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Abstract

Recent work on meteor showers is reviewed. New data is presented on the long duration showers that wander in sun-centered ecliptic coordinates. Since the early days of meteor photography, much progress has been made in mapping visual meteor showers, using low-light video cameras instead. Now, some 820,000 meteoroid orbits have been measured by four orbit surveys during 2007–2015. Mapped in sun-centered ecliptic coordinates in 5º intervals of solar longitude, the data show a number of long duration (> 15 days) meteor showers that have drifting radiants and speeds with solar longitude. 18 showers emerge from the antihelion source and follow a drift pattern towards high ecliptic latitudes. 27 Halley-type showers in the apex source move mostly towards lower ecliptic longitudes, but those at high ecliptic latitudes move backwards. Also, 5 low-speed showers appear between the toroidal ring and the apex source, moving towards the antihelion source. Most other showers do not last long, or do not move much in sun-centered ecliptic coordinates. The surveys also detected episodic showers, which mostly document the early stages of meteoroid stream formation. New data on the sporadic background have shed light on the dynamical evolution of the zodiacal cloud.

Keywords: meteors, meteor showers, meteoroids, celestial mechanics, minor planets

1. Introduction

A working list of meteor showers is maintained at the International Astronomical Union's Meteor Data Center (Jopek & Kanuchova, 2016). At the time of writing, 701 proposed showers are catalogued, of which 112 meteor showers are certain to exist. Of those, only 32 have known parent bodies.

It is important to better document these showers, and search for more, because meteor showers provide a unique record of past comet activity. They document the meteoroid stream dynamics that will result ultimately in replenishing the zodiacal dust cloud. For reviews, see Jenniskens (2006, 2016) and Williams & Jopek (2014).

Fundamental questions remain. Comet disruptions are the main mass-loss mechanism of comets contributing to meteoroid streams and the zodiacal cloud (Jenniskens, 2008a,b; Nesvorny et al., 2010, 2011; Yang & Ishiguro, 2015; Ye et al., 2015b), but what are the velocity dispersions that result from that? On what timescale do comets disrupt? When did individual streams form? What are the long-term dynamical and physical processes that form the zodiacal cloud? Even the collisional lifetime of meteoroids is uncertain (Jenniskens et al., 2016c).