Polarimetric Observations of Comet 67P/Churyumov-Gerasimenko During Its 2008-2009 Apparition

EDITH HADAMCIK[1], A. CHANTAL LEVASSEUR-REGOURD[1], ASOKE K. SEN[2], JEREMIE LASUE[3], RANJAN GUPTA[4]

[1]*UPMC Univ. Paris 06 / LATMOS-IPSL, BP 3, 91371 Verrieres-le-Buisson, France*
[2]*Assam Univ., Silchar 788001, India,* [1]

[3]*LPI, 3600 Bay Area Blvd, Houston, TX 77058-1113 USA*

[4]*IUCAA, Post Bag 4, Ganeshkhind, Pune-411007, India*
edith.hadamcik@latmos.ipsl.fr

Comet 67P/Churyumov-Gerasimenko is the main target of the ESA/Rosetta mission, with a rendezvous in 2014. It is important to optimize the mission to have information on the physical properties of the dust. Light scattering observations and especially linear polarization observations allow a comparison between different coma regions and different comets [1,2,3], including comets that have been studied by space probes e.g. [4].

Imaging polarimetric observations have been conducted two months before perihelion at IGO (India), three weeks after perihelion at OHP (France) and finally two months after at IGO. The intensity and polarization variations are studied through the different coma regions [5,6].

For the two first periods the coma is asymmetric with very steep intensity radial decrease (down to -1.5) mainly in the solar direction in agreement with previous observations 1982-83 and 1995-96. Two months after perihelion the coma is about isotropic with a radial decrease close to the nominal value -1. Before perihelion and two months after the aperture polarization values are comparable to polarization values measured on other comets at such phase angles.

The sharp radial decrease in intensity and the feature in the tailward direction without any difference in polarization in the coma before perihelion suggest the presence of large dark particles. The post-perihelion increase in intensity (about 2 magnitude) and in polarization (1 %) suggests the ejection of dust with different physical properties. More polarized structures than in the surrounding coma are noticed on the polarization maps with evolution of the structures in 24 h suggesting small micron or sub-micron-sized grains eventually included in fluffy aggregates. An important seasonal effect suggests that the different grains originate from different hemispheres of the nucleus.

Keywords: comet individual; polarization; observations; dust; Rosetta mission

References

[1] Sen A.K., Joshi, U.C., Deshpande, M.R., Prasad C/D/, Icarus 86, 248 (1990)
[2] Levasseur-Regourd A.C., Space Sci. Rev. 90, 163 (1999)
[3] Hadamcik E. and Levasseur-Regourd A.C., JQSRT 79-80, 661 (2003)
[4] Hadamcik E., Levasseur-Regourd A.C., Leroi V., Bardin D., Icarus 190, 459 (2007)
[5] Levasseur-Regourd A.C., Hadamcik E., Sen A.K., et al In: Icy bodies in the solar system, IAU 263, Cambridge University press, accepted.
[6] Hadamcik E., Sen A.K., Hadamcik E., Gupta R., Lasue J., AandA, submitted