Optical Observations of Comet McNaught from La Silla.†

Colin Snodgrass[1], Alan Fitzsimmons[2], Emmanuël Jehin[3], Jean Manfroid[3], Damien Hutsemékers[3]. [1]European Southern Observatory, Chile (csnodgra@eso.org), [2]Queen's University Belfast, UK, [3]Université de Liège, Belgium

Comet C/2006 P1 (McNaught) has rightly earned the title of a 'Great Comet'; one so bright in the sky that such an occurrence could be expected once in a generation. Observers from both hemispheres saw the impressive tail as the comet passed within 0.3 AU of the Sun and became highly active, but those in the Southern Hemisphere got the most spectacular views after perihelion. We report on our optical observations from the European Southern Observatory's La Silla site, in Chile[1].

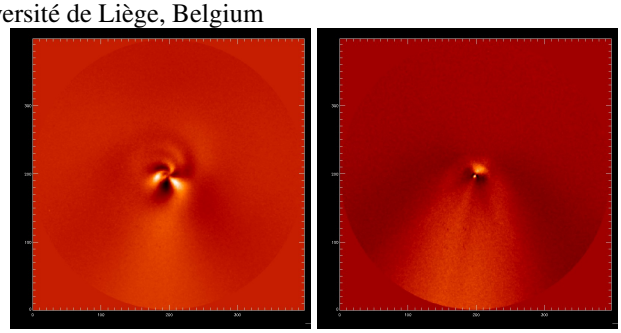

Figure 1: CN and dust L-S processed images (Jan 30th). The Sun direction is slightly to the right of up.

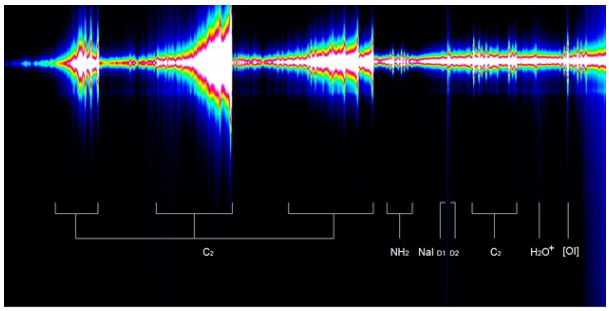

Figure 2: A long slit spectrum taken on Feb 3rd and covering the spectral range 450-650nm, showing prominent C2 emissions and also the extension of a number of lines in the anti-solar (tail) direction (downwards in this image), including the Sodium doublet.

Observations

Observations of the comet immediately after perihelion were difficult to make, as the comet was so close to the Sun. We took advantage of the unique abilities of the 3.6m New Technology Telescope at La Silla to observe the comet in twilight while it was at very low elevation. Beginning on the 27th of January 2007 (15 days after perihelion) we observed the comet right down to the 10° elevation limit of the NTT (∼half an hour of observations were possible each twilight[2]), until the 3rd of Feb. Further data were taken between the 25th and 28th of Feb. We used EMMI, the ESO Multi-Mode Instrument, to perform both imaging in broadband and narrowband cometary filters and spectroscopy in both low resolution long slit mode and high resolution (Echelle) mode. A total of 210 exposures were taken.

Imaging

We imaged the central region of the coma in both broadband (BVR) filters and also 6 narrowband cometary filters: four centred on the emission lines of CN at 386nm, C3 at 405nm, C2 at 510nm, and NH2 at 662nm, and also blue and red dust continuum at 441 and 683nm. Fig 1 shows the resulting images tracing the gas (CN) and dust (blue continuum), which have been processed using the Larson-Sekanina algorithm[3]. At least three jets are visible in the CN image, while the dust shows a Sunward fan. We have a sequence of images showing the jets at different times, and they are seen to change, presumably with the rotation of the nucleus, although a rotation period has yet to be found from these data.

Spectroscopy

Echelle spectra obtained on Jan 29 revealed very strong emissions of the Na I doublet at 589 nm. Mid resolution ($R_S \approx 1000$) long slit spectra (Fig. 2) covering 450-650nm show spatially asymmetric Na I lines in the inner coma (excess in the sunward direction for about 4500 km and along the anti-sun direction over the full extent of the CCD frame, about 100" or 80,000 km). This rather constant emission is not present in the spectra taken with the slit aligned perpendicular to the tail. This is most probably due to the existence of a Na I tail like the one observed for Hale-Bopp[4]. In later spectra the Na I emision was much fainter, and it was not present at all by the end of February.

Notes/References

[1] The first epoch results were published in CBET 832.

[2] We thank M. Hamuy, M. Jones, E. Unda-Sanzana and M. Schirmer for allowing us to carry out these observations during the twilights of nights allocated to their programmes.

[3] Larson, S. & Sekanina, Z., AJ 89, 571 (1984)

[4] Cremonese, G., et al., ApJL 490, 199 (1997)

† ESO programmes 278.C-5045 and 278.C-5051