

# Offline analysis of SNLS data

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(Vincent Luset)

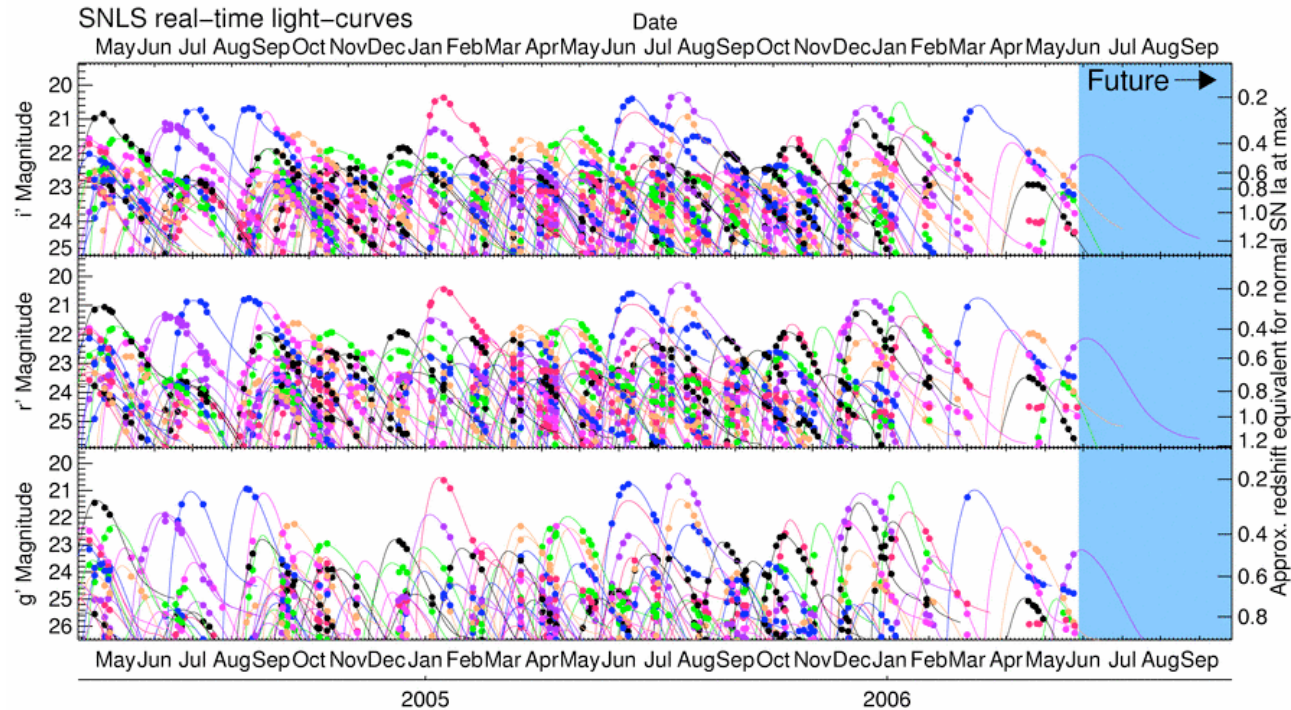
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## Real-time rolling search



Canada

+

France



Astier et al.,  
A&A 447 (2006) 31

## Offline chain

- Aim** Different image processing, photometry & analysis  
Additional supernova events
- Data** Terapix T0003 + scamp (alignment) + swarp (binning)

# Offline detection chain

Initial version (v1)  
(V. Lusset PhD thesis, May 2006)

Improved version (v2)  
(G. Bazin PhD thesis)

Image subtraction

Upgraded  
(kernel estimate, image cleaning)

Event detection  
(on individual subs)

Stacking of all subs in a run  
Detection on stacks

PSF fit photometry on subs

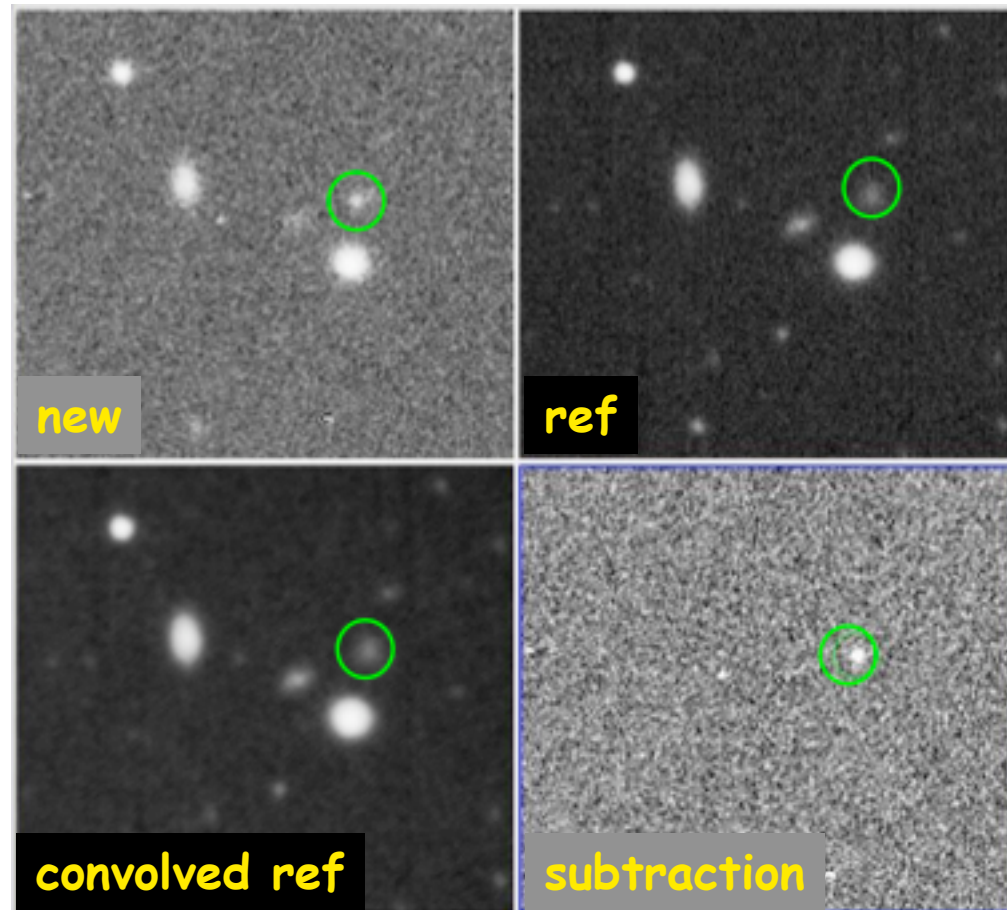
Upgraded  
(improvement of PSF profile,  
local background)

# Detection of variable objects (1/2)

03D1ax, z=0.50

Image subtraction  
with Triton  
(L. Le Guillou, PhD 2003)  
modified for CFHTLS

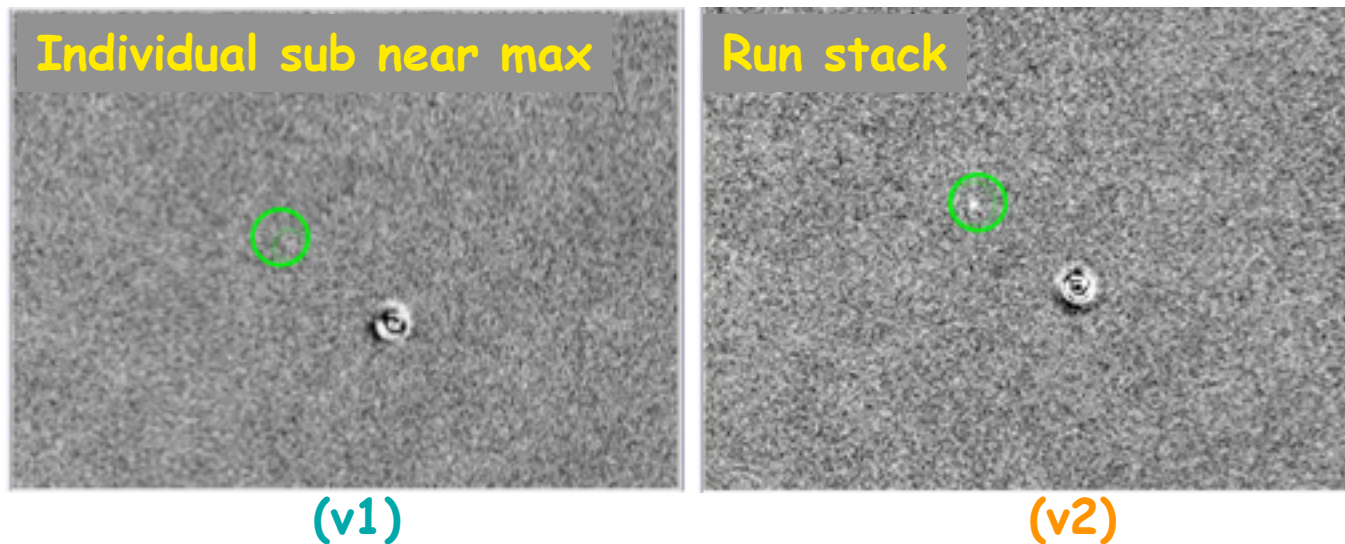
based on technique of  
Alard & Lupton, 1998



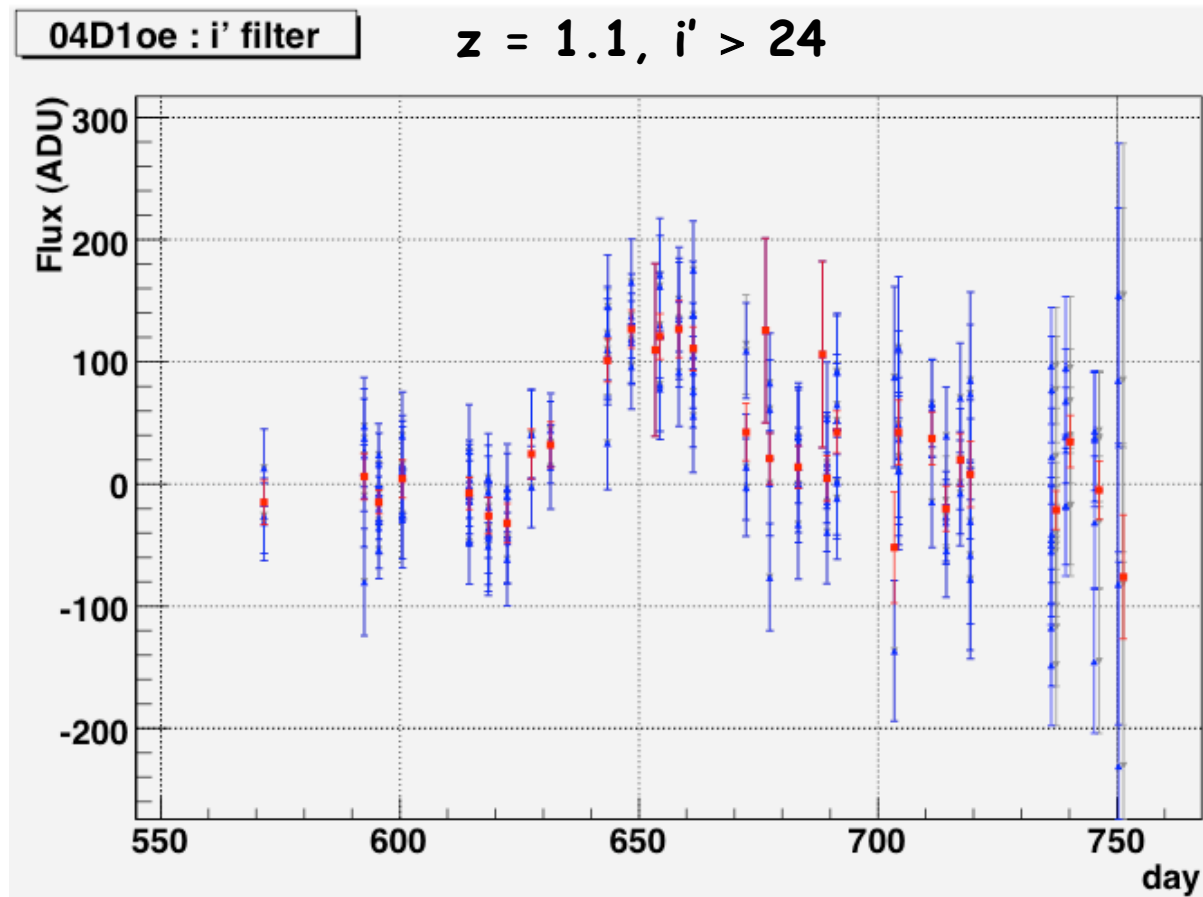
# Detection of variable objects (2/2)

Improved S/N by run stacks (~25 images)

04D10e (SNIa?),  $z = 1.1$ ,  $i' > 24$



# Photometry (1/3)



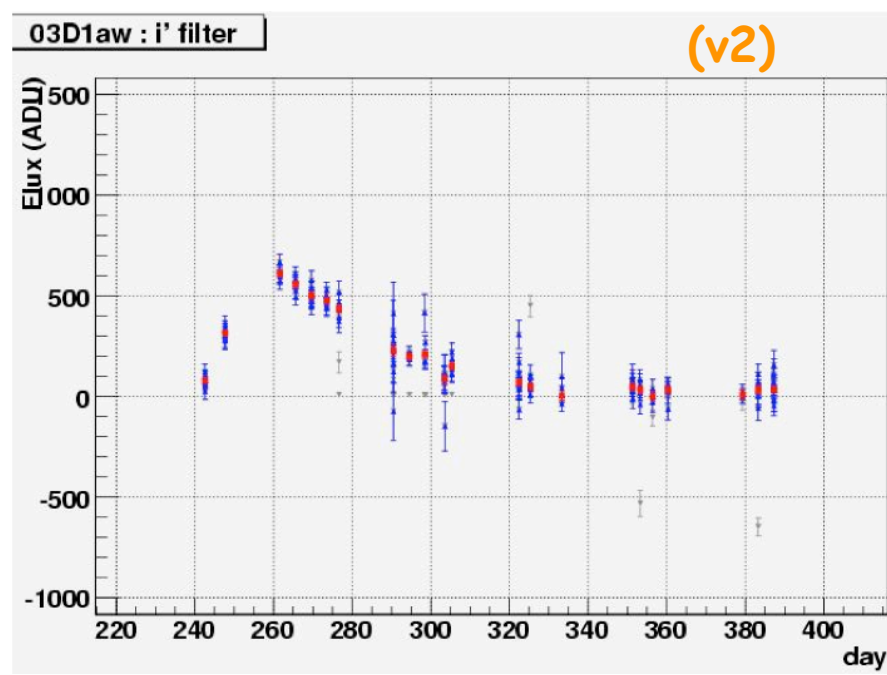
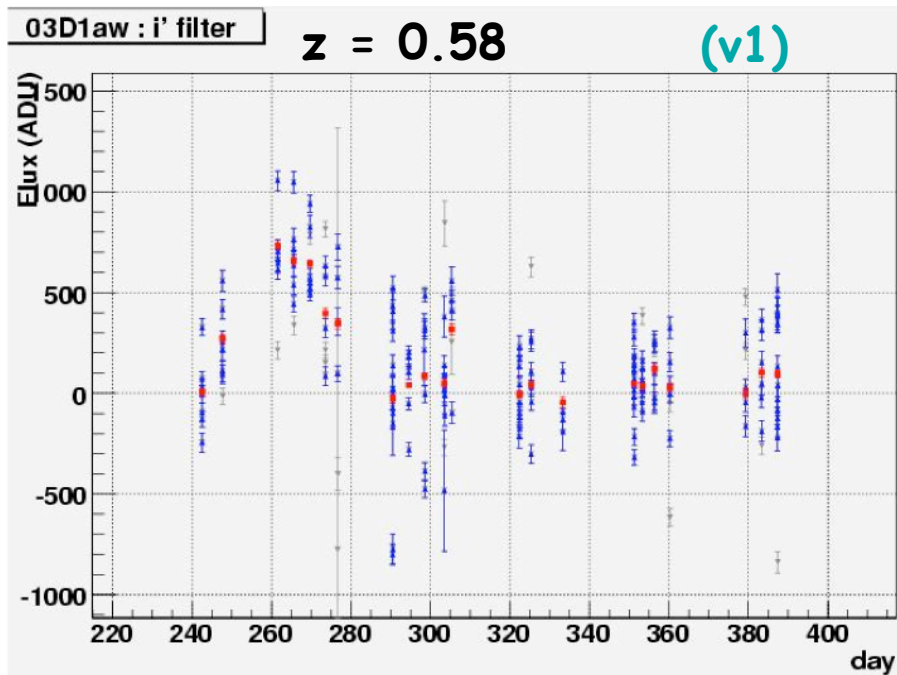
PSF fit (Triton)



# Photometry (2/3)

Improvements on

- Image cleaning (ref & new)
- Optimized kernel for ref convolution
- Improved PSF profile (stars)
- Local background

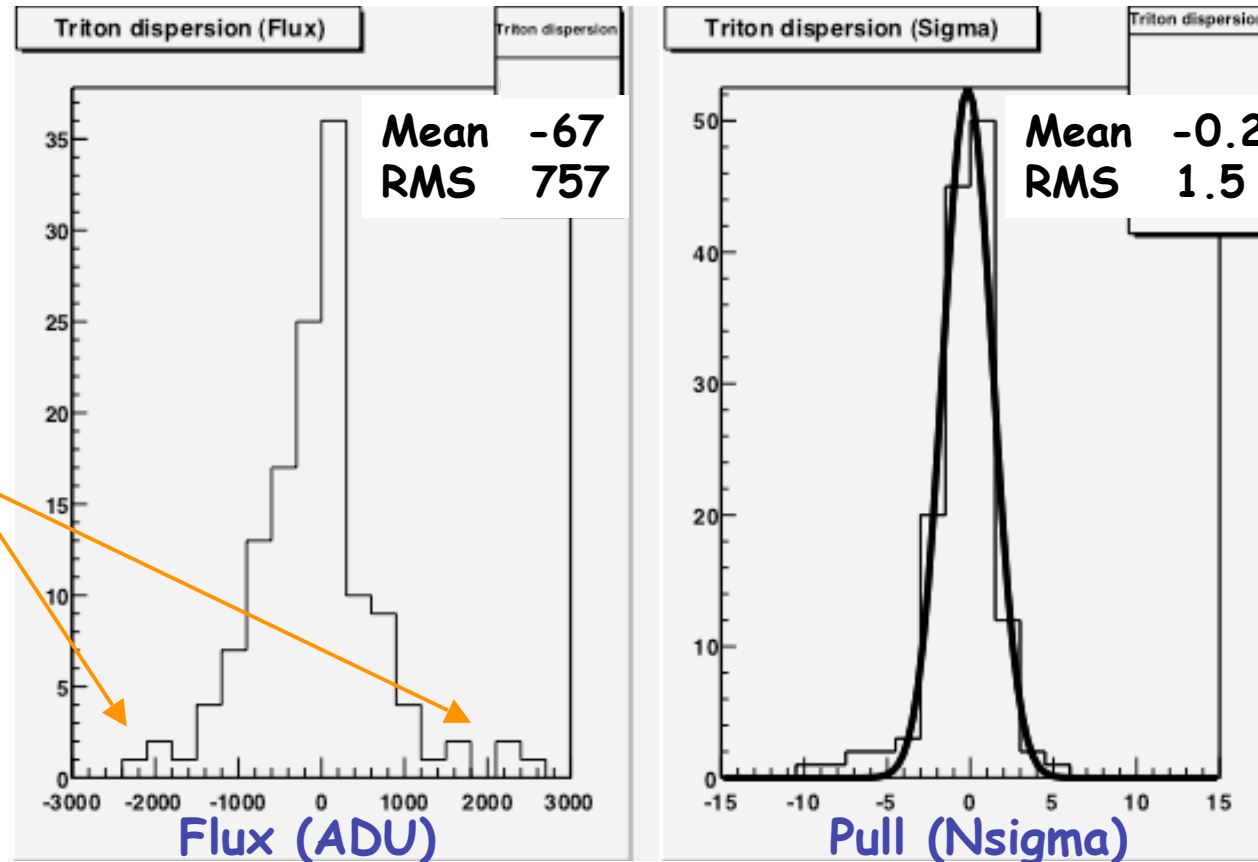


# Photometry (3/3)

$$\text{Residuals} = \text{flux} - \text{SN model}$$

Subs  
affected by

- bright host
- fringe residuals



11 SN  
D1  
1 year



# Analysis (ongoing work)

## Initial version (v1)

Monochromatic (i') selection

Official g'r'i'z' photometry

SN photometric redshift

SALT\*  $\chi^2$  map vs. redshift

$\Delta z/(1+z) = 0.02 - 0.05$

(depending on z range)

SALT fit at zphot on lightcurves

Final selection

## Planned (v2)

Multi filter (g'r'i'z') selection

SALT\* 2

(\* J. Guy et al., 2005)

$\Delta z/(1+z) = 0.02$  whatever z

= 0.01 (gaussian fit)

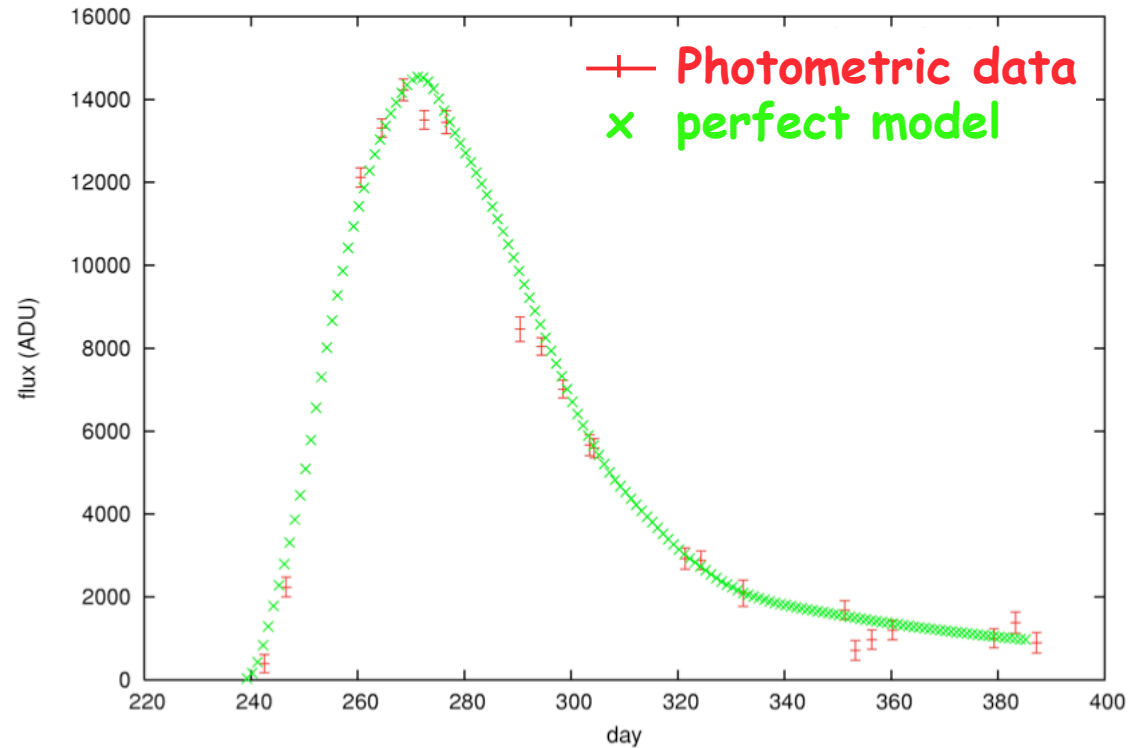
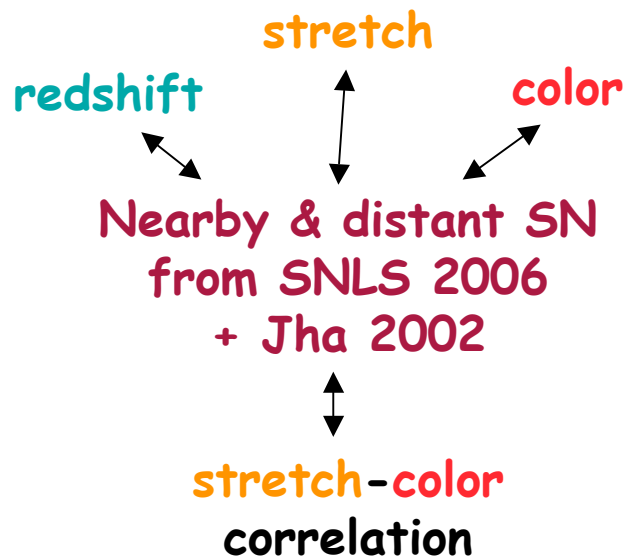
same

+ efficiency estimation  
(image & light curve simulations)

+ contamination (Ib/Ic) estimation

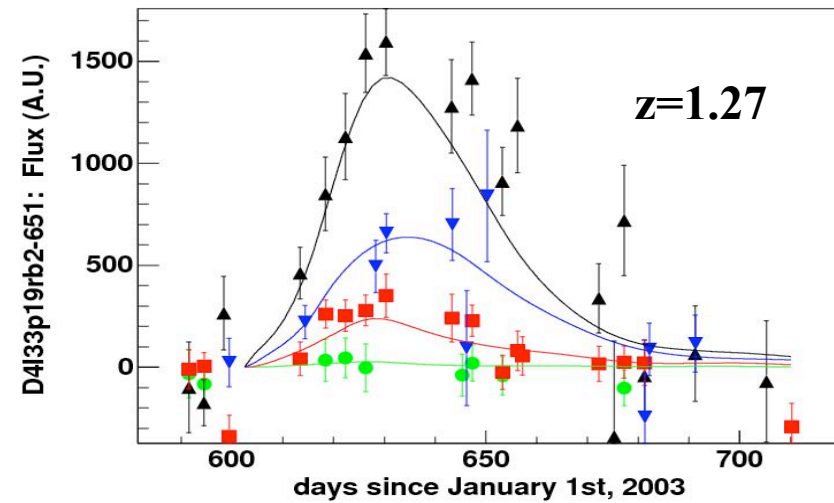
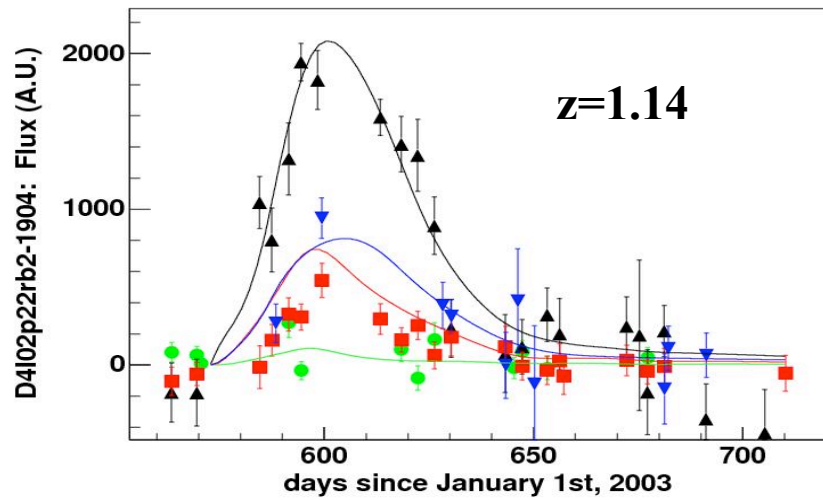
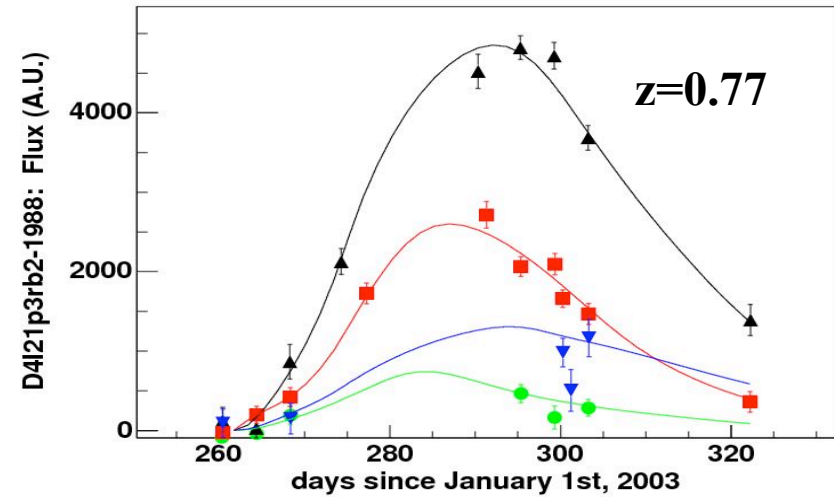
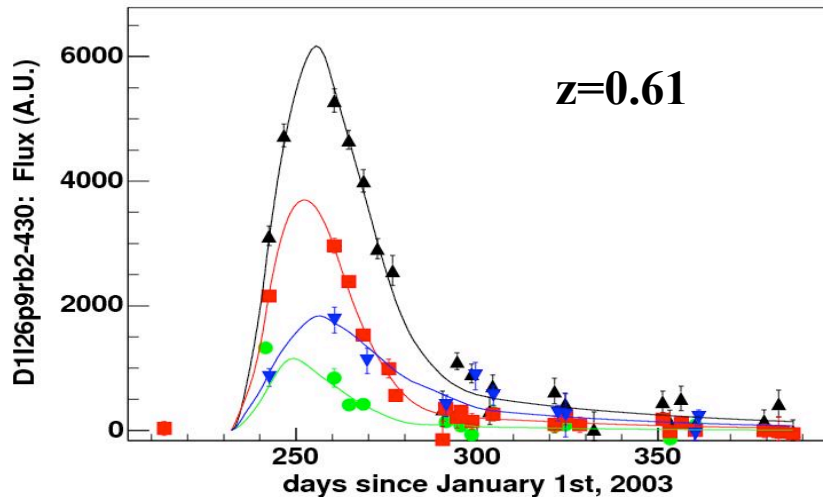
# Light curve simulation

## Simple model



+ Photometric dispersion to reproduce either Triton or official photometry

# First results (v1)



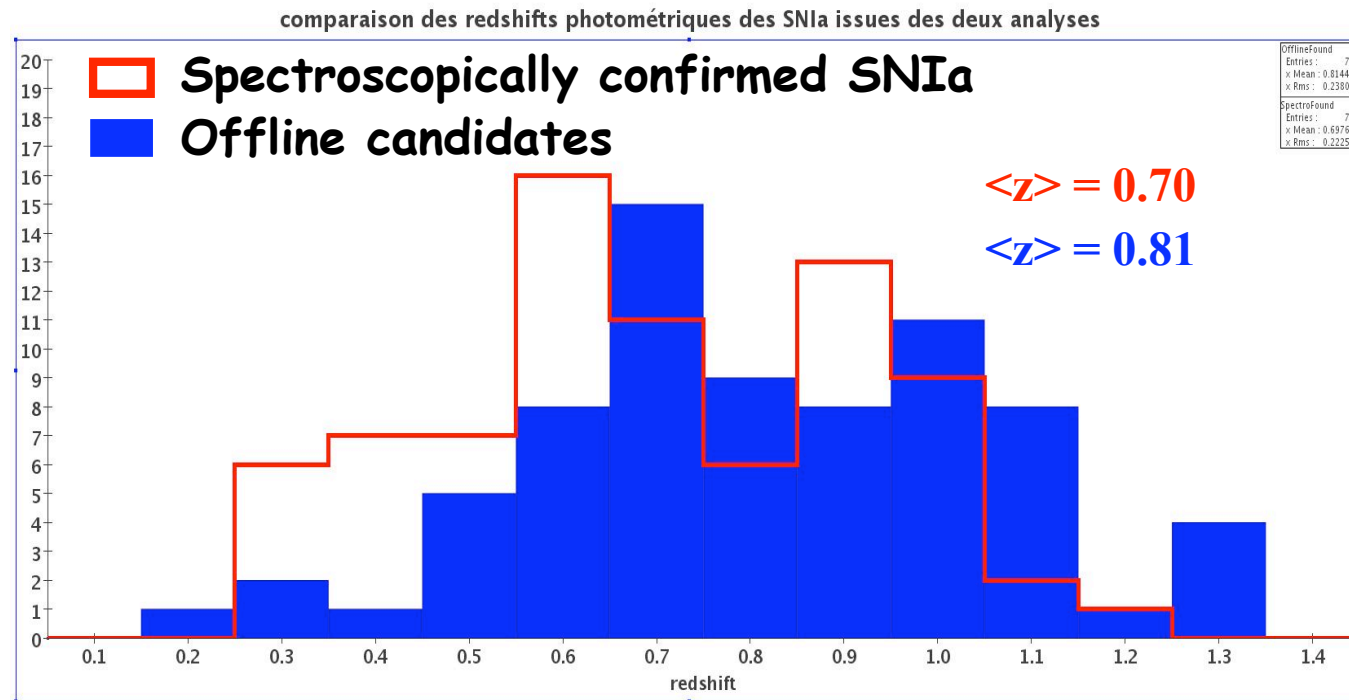
November 6, 2006

Nathalie Palanque-Delabrouille  
CFHTLS Meeting

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# First results (v1)

69 additional candidates



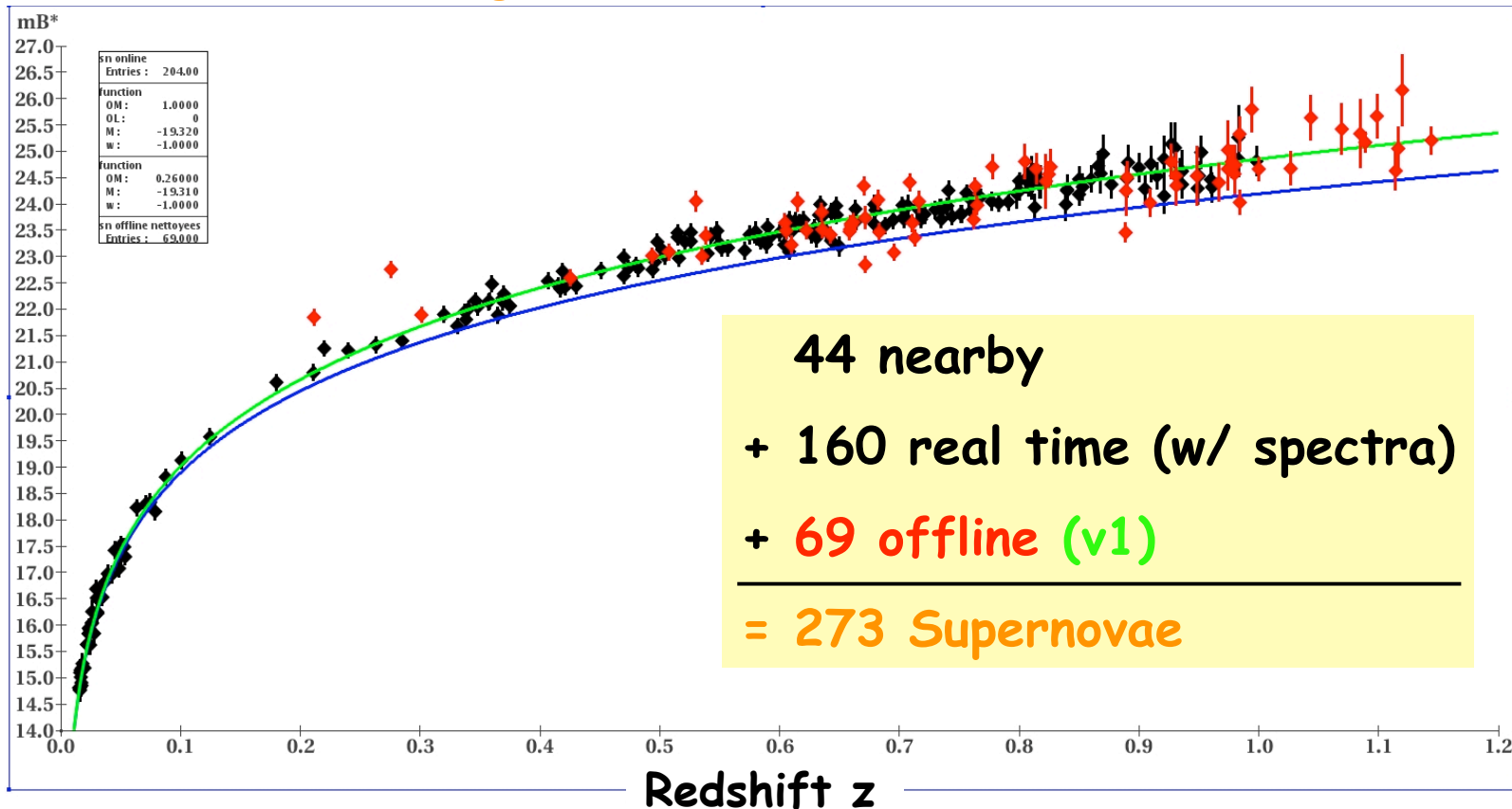
in particular in central regions of galaxies

# First results (v1)

## Explosion rate on D4

$$R = 2.8 \pm 0.7 \text{ } 10^{-5} \text{ yr}^{-1} \text{ Mpc}^{-3} \text{ at } \langle z \rangle = 0.5 \text{ (0.2 to 0.6)}$$

## Extended Hubble diagram



# Conclusions

- A first-version fully automated offline search for type Ia SNe working
- Many significant improvements on offline detection chain being applied to ongoing processing
- Analysis underway (2nd version)

More soon ...