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Limitations of the current methods used to compute meteors orbits

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Abstract

The Cameras for BEtter Resolution NETwork (CABERNET) project aims to provide the most accurate meteoroid orbits achievable working with digital recordings of night sky imagery. The level of performance obtained is governed by the technical attributes of the collection systems and having both accurate and robust data processing. The technical challenges have been met by employing three cameras, each with a field of view of 40°x26° and a spatial (angular) resolution of 0.01°/pixel. The single image snapshots of meteors achieve temporal discrimination along the track through the use of an electronic shutter coupled to the cameras, operating at a sample rate between 100Hz and 200Hz. The numerical processing of meteor trajectories has already been explored by many authors. This included an examination of the intersecting planes method developed by Ceplecha (1987), the least squares method of Borovicka (1990), and the multi-fit parameterization method published by Gural (2012). After a comparison of these three techniques, we chose to implement Gural 's method, employing several non-linear minimization techniques and trying to match the modeling as close as possible to the basic data measured, i.e. the meteor space-time positions in the sequence of images. This approach results in a more precise and reliable way to determine both the meteor trajectory and velocity through the atmosphere.