New model of fireball atmospheric entry: clues to find and analyze meteorite droppers.

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The analysis and modeling of the atmospheric flight requires the detailed knowledge about meteoroid physical properties (most of which change along the flight), such as bulk and grain density, shape, mass, etc. A different approach to tackle this problem is based on dimensional analysis, scaling, and similarity laws. Thus, instead of using the average values as input data, all unknowns can be gathered into dimensionless parameters, retrievable from the observations with the help of inverse techniques. Such approach has been recently implemented in [1], [2] and [3]. In this report we describe several improvements to this model, including a possibility to correct calculations with account for the real atmospheric conditions. Furthermore we suggest several side applications of the introduced parameterization, such as, for example, determination of duration and the terminal height of the fireballs [4]. In order to demonstrate the applicability of the model, we have used archived data from the *Meteorite Observation and Recovery Project (MORP)* operated in Canada between 1970 and 1985 as well as selected recent fireball records [5]. Our next steps foresee fireball data processing obtained by the Finnish Fireball Network (FFN) and the Spanish Meteor Network (SPMN). The future scope of this model is to provide an efficient tool for planetary defense purposes, and to gain a better insight on meteorite physical properties and quantify the effects produced on these rocks during their atmospheric deceleration. Sample-return missions bringing back pristine samples of the solar system materials could be compared with meteorite samples recovered on Earth, thus, increasing our current understanding about the natural pathways of meteorite delivery to Earth.

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