

Abstract

Title: Dynamics of meteoroids and dust particles flight through the planetary atmosphere

Author: Mgr. Karol Havrila

Institution:

Comenius University in Bratislava

Faculty of Mathematics, Physics and Informatics

Department of Astronomy, Earth Physics and Meteorology

Section of Astronomy and Astrophysics

Tutor: doc. RNDr. Juraj Tóth, PhD.

Abstract: In the submitted thesis we focus on the research of objects originating from interplanetary matter, in the form of meteoroids, meteorites and dust particles. Laboratory analysis of interplanetary material provides us with an understanding of the processes associated with the origin, evolution, structure, and dynamics of planetary systems. This material research is associated with the need to effectively define the position of the object in the atmosphere, its impact on the Earth's surface and the subsequent collection of meteorites and dust particles. In the first part of the thesis, we focus on the selection of meteoric events in terms of the probability of the preservation of the material from the meteoroids after passing through the atmosphere. For this purpose, we work with the $\alpha - \beta$ *Calculator* program, which analyzes the passing of a specific meteoroid through the Earth's atmosphere and, based on the changes in its dynamic properties, defines the probability of meteorites and dust particles formation. Subsequently, we look into the dynamics of objects with realistic shapes in the dark phase of flight, taking into account resistance and wind field. To calculate the aerodynamic properties of the body, in the space of the Earth's atmosphere, we use the $\mu(m)$ -*Trajectory* program with a developed user interface. Finally, we simulate the dynamics of dust particles for the case of the Košice meteorite, in terms of volume and area concentration of particles, using a separate *KDE Calculator* program.

Keywords: meteoroids, meteorites, dust particles, dark phase of flight, particle concentration, drag coefficient, wind field.