Modelling meteor showers: future Draconid outbursts

A. Egal, P. Wiegert, P. G. Brown, M. Campbell-Brown

Predicting meteor showers is important for a wide range of applications, from meteor observations to estimating the risk of impacts with satellites. Since the 19th century, efforts have been made to improve the accuracy of shower forecasts. Generic meteoroid stream descriptions based on secular perturbation methods have been replaced by elaborate numerical models of trail ejection. The complexity and credibility of these simulations has evolved with growing computing power. Current models incorporate a detailed knowledge of the dynamics and photometry of the parent comet, inferred through observations and in-situ space missions. These improvements are crucial when the fine structure of a stream needs to be examined, such as that of the October Draconid meteor shower.

The Draconids, irregular in time and intensity, have been challenging forecasts since their first recorded apparition in 1926. Following a review of previous models of the shower, we will present our new implementation of a method originally proposed by Vaubaillon (2005). Our analysis, supported by an unprecedented observational campaign of comet 21P/Giacobini-Zinner and extensive simulations, aims to provide realistic activity profiles of past and future Draconid outbursts. Long-term monitoring of meteor showers is critical to assess the accuracy of these predictions.