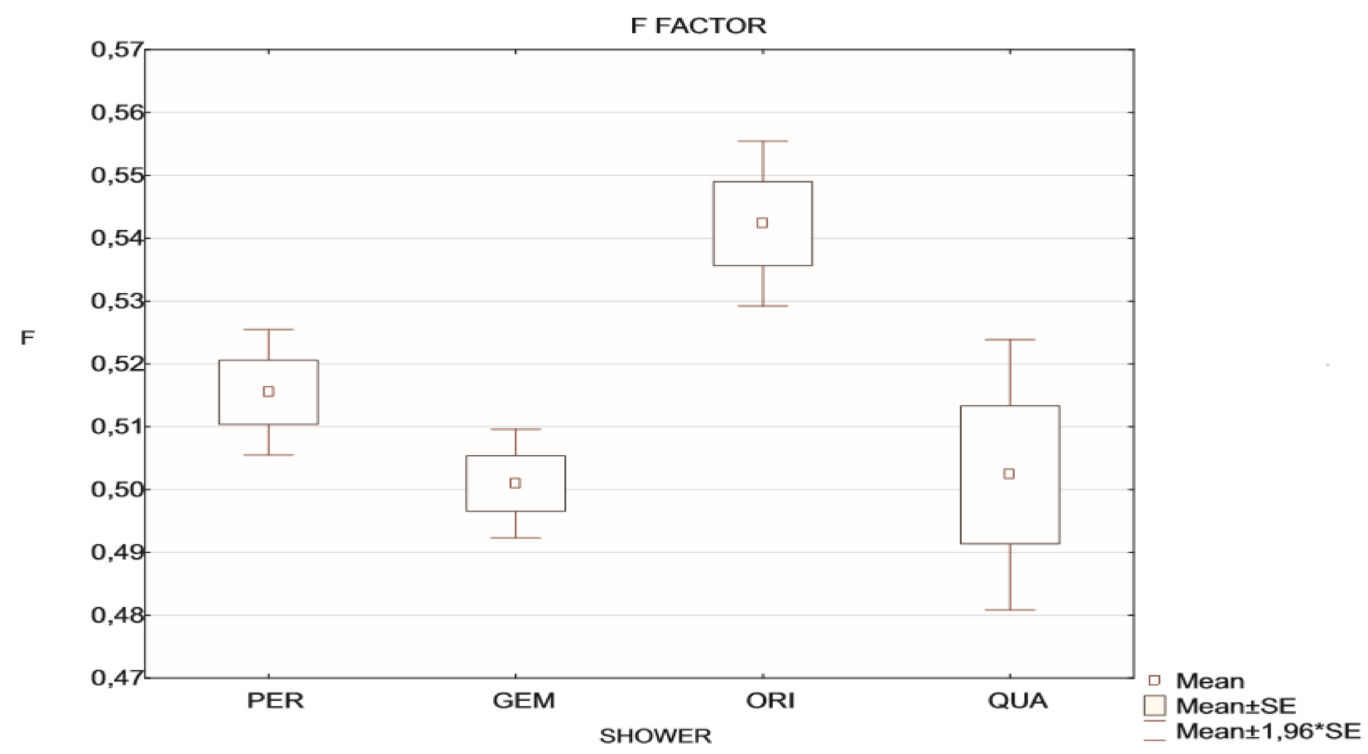

Figure 4: Graphical representation of F parameter for different showers

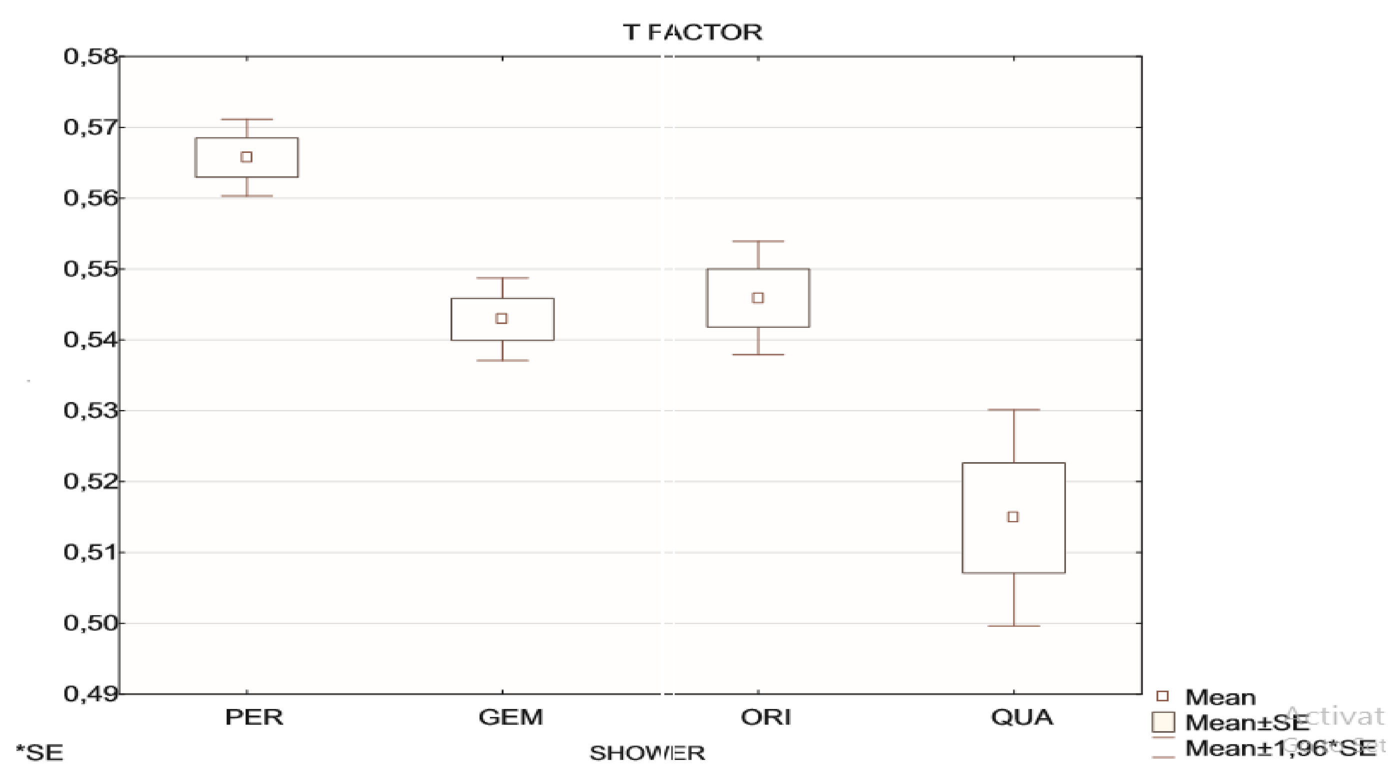

Figure 5: Graphical representation of T parameter for different showers

Conclusions

- Orionids tend to stand out regardless of which method we use to process the data.
- Contradictory to the expectations and regardless of the sample size, Geminids have the lowest F factor and one of lowest T factor of all meteor showers.
- For all showers, meteors with smaller radiant zenith distances, or radiants that are higher up, have bigger F factors than those who are not as high.
- Results didn't wary on sample size.

Forthcoming Research

If possible, we would like to test these result for television meteors with much higher sensitivity and see the difference.

References

[1] J.Jones D.E.B Fleming, R.L.Hawkes. Light curves of faint television meteors. 1993.

[2] P.Spurný H.Betlem P.Koten, J.Borovicka and S.Evans. *Atmospheric trajectories and light curves of shower meteors*. EDP Sciences, 2004.

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