Measuring the temperature of impact plumes from the analysis of lunar impact flashes

J.M. Madiedo (1,2), J.L. Ortiz (3),
(1) Departamento de Física Atómica, Molecular y Nuclear, Universidad de Sevilla, Spain, (2) Facultad de Ciencias Experimentales, Universidad de Huelva, Spain, (3) Instituto de Astrofísica de Andalucía , CSIC, Apt. 3004, 18080 Granada, Spain, (madiedo@cica.es)

Introduction

Different researchers have studied the impacts of meteoroids on the lunar surface by analyzing the flashes produced during these collisions (see e.g. [1] to [4]). In this way different parameters can be determined, such as the energy of the impactor, its mass, and the size of the resulting crater. From the frequency of these events, paramount information related to the impact hazard for Earth can be also derived [1, 5]. However, the detection of these impact flashes has so far been performed in the visible range. Our team started in 2009 a lunar impact flashes monitoring program named MIDAS [5], which is the continuation of the lunar impact flashes monitoring project started by the second author in 1999 [6]. Recently, in addition to the observations performed in visible band, we have also conducted a monitoring of the night side of the Moon in the near-infrared (nIR) by using a specific nIR filter. In this way, we can analyze the behaviour of these impact flashes in different spectral bands. The analysis of these events is providing the value of the emission efficiency for impact flashes in the nIR. Besides, the temperature of the impact plume, and the evolution with time of this temperature, can be obtained. Our results suggest that condensation gives rise to an equilibrium in the impact plume, and that the energy radiated as a consequence of the release of the evaporation energy leads to a prolongation of radiative response.

References

[1] Ortiz J. L. et al., 2006, Icarus, 184, 319.
[2] Madiedo J. M., Ortiz J. L., Morales N., Cabrera-Caño J., 2014, MNRAS, 439, 2364.
[3] Suggs R. M., Moser D. E., Cooke W., Suggs R. J., 2014, Icarus, 238, 23.
[4] Ortiz J. L., Sada P. V., Bellot Rubio L. R., Aceituno F. V., Aceituno J., Gutierrez P. J., Thiele U., 2000, Nature, 405, 921.
[5] Madiedo J.M., Ortiz J.L., Morales N., Cabrera-Caño, J., MNRAS, Vol. 439, pp. 2364-2369, 2014.
[6] Ortiz J. L., Aceituno F. J., Aceituno J., 1999. A&A, 343, L57.