

67P/Churyumov-Gerasimenko: the Rosetta Target Comet in the Aphelion Arc. C. Tubiana¹, H. Boehnhardt¹, M. Drahus¹, L. Barrera², J.L. Ortiz³, G. Schwehm⁴, R. Schulz⁴, J. Stuewe⁵, J.B. Vincent¹, ¹MPI fuer Sonnensystemforschung, Katlenburg-Lindau, Germany (tubiana@mps.mpg.de), ²UMCE, Santiago de Chile, Chile, ³Instituto de Astrofisica de Andalucia, Granada, Spain, ⁴ESTEC, Noordwijk, The Netherlands, ⁵Univ. Leiden, The Netherlands.

Introduction: ESA's Rosetta spacecraft will rendezvous with the Jupiter family comet 67P/Churyumov-Gerasimenko in 2014. Here, we present results from visible imaging and spectroscopy of 67P observed with the ESO Very Large Telescope in June 2004, May 2006, August 2006 and July 2007 when the comet was at $r \geq 4.6$ AU. A good knowledge of the activity and dust environment of 67P/Churyumov-Gerasimenko far from the Sun is essential for the planning of the rendezvous approach of the Rosetta spacecraft. Moreover, these observations contribute to improve our knowledge about the possible activity and dust environment of short period comets at large heliocentric distances.

The comet appears point-like at all observing epochs, indicating that no significant coma is present around the nucleus. From 67P images taken in May and August 2006 we determined a rotational period of the nucleus of 12.7047 ± 0.0011 h and a linear phase coefficient $\beta = 0.076 \pm 0.003$ mag/deg. We estimated the large-to-small axis ratio $a/b > 1.45 \pm 0.09$ and an effective nucleus radius of 2.38 ± 0.04 km, assuming an albedo of 0.04. No color variation with rotational phase is found, based on broadband color indices and reflectance spectra of the nucleus. The average V-R and R-I colors of the nucleus are found to be (0.54 ± 0.03) mag and (0.47 ± 0.03) mag, respectively and compare to a mean spectral reddening of $(11 \pm 2)\%/1000\text{\AA}$. The reflectance spectra of the nucleus of 67P display a reddening of rather constant slope of about $10\%/1000\text{\AA}$ and they do not show any absorption or emission features. These aforementioned results are confirmed by photometry and spectroscopy of 67P/Churyumov-Gerasimenko performed in July 2007.

The June 2004 observations were dedicated to the detection and characterization of the comet's dust trail. A trail-like structure of heavy grains is clearly detectable, displaying a surface brightness of ~ 28 mag/sarcsec in R filter. For the first time we determined also the visible colors of the trail-like structure: V-R = 0.95 ± 0.14 mag/sarcsec and R-I = 0.39 ± 0.14 mag/sarcsec. A trail like structure is also barely visible in the May 2006 images, but a quantitative study is not possible.