

Meteor shower Forecast - Orbital Calculation of Cometary Dust Trails

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Meteor is a plasma emission that occurs when interplanetary dust called meteoroid enters the Earth's atmosphere. Meteoroids are thought to originate from asteroids and comets. mm-sized meteoroids ejected by a comet generate a meteoroid stream called dust trails, and when they intersect with the Earth's orbit they can create meteor showers. Every time a comet returns to the sun, a large amount of dust is released with gas and a new dust trails is formed. Furthermore the orbit of the dust trails changes complicatedly due to gravity perturbations by planets, dwarf planets, moon. We can predict the appearance of meteor shower by calculating the orbit of dust and considering the intersection condition with the earth orbit. Meteor shower forecast can provide the date and time when dust trails encounter with the Earth's orbit. We performed orbital calculations of dust trails formed by comet 109P/Swift-Tuttle, the parent body of Perseid meteor shower. In this study, the maximum of the 2016 Perseids is successfully predicted by our 1D orbital calculation and 2D orbital calculation model which are comparable to optical observational result. 1D orbital calculation supposes that dusts are emitted when comet is in perihelion (2D orbital calculation: perihelion and surroundings). Our new 4D orbital calculation model is also discussed. This calculation supposes that dusts are emitted from the comet in three axial directions. Three axial directions are progress direction of comet, radial direction and perpendicular to the orbital plane (1D and 2D orbital calculation consider only progress direction of comet). And, ejection velocity of dust in 2D orbital calculation and 4D orbital calculation was compared. We found that there was a difference in ejection velocity.

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