Preliminary analysis of Loiret/Boccherini
SCP/FROGS' Note

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1 Preliminary analysis of SN2001gn

1.1 Photometric measurement

Using the images coming from the search at CFHT and from the follow up at HST, we performed the first analysis of SN2001gn in I band.

The presence of the host galaxy under the supernova forced us to find a way to determine its contribution. As no reference image was available at the moment of this analysis, we had to estimate this contribution using only images containing both host galaxy and supernova.

Moreover, the PSF of the WFPC2 (Wide Field Planetary Camera) is undersampled and the galaxy is unresolved, then it was impossible to build a realistic analytic model of the galaxy.

Finally, we decided to build a model of the galaxy using the last image (where the galaxy represents more than 90% of the flux). The procedure was the following: we subtracted a $PSF * flux$ to the last image at the position of the supernova and adjusted the flux to obtain a smooth galaxy. Figure 2 shows the last image before and after the subtraction of the PSF.The PSF model was constructed using the Tiny Tim PSF generator (see Krist[2]).

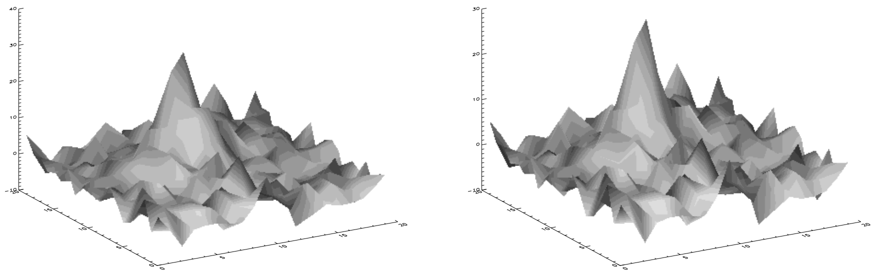

Figure 1: Last image of SN2001gn before and after the subtraction of the supernova

From this point, we estimated the flux of the system supernova+galaxy, the flux of the model within the same aperture losses and subtracted these fluxes to obtain an estimation of the supernova flux at each period. Fluxes were finally corrected for aperture (8%) and charge transfer efficiency (4% correction).

The first two photometric point of the lightcurve from CFHT search images were constructed considering a negligeable contribution from the galaxy on the reference image (from march 30th) using standard subtraction analysis. These points have permitted the construction of the instrumental lightcurve.

1.2 Construction of the model

We wanted to construct lightcurve models to reproduce instrumental fluxes obtained during the photometric analysis. With this aim in view, we build a model by convolving instrumental transmission of the instrument (accounting for telescope transmitance, camera efficiency and filter) for every telescope (CFHT and HST in SN2001gn case) with Peter's template spectra of type Ia supernovae suitabily redshifted.

This simulation has been tested using Vega spectra, we checked that we were able to reproduce Vega zero points presented by Holtzman[1] for every filter used.

1.3 Fit of the lightcurve and results

The last step was the fit of models to intrumental photometric points to estimate the lightcurve parameters: the date of the maximum of luminosity, the flux at this maximum and the stretch factor. In this way, we built a model of lightcurve for every telescope and every filter used and fitted simultaneoustly the parameters. The result is presented on Figure 3. For convenience, the figure exhibits HST F814W filter Vega magnitude.

Finally, we correct this result accounting for Galactic extinction (0.06 mag from Schlegel[3]). We measured the magnitude at max of SN2001gn to be $I_{F814W} = 24.33 \pm 0.18$ considering an intrinsic dispertion of type Ia supernova (0.17 mag). This magnitude is only 1σ fainter than expected from the standard cosmology ($\Omega_M = 0.28$ and $\Omega_\Lambda = 0.72$).

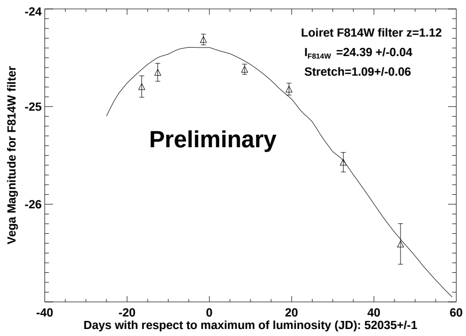

Figure 2: Lightcurve of SN2001gn using Vega magnitude for F814W HST filter. The two first points have been taken with the cfh12k, the 5 last ones with the WFPC2 at HST. For convenience, the two discovery points taken have been expressed in F814W filter magnitudes.

References

1. J. Holtzman, *PASP* **107**, 156 (1995).
2. J. Krist TINY TIM: An HST PSF Simulator, , Astronomical Data Analysis Software and Systems II, A.S.P. Conference Series, Vol. 52, 1993.
3. D. Schlegel, D. Finkbeiner, & M. Davis *APJ* **550**, 525 (1998).