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# SUPERHUMPS IN THE 2003 UV Per SUPEROUTBURST

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UV Per, $\alpha$=02$^{h}$10$^{m}$08$^{s}$.25 $\delta$=+57°11′20″.6 (J2000), is a UGSU system with a magnitude range of 11.7V - 17.9V (Downes, 2003) and a variable and long supercycle. On Nov 03.810 (JD2452947.31) Schmeer observed UV Per's location and did not detect it to a limiting visual magnitude of 13.6. The next day it was detected in outburst by P. Schmeer on November 04.767, 2003 (JD2452948.267) UT at visual magnitude 11.5. Schmeer notified the AAVSO and an automatic notice was sent out to observers within 10 minutes (Price, 2003). Superhumps were first reported by A. Oksanen in observations that began on JD2452951.3330.

A total of 11,545 CCD observations were made during the decline of the superoutburst and reported to the AAVSO. Photometry was done by the individual authors and includes the application of flat and dark frames. Statistical uncertainty varies by observer and time and is available with the raw data by request to AAVSO Headquarters.

UBVRI field calibration was performed on multiple nights using the USNO-FS 1.0m telescope along with a large set of Landolt standards of wide color and airmass. In Table 1 we present the comparison stars used by observers and their V-R colors used to minimize the possibility that they may be variable. A complete table of field stars, including complete UBVRI data, is given in 5488-t3.txt.

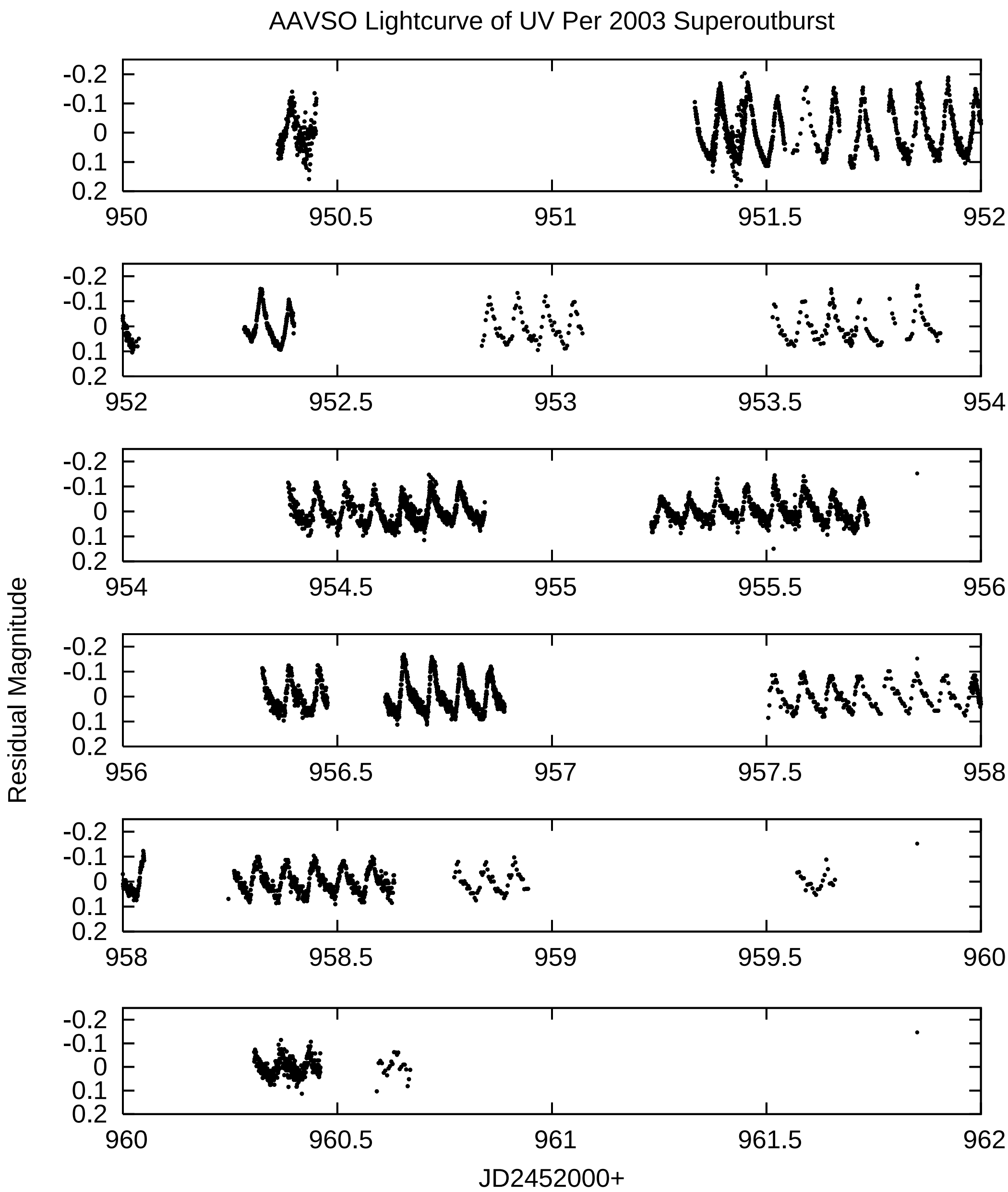


**Figure 1.** Light Curve of 2003 UV Per Superoutburst With Long Term Variation Removed

| *GSC ID* | $V$ | $V - R_c$ | $V$ error | $V - R_c$ error |
|---|---|---|---|---|
| 3693-2068 | 10.981 | 0.213 | 0.058 | 0.032 |
| 3693-1862 | 12.715 | 0.260 | 0.013 | 0.014 |
| 3693-1760 | 13.309 | 0.821 | 0.018 | 0.017 |

Table 1: Comparison Star Photometry

A linear fit was applied to the datasets from each separate observing session to remove the overall fading behavior and zero point differences between filtered and unfiltered observers. The combined data were then put through a Date-Compensated Discrete Fourier Transform (Ferraz-Mello, 1981) and the results refined with the CLEAN algorithm (Foster, 1995). The analysis reveals an average superhump period of 95.92±0.006 minutes ($2\sigma$). In addition, we analysed AAVSO data from the previous superoutburst in December 2000 using the same technique and detected a superhump period of 95.83 ± 0.12 minutes.

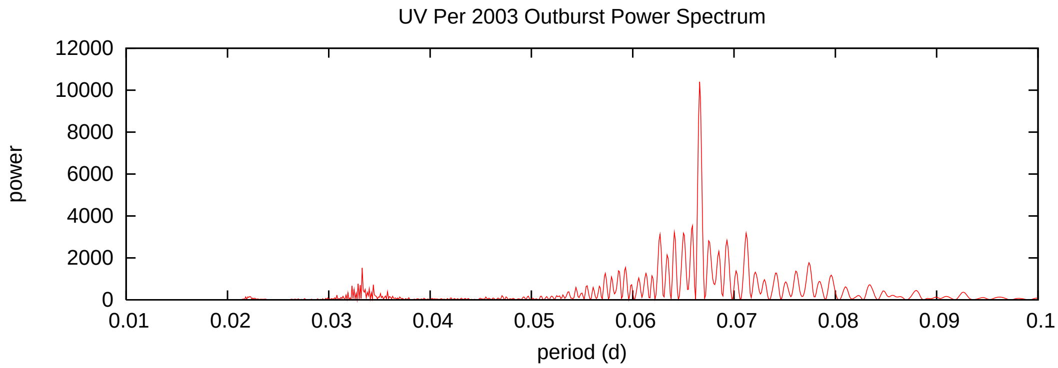


**Figure 2.** DCDFT & CLEAN Power Spectrum

A period of 95.63 ± 0.05 minutes has been previously published for the 1989 superoutburst. (Udalski, 1992) Timings of maxima were used to derive the 1989 superhump period and may explain the difference in results with our CLEAN algorithm which was specifically designed to mitigate the effect of gaps in the data. In addition, the quantity of data available now is much greater than that from the 1989 outburst, which consisted of 11 superhump cycles over a four-day period while this data set includes 71 cycles over a ten-day period. Finally, the superhump period of UV Per could be increasing in each supercycle.

Wavelet analysis (Foster, 1996) detects an increase in the superhump period of 0.001 minutes per day beginning from JD2452951 to JD2452956. Then the superhump period decreases by an average rate of 0.095 minutes per day from JD2452956 to JD2452961. Udalski and Pych did not detect a superhump period change in their data. The analysis also revealed an average amplitude decline of 3.13% per day for JD2452956 - JD2452961.

Visual and CCD observations following the outburst detected a period of post-superoutburst brightening.

Additionally, we have calculated a supercycle of 871±379 days determined by averaging the last 19 superoutbursts in the AAVSO International Database since March 19, 1963 (JD2438108) and using the standard deviation as uncertainty. This projects to the next superoutburst window being March 10, 2005 (JD2453440) and April 7, 2007 (JD2454198).

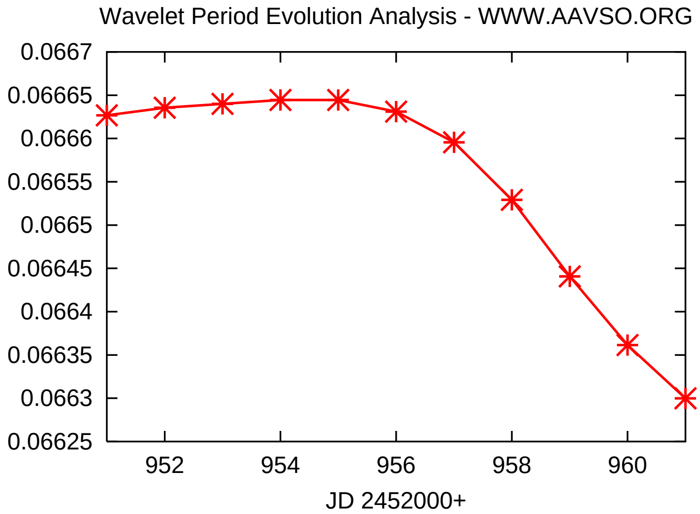


**Figure 3.** Wavelet Period Change Analysis

| *JD* | *Mag* | *Method* | *Observer* |
|---|---|---|---|
| 2452965.692 | 15.7 | CCDV | Goff, Bill |
| 2452966.2472 | <14.1 | Visual | Muyllaert, Eddy |
| 2452966.335 | 13.5 | Visual | Anderson, Bill |
| 2452966.4424 | 13.7 | Visual | Chaple, Glenn |
| 2452966.7694 | 13.5 | Visual | Scott, Tracy |
| 2452967.531 | <15.3 | Visual | Poyner, Gary |
| 2452967.8194 | 15.7 | CCDV | Royer, Ron |

Table 2: Observations of Post-Superoutburst Brightening

However, if past observations from JD2442119.53 - JD2444678.3 are removed because the superoutbursts could have been missed due to the solar gap, we calculate a supercycle of $758 \pm 134$ days which projects to the next superoutburst window being July 20, 2005 (JD2453572) to April 14, 2006 (JD2453840).

All data is available by sending a request to the AAVSO at `aavso@aavso.org`.

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