

Correction effect to the radiant dispersion in case of Low Velocity Meteor Showers

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Abstract. We usually apply various corrections for determining apparent radiant point to the actual trajectories of shower meteors. In case of low velocity meteor showers, the velocity corrections should be carefully performed together with the error estimate. Here we show that such correction strongly affects the dispersion of radiant points especially in case of low geocentric velocity meteor showers.

Keywords: near-Earth asteroids, dormant comets, meteoroid stream, meteor showers, orbits, evolution, radiants

1. Introduction

We usually apply various corrections for determining apparent radiant point to the actual trajectories of shower meteors. In case of low velocity meteor showers, the velocity corrections should be carefully performed together with the error estimate. Here we show that such correction strongly affects the dispersion of radiant points especially in case of low geocentric velocity meteor showers.

2. Examination

The radiant is described by the synthetic vector between the velocity of meteoroids and the velocity of the Earth. We assumed the range of intrinsic dispersion in the estimate of velocity “d”. Figure 1 shows the relation between the radius of the radiant and “d”. It becomes obvious that the radius is dependent on the geocentric velocity “Vg”. And we derived the corresponding radii of radiant points in various meteor showers. Figure 2 shows the result when “d” = 2 km/sec. We can easily recognize the correction effect of the dispersion is larger with lower velocity meteor showers. While in the case of large velocity such as Leonids and Perseids, the derived dispersion of the radiants is small, it becomes quite large in the case of Draconids and Phoenicids. Accordingly, we found out the simple method of correcting this. We calculate the corrected radiant by subtracting the Earth vector (Figure 3). It means that the actual heliocentric velocity of meteor shower is obtained. Figure 4 shows the result of modified radiant points. It becomes clear that the derived dispersion of radiants can be obtained by this correction.

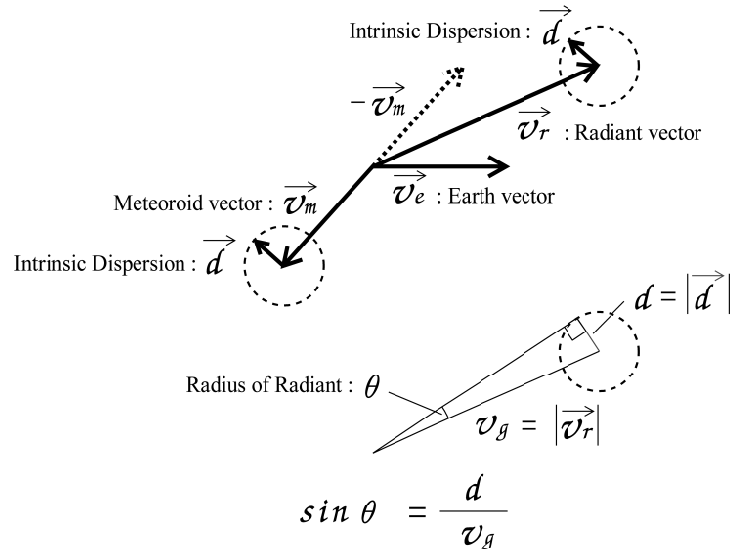


Figure 1. Relation between the radius of the radiant and the geocentric velocity of meteor showers.

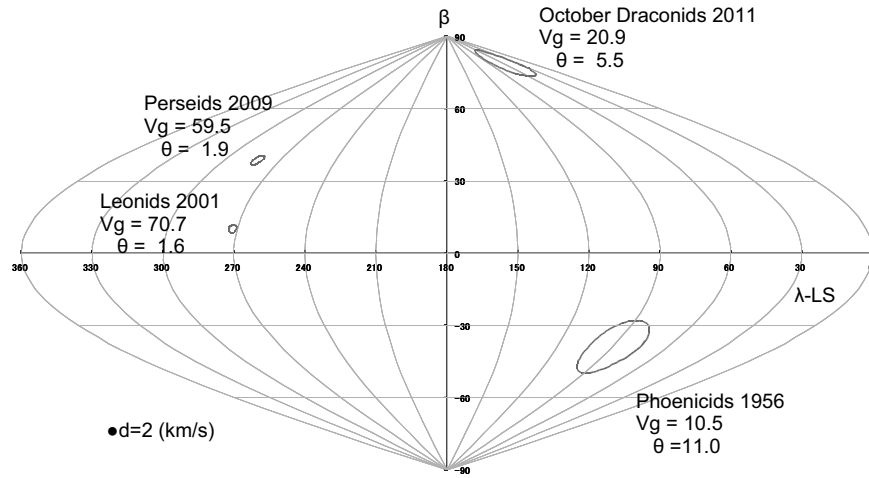


Figure 2. Derived radii of radiant points corresponding to the error of 2 km/sec. V_g is the geocentric velocity of meteor showers.

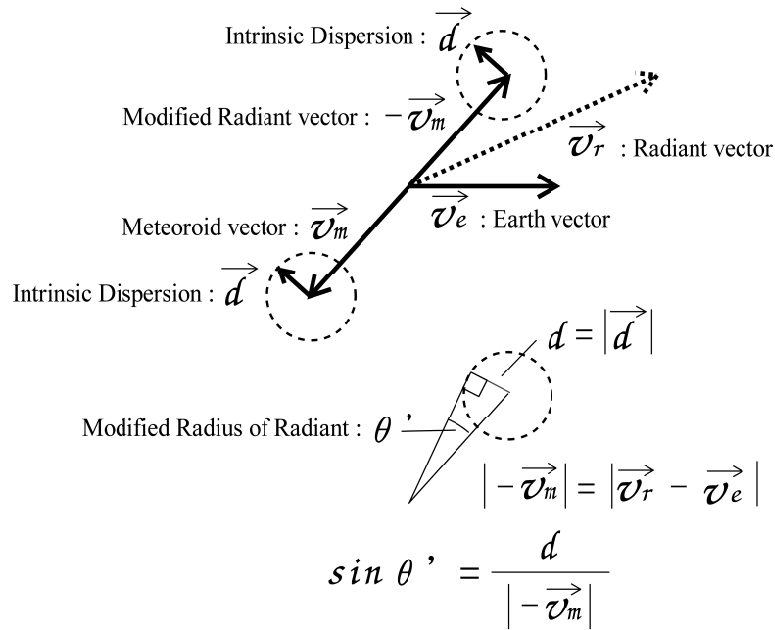
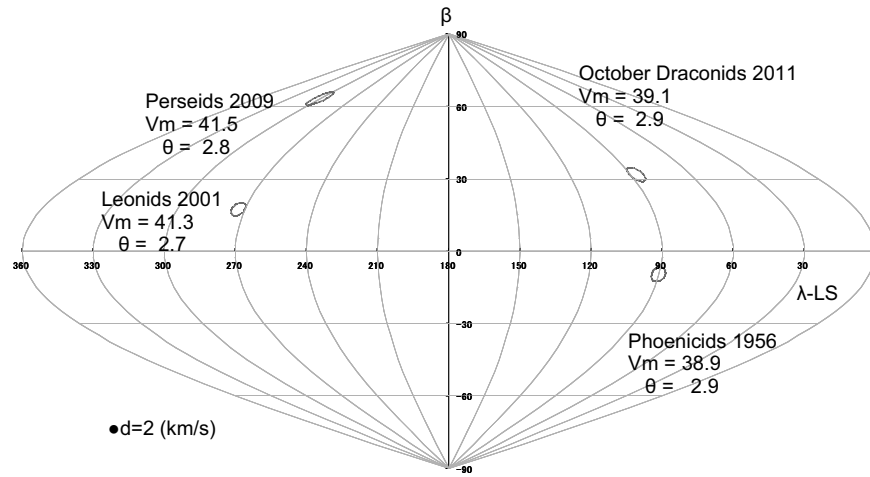


Figure 3. Method of correction.

Figure 4. Derived radii of modified radiant points corresponding to the dispersion of 2 km/sec. V_m is the actual velocity of meteor showers.

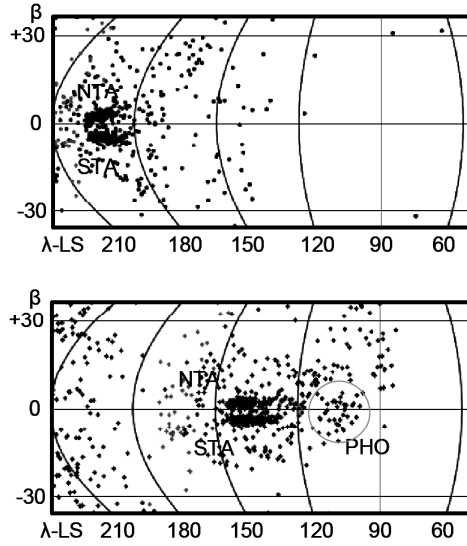


Figure 5. Distributions of radiants between October 20 and November 20 in 2008. Upper panel shows uncorrected and lower panel shows corrected cases. The radiant of Phoenicids (PHO) can be recognized only in corrected figure. Data of radiants was referred to from SonotaCo Network

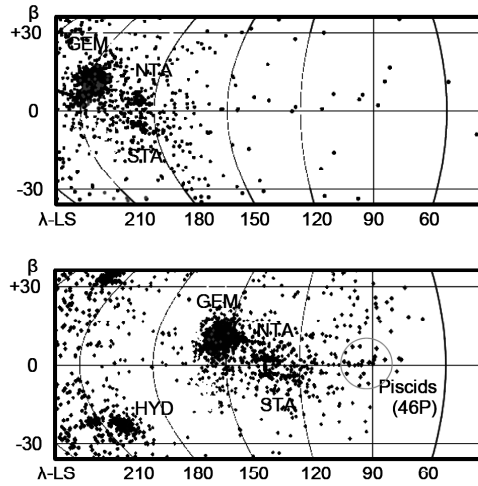


Figure 6. Distributions of radiants between December 1 and 21 in 2012. Upper panel shows uncorrected and lower panel shows corrected cases. The radiant of December Piscids can be recognized only in corrected figure. Data of radiants was referred to from SonotaCo Network.

3. Detection of meteor showers

We carried out careful inspection to the observed data for low velocity meteor showers by taking this correction effect into account, and found the existence of activities of Phoenicids in 2008 and December Piscids in 2012. Figures 5 and 6 show the result of the obtained radiants of uncorrected and corrected of this effect.

4. Conclusions

It became clear that Phoenicids in 2008 and December Piscids in 2012 can be recognized only in this corrected figure. It also means that such low velocity meteor showers were overlooked without this correction. Therefore, we should perform this correction when we inspect low velocity meteor showers.

Kresak and Porubcan (1970) estimated that the dispersion of radiants was generally about 1 km/sec. In this case, it seems to be slightly large. We have to investigate in more detail.

Acknowledgements

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References

Kresak L., Porubčan V., 1970, Bull. Astron. Inst. of Czechoslovakia 21, 153