BVRI photometry of SN 2011fe in M101 from the RIT Observatory

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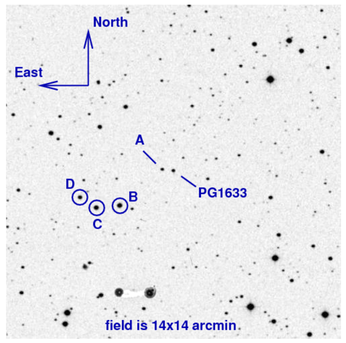
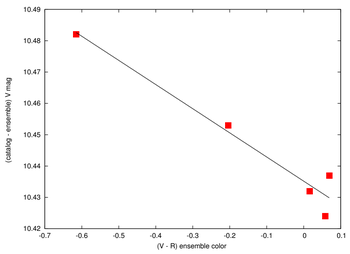
On August 24, 2011 the Palomar Transient Factory announced the discovery of PTF11kly in M101, which was soon confirmed to be a young Type Ia supernova. This is the closest Type Ia supernova since 1972. Astronomers everywhere have scrambled to acquire data on what promises to be one of the best–studied supernovae ever.

Beautiful color CCD image by Rick Johnson (not at RIT)

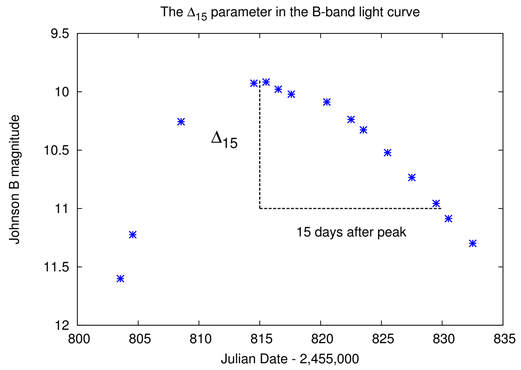
We use aperture photometry to measure the light of the SN and nearby comparison stars. Since the SN is at this stage much brighter than the surrounding light from M101, this simple approach is reasonable. We calibrate our measurements using BVRI photometry of stars in the field from the AAVSO. We used observations of the Landolt field PG1633 (below on left) to compute the first–order color terms which bring our instrumental measurements onto the Johnson–Cousins system.



Color term in V vs. (v–r)



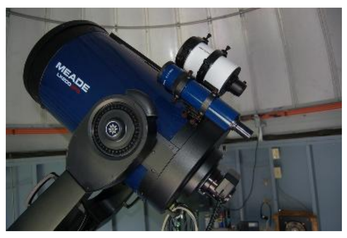
V = v – 0.077(v–r) + zp



Phillips (ApJ 413,L105, 1993) was the first to describe the correlation between the rate at which a supernova declines after maximum and its absolute luminosity. One way to characterize this property is the decline in mag during the 15 days after maximum light. Our light curve in the B–band yields a drop of 1.17 mag. Using the relationship shown in Prieto, Rest and Suntzeff (ApJ 647, 501, 2006) this suggests that SN 2011fe had an absolute magnitude of M(B) = –19.27.

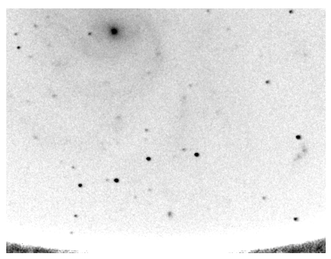
Combining that with the peak apparent mag m(B) = 9.92 yields a distance modulus (m – B) = 29.04, close to the recent Cepheid distance measurement of Shappee and Stanek (ApJ 733, 124 , 2011)

The RIT Observatory is located on the RIT campus, about 5 miles southwest of downtown Rochester. We have observed SN 2011fe with the 12–inch Meade LX200 telescope inside the dome shown above. Our CCD camera is an SBIG ST–8E with BVRI filters.



Our standard procedure for observing the supernova is to take a series of 15 images in B, 10 images each in VRI. Each image is an unguided 60–second exposure (there are no stars which fall into the small guiding chip on our camera). We reduce the raw images using master darks created from the median of 10 60–second exposures and master flatfields created from the median of 10 images in each filter of the twilight sky.

UT Aug 26 stack of 5x60 R–band images First night of observation at RIT Obs



UT Sep 11 60–second R–band image The SN is near its maximum brightness