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Measuring of short-duration meteor trains

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Meteor trains are known as illuminating phenomena appeared along their meteor trajectories, just after appearing of meteors in Earth's atmosphere. Even by our naked-eyes, the illumination can be observed within a few seconds in the shortest, a few minutes in the longest. It can be recorded for about a few tens minutes by professional observation instruments. In order to obtain double-station meteor train images/movies with high spatial/temporal resolution, meteor train observation campaign was conducted by the authors in 1998, during an expected period of Leonids meteor storm, resulting successful archives of train images of numerous values of meteors of train images especially in 2001 .

In double-staion meteor movie data taken by image-intensified (I.I.) video cameras(Shigeno et al., 2003), many video clips of meteors with short-duration meteor trains were found. By using a motion-detection software "UFOCapture" (Sonotaco, 2009), 26 short-duration meteor trains (18 examples of Leonids as well as 8 of sporadic meteors) were picked out, deriving altitude distribution of short-duration meteor trains. As a result, (1) short-duration meteor trains averagely appeared between 120 km and 96 km altitude, (2) altitude distribution of short-duration meteor trains averagely changes in time to be finally centered at around 107 km, with having linear dependence for their upper limit altitudes as well as logarithmic dependence for lower limits, (3) duration time of short-duration meteor trains was in a range between 0.2 s to 4 s, (4) high correlation between absolute magnitudes of parent meteors and duration time of short-duration meteor trains, and (5) the altitude distribution of short-duration meteor trains could be explained with OI557.7 nm luminescence and collision (quenching) process with surrounding upper atmosphere.

Applying the analizing method of Leonids short-duration meteor trains to the other meteor showers, it is expected to obtain altitude distribution of the short-duration meteor trains and its evolution in time for several meteor showers as was studied in Leonids case (Toda et al., 2010), as well as to study comparison in altitude distribution of short-duration meteor trains. Moreover as a suggestion of observing meteor train in near future, we would like to introduce an imaging method with repetition of quick exposure (1s or shorter) with a fixed FOV by high-sensitivity digital cameras, as well as our dating results of meteors and meteor trains.

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[2] Y. Shigeno, H. Shioi, T. Shigeno, "Radiants and orbits of 2001 Leonids," Inst. Space Astro. Sci. Rep. SP, Vol.15, 237-244. 2003.

[3] SonotaCo, "A meteor shower catalog based on video observation in 2007-2008," WGN, Vol. 37, No.2, 55-62. 2009.

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