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METEOR ORBIT DETERMINATION USING DIFFERENT MODELS OF DYNAMICAL COMPUTATION

Abstract

Meteors are produced when small dust particles from comets and asteroids, called meteoroids, enter the Earth's atmosphere. These particles are not larger than a grain of sand and their properties for calculations can be considered as a 5•10-4 kg of mass and with a volume of 1 mm2. The Meteor Research Group (MRG) from the Research and Science Support Department (RSSD) of the European Space Agency (ESA) is working on meteors from 1998. The main science interests are to understand the distribution and evolution of dust in the solar system and to link the physical properties of the particles producing the meteors to their parent body. According with these points image-intensified video cameras are used to observe the same location in the Earth's atmosphere from two different directions.

This document summarizes the work done during my trainee at ESAC. The Orbital Characterization of the meteoroids is not standardized yet and some different software is used. It's needed to compare different software and accuracies and try to do the best approximation to the real orbit the meteoroids come from. The final purpose is to obtain an easy and standard software with a minimum accuracy of the third body approximation with the slogan "Make it simplest". The objective of the global project is to make some comparison between the own software called MOTS and a Czech code called FIRBAL.

The main points of my trainee were to evaluate the viability of the commercial programs for meteors orbital parameters analysis, to create specific software coded in C++ and to contrast different orbit data obtained from various methods of calculation. There are many software tools in the world focused on determining the orbital dynamics of meteors. For the first time it is propounded a n-body simulator called "Radiant Attraction N-Body Orbiter" Tool, RANBO, which consists on a Runge Kutta method applied to solve the orbital elements of the meteor and some other included perturbations.

Software is designed for reading directly the VMO file or introducing handily the orbital parameters. Outputs are produced in an ASCII file and they include error estimations. Subsequently this software will be able to compare the accuracy of typical two body simulators and the programs based on the zenithal attraction approximation.