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SIMULATION OF ASTEROID ENTRY BY SHEAR ABLATION EXPERIMENTS

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ABSTRACT

Ablation the most important physical behavior during asteroid entry, which largely determines the mass loss/shape change, flight trajectory, and even radiation

characteristics of the asteroid. For validation and correction of ablative models and observe typical ablation process, Shear ablation experiments were conducted in an arc heater to simulate the typical conditions of asteroid entry, which are extended from our former work of blunt-shaped test sample experiments. In this work, stony and iron meteorite material are machined in plate forms of 40×40×20mm, turbulent plate test method is adopted. The ablation process of test samples were clearly recorded, in which the melt flow of two different materials and the spallation of fragments as well as vaporization of basalt were observed. The evolutions of emission spectroscopy, recession profile and surface temperature profile during the whole process were acquired. The results indicate that the ablation phenomenon and the mechanism of mass loss of two materials are obviously different, the effective ablation enthalpy of the asteroid material under different conditions were estimated, the relation with the incoming flow condition was fitted, and the volume loss rate of meteorites from the assumed height of disintegration to the moment of landing was calculated.

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