Photometry and Imaging of Comet LINEAR (2000 WM1)

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5 June 2002

Keywords: Comet, Narrowband photometry, Imaging, C/LINEAR (2001 WM1), C/2000 WM1

We present preliminary results from our on-going observational campaign of Comet LINEAR (2000 WM1). These ground-based observations include both narrowband photometry and CCD imaging. We began monthly photometric observations of LINEAR in August 2001 ($r_{\rm H}$=2.7 AU) using the Hall 1.1-m telescope at Lowell Observatory. These continued from Lowell until mid-December, when LINEAR became a southern hemisphere object and observations began from the 0.6-m Planetary Patrol telescope at Perth Observatory. Production rates for the measured gas species and for dust (see A'Hearn *et al.* 1995 for model parameters) are shown in Figure 1 for dates ranging from 23 August 2001 to 11 January 2002, only eleven days prior to perihelion (0.56 AU). Our most recent production rate for OH was obtained on 13 December (1.05 AU), with a Haser value of 3.8×10^{28}mol/s, corresponding to a vectorial equivalent water production rate of 5.2×10^{28}mol/s. (The near-UV OH and NH bands are not measured from Perth due to its relatively low elevation.) The $r_{\rm H}$-dependence of water closely follows a standard ice vaporization model (cf. Cowan and A'Hearn 1979), and the water production implies an effective active area of 10 km^2. This corresponds to a lower limit of the effective nucleus radius of about 0.9 km. Relative abundances of the minor species yield a classification of "typical" in the A'Hearn *et al.* (1995) database.

The apparently anomalous behavior of dust production with distance shown in Figure 1 is actually a consequence of phase angle effects. The phase angle varied between 21° and 26° from August to October, decreased to 15° during the November observations, and reached 72° in December. Therefore, enhanced backscattering at small phase angles contributes to the high values in November near 1 AU. However, the primary cause of the artificially high values in November is LINEAR's strong dust tail, shown in Figure 2. At small phase angles, the tail is nearly behind the coma and therefore partially within the photometer's entrance apertures. The measurements obtained at large phase angles in December are, therefore, more representative of LINEAR's actual dust production. This research is supported by NASA.

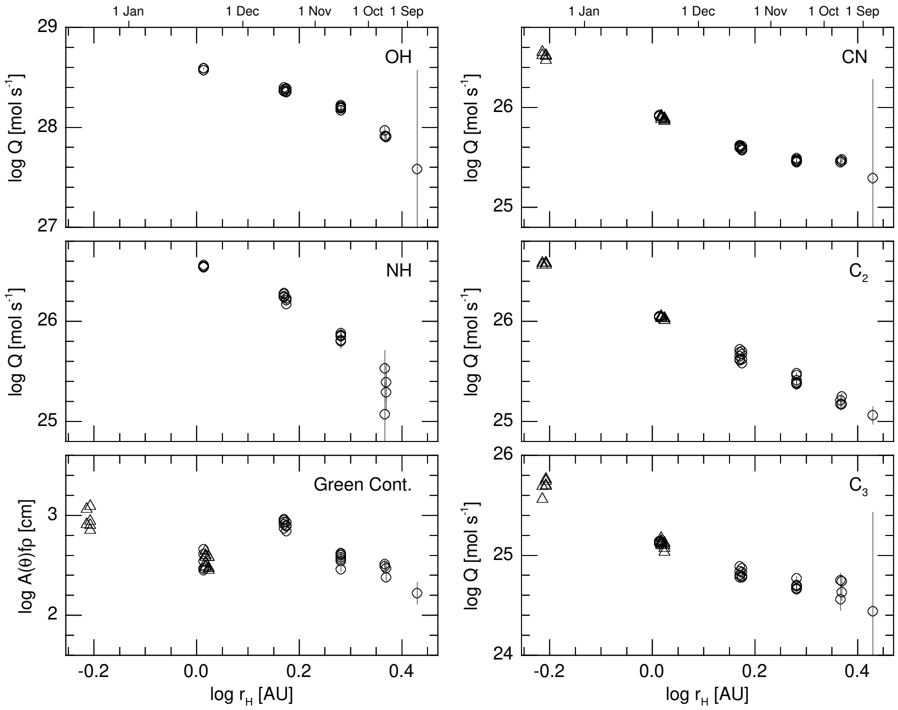

Figure 1. Log of gas production rates and log $Af\rho$ (a measure of dust production) at $\lambda 5260$ plotted as a function of the log of heliocentric distance. Monthly observations from Lowell Observatory are shown as circles, while triangles represent observations obtained from Perth Observatory. The apparent decrease in dust production in December near 1 AU is a consequence of artifically high apparent dust production values in November and early, when the comet was at smaller phase angles.

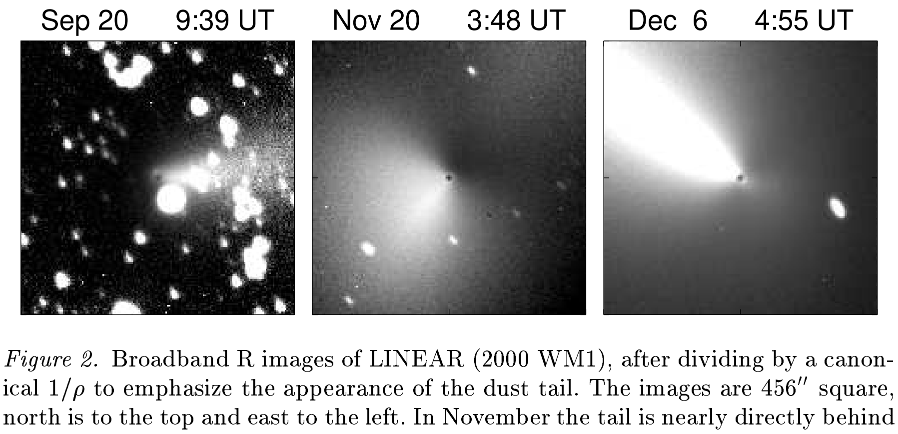

Figure 2. Broadband R images of LINEAR (2000 WM1), after dividing by a canonical $1/\rho$ to emphasize the appearance of the dust tail. The images are $456''$ square, north is to the top and east to the left. In November the tail is nearly directly behind the photo-center because of the small phase angle.

References

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