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LARGE-AMPLITUDE IRREGULAR VARIABLE V559 Lyr

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V559 Lyr is a variable star discovered by Takamizawa (1998) as TmzV32. Takamizawa (1998) noted little variation between 1994 and 1997, but reported a deep fading by $1\overset{\mathrm{m}}{.}7$ in 1998 March. The object was then considered as a possible eclipsing variable, and its suggested classification was taken over in the 75th Name List of Variable Stars (Kazarovets et al. 2000). One of the authors (T. Kinnunen) noted a gradual rise until early 1999, which made this classification unlikely. Since the sudden fade and gradual rise looked more characteristic of an R CrB-type star, we called for an intensive observing campaign through VSNET Collaboration (http://www.kusastro.kyoto-u.ac.jp/vsnet/).

The observations were taken photographically by Takamizawa and visually by four observers. Takamizawa used twin patrol cameras equipped with $D = 10$ cm $f/4.0$ telephoto lens and unfiltered T-Max 400 emulsions. Visual observations were done with 44.5-cm, 20-cm, 30-cm and 40-cm reflectors by Kinnunen, Nakatani, Itoh and Sato, respectively. All observations used GSC magnitudes for comparison stars. Calibration of GSC magnitudes in this field, using Tycho-2 V-magnitudes, has yielded a negligible scatter and zero-point error (typically less than $0\overset{\mathrm{m}}{.}2$). The overall uncertainty of estimates will not exceed $0\overset{\mathrm{m}}{.}4$, which will not affect the following discussion. The total number of positive estimates was 156.

The overall light curve based on these observations is shown in Figure 1. A well-observed sudden fading between JD 2451250 and 2451300, following the slow rise (JD 2450900–2451250, mentioned above), is evident. Although the light curve became more complex after that, the general tendency of fadings and slower recovery is not inconsistent with an R CrB-type variation. We took a low-resolution spectrum with a 1.88-m telescope at Okayama Astrophysical Observatory (OAO) on 2000 April 29. The dispersion was 5.9 Å/pixel. The reduction was done with IRAF (IRAF is distributed by the National Optical Astronomy Observatories), using the flux calibration standard of Feige 34. The spectrum

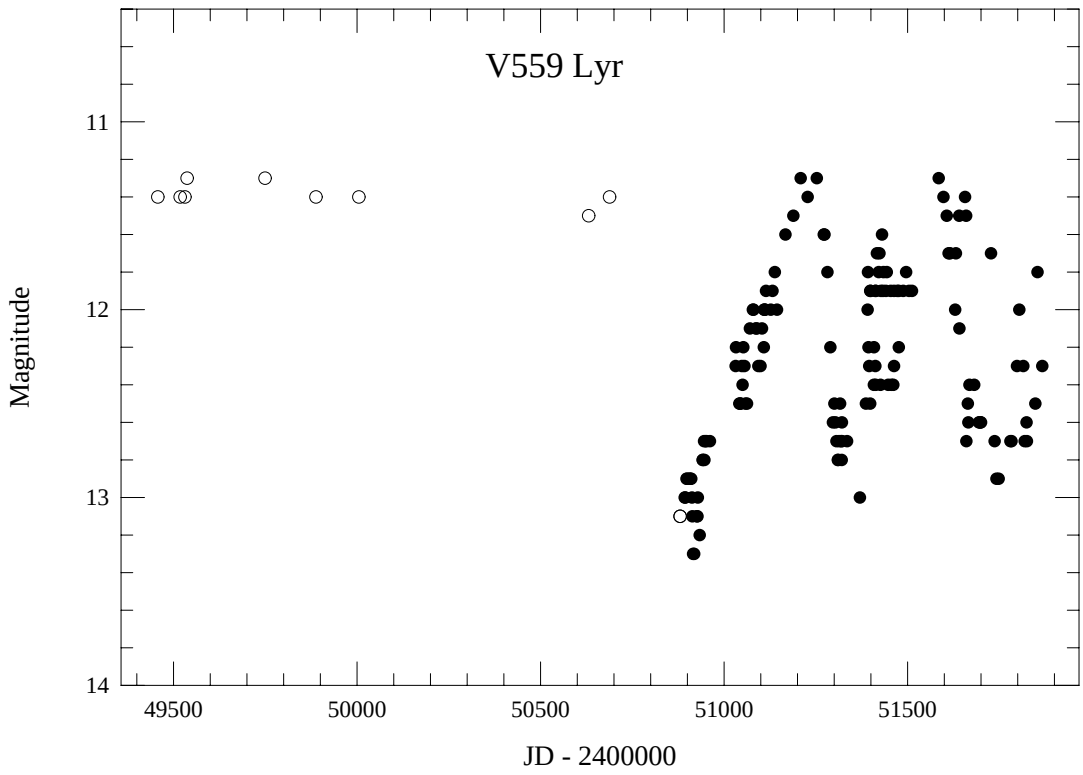

Figure 1. Light curve of V559 Lyr. Open and filled circles represent photographic and visual observations, respectively

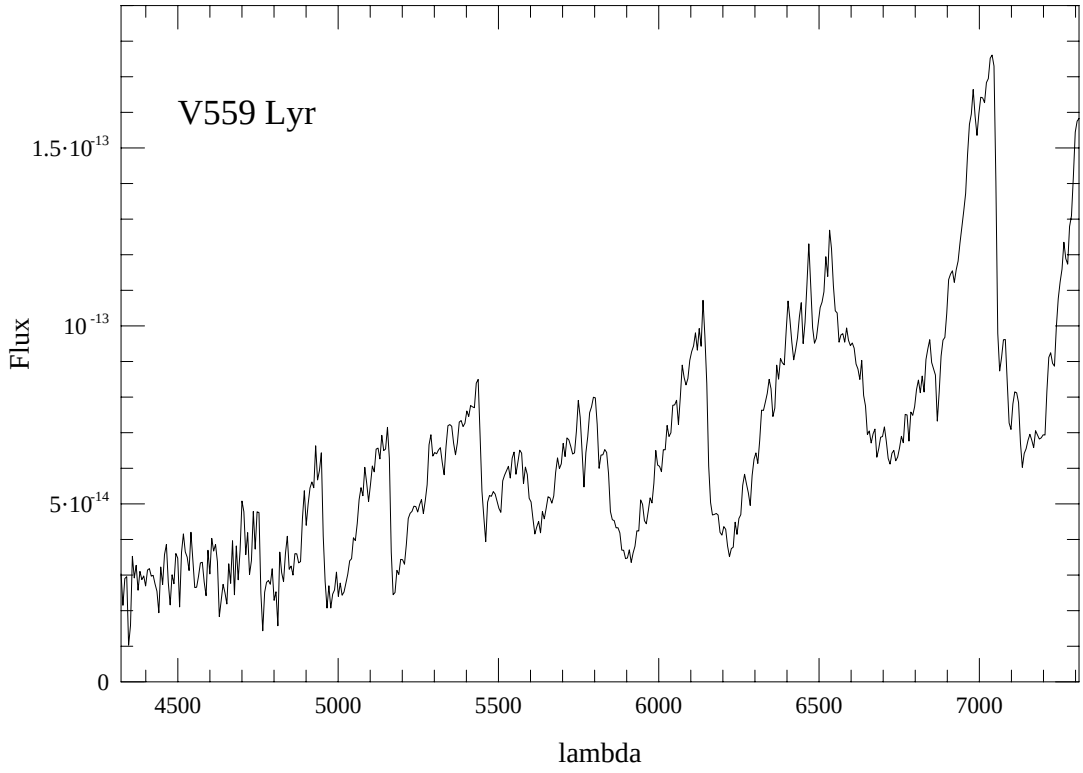

Figure 2. Spectrum of V559 Lyr. The unit in flux is erg s^{-1} cm^{-2} Å^{-1}

is shown in Figure 2, which clearly shows an M-type spectrum with TiO absorption features. The overall feature of the spectrum is consistent with a normal M 3-5 III star. The spectrum is inconsistent with the R CrB-type classification, and the star is most likely a large-amplitude irregular L-type variable star.

Large-amplitude L- and SR-type stars are relatively rare and, some of them are cool carbon-rich stars which are considered to occasionally produce dusts. Some stars, like V517 Oph (Kilkenny et al. 1992) and DY Per (Alksnis 1991, 1994) are sometimes considered as intermediate stars between R CrB stars and hydrogen-rich L- and SR-type stars (for a review, see Clayton 1996). Such stars may be analogous to R CrB-type stars in the mechanism of occasional deep fadings, but the case is not yet clear for V559 Lyr. More detailed observations of the chemical composition are therefore needed. It is noteworthy that this variable was included in the ROTSE test field (Akerlof et al. 2000), but the object was not picked up as a variable star. Since ROTSE observed the field since 1998, the object should have shown considerable variation during this period. A retrospective study on the ROTSE data may reveal more details of the variability of V559 Lyr.

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References:

Akerlof, C., Amrose, S., Balsano, R., Bloch, J., Casperson, D., Fletcher, S., Gisler, G., Hills, J., Kehoe, R., Lee, B., Marshall, S., McKay, T., Pawl, A., Schaefer, J., Szymanski, J., Wren, J., 2000, *AJ*, **119**, 1901

Alksnis, A., 1991, *IAUC*, No. 5400

Alksnis, A., 1994, *Balt. Astron.*, **3**, 410

Clayton, G. C., 1996, *PASP*, **108**, 225

Kazarovets, E. V., Samus, N. N., Durlevich, O. V., 2000, *IBVS*, No. 4870

Kilkenny, D., Lloyd Evans, T., Bateson, F. M., Jones, A. F., Lawson, W. A., 1992, *Observatory*, **112**, 158

Takamizawa, K., 1998, *VSNET observations*, No. 10379 (available from http://www.kusastro.kyoto-u.ac.jp/vsnet/Mail/obs10000/msg00379.html)