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Photometric study of SN2014J type 1a supernova

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The characteristic tight relation between peak luminosity and the brightness decline rate of type 1a supernovae was tested in this research from an empirical method by validating the distance to the M-82 host galaxy of SN2014J type 1a supernova, which occurred in January 2014, using the long term photometry data of observed SN2014J available at the American Association of Variable Stars Observers (AAVSO). From the light curve generated through these data, the apparent B (B_{\max}) band magnitude and V (V_{\max}) band magnitude at the peak luminosity were determined as 11.74 ± 0.15 mag. and 10.50 ± 0.05 mag, respectively. The light decline rates 15 days after the peak luminosity in V and B bands, Δm_{15B} and Δm_{15V} , were calculated as 1.03 ± 0.15 mag/day and 0.66 ± 0.05 mag/day respectively. The empirical method which utilizes the above mentioned peak luminosity – light decline rate relationship was used to determine the peak absolute magnitudes of SN2014J for eliminating the interstellar and circumstellar origin of observed extinction through color excess, $E(B-V)$. The color excess, $E(B-V) = 1.10 \pm 0.20$ mag, was derived from the peak absolute magnitudes of B,V bands which calculated as -19.36 ± 0.01 mag and -19.50 ± 0.01 mag respectively. The distance to the host M82 galaxy was then estimated as 3.54 ± 0.31 Mpc (Mega Parsecs). The results obtained here further establish that the type 1a supernovae can be used as standard candles of measurements for extragalactic distances.

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