A www redshift indicator tool for Gamma-Ray Bursts

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OUTLINES

- Presentation of the redshift indicator
- A tool available on the web
- Discussion (some interesting cases...)

1. Presentation of the redshift indicator ➔ bases and definitions

spectra integrated on the total duration

$E_{p,i}$ – E_{iso} relation (Amati et al., 2002)

redshift indicator :

$$X_0 = \frac{N_\gamma}{E_p \sqrt{T_{90}}}$$

Atteia, J-L. (2003)

spectra integrated **on the 15sec.-long interval with the highest fluence**

$E_{p,i}$ – E_{iso} (Amati et al., 2002)
& $E_{p,i}$ – L_{iso} relation (Yonetoku et al., 2004)

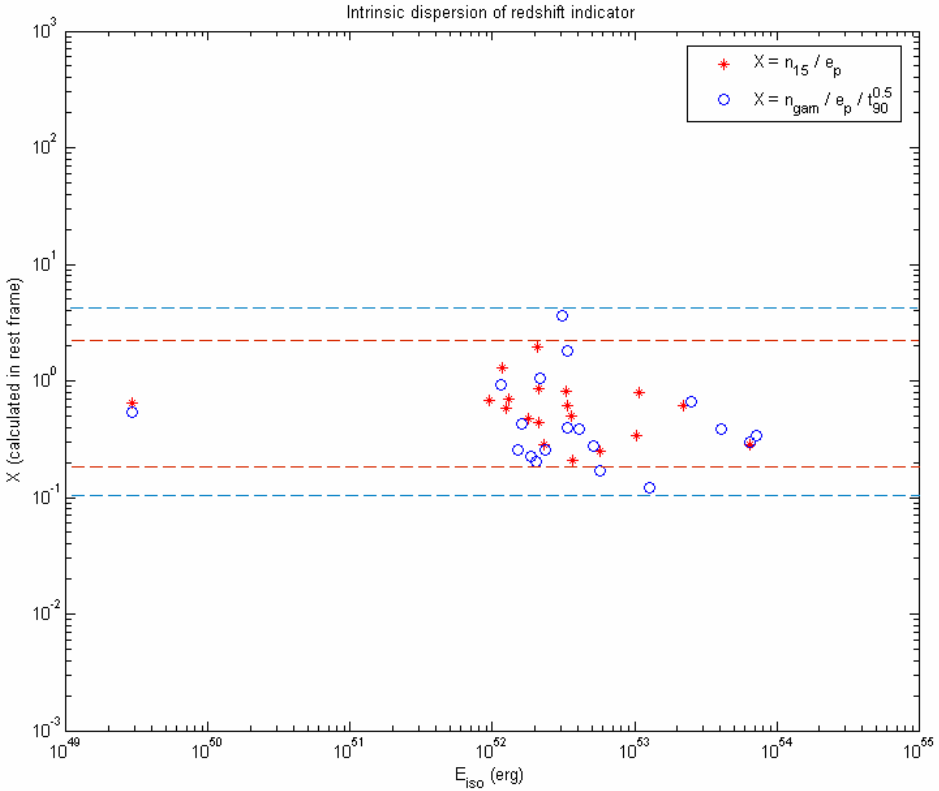
redshift indicator :

$X_0 = N_{15} / E_p$

Pélangeon, A. et al. (2006)

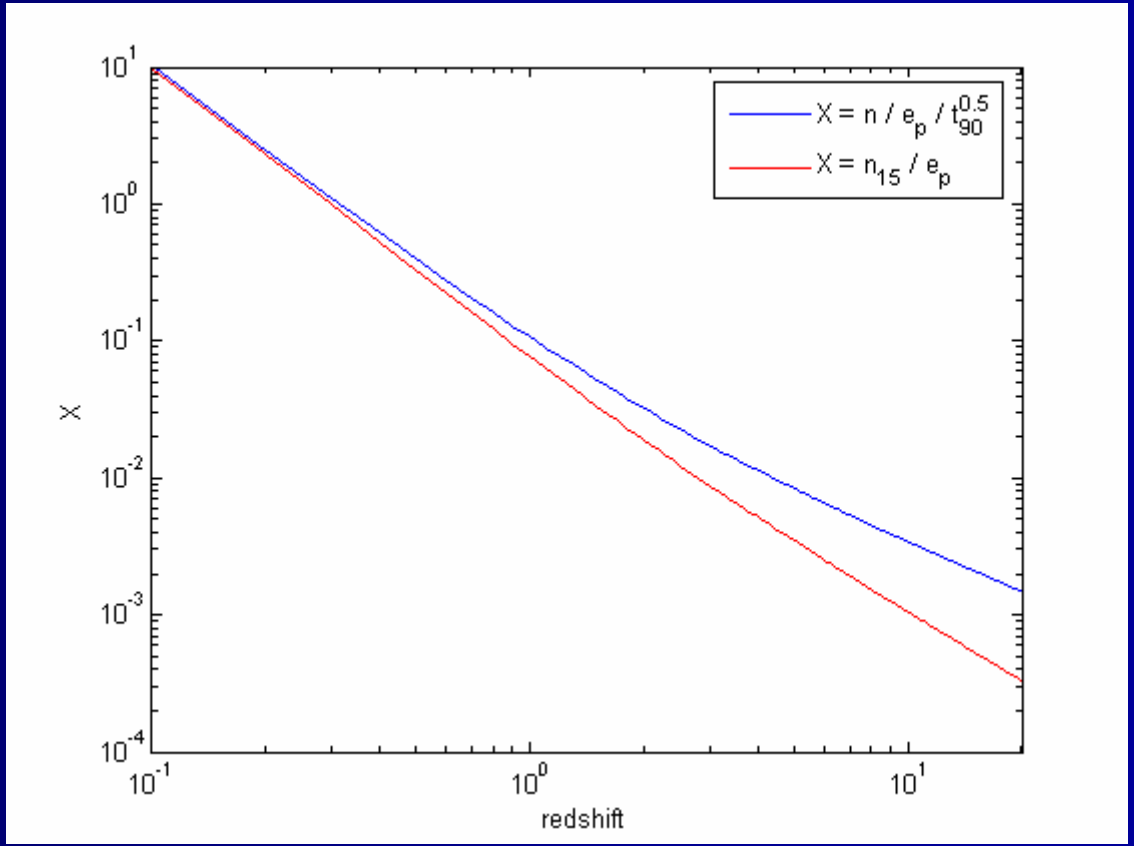
1. Presentation of the redshift indicator ➔ improvements (1/4)

Intrinsic dispersion



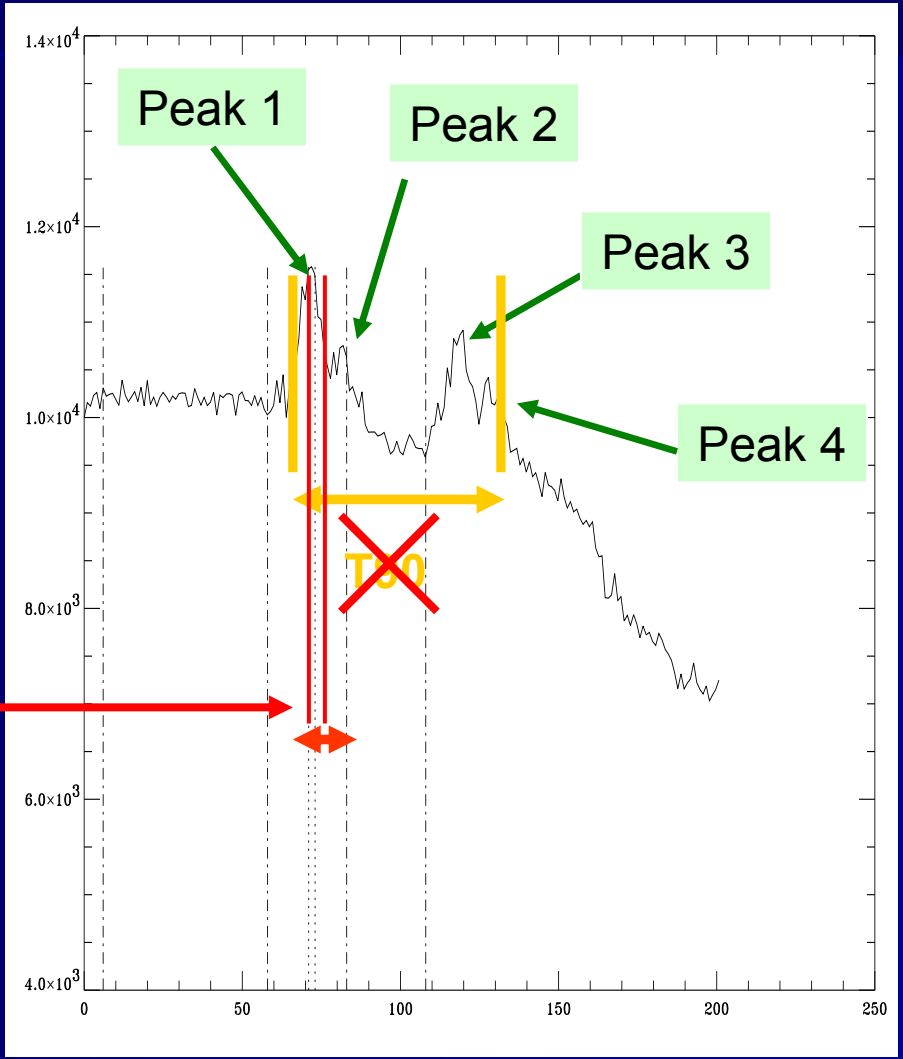
1. Presentation of the redshift indicator ➔ improvements (2/4)

Evolution with the redshift



1. Presentation of the redshift indicator ➔ improvements (3/4)

Multi-peak bursts



spectra are now performed on the most intense 15sec.-long duration peak

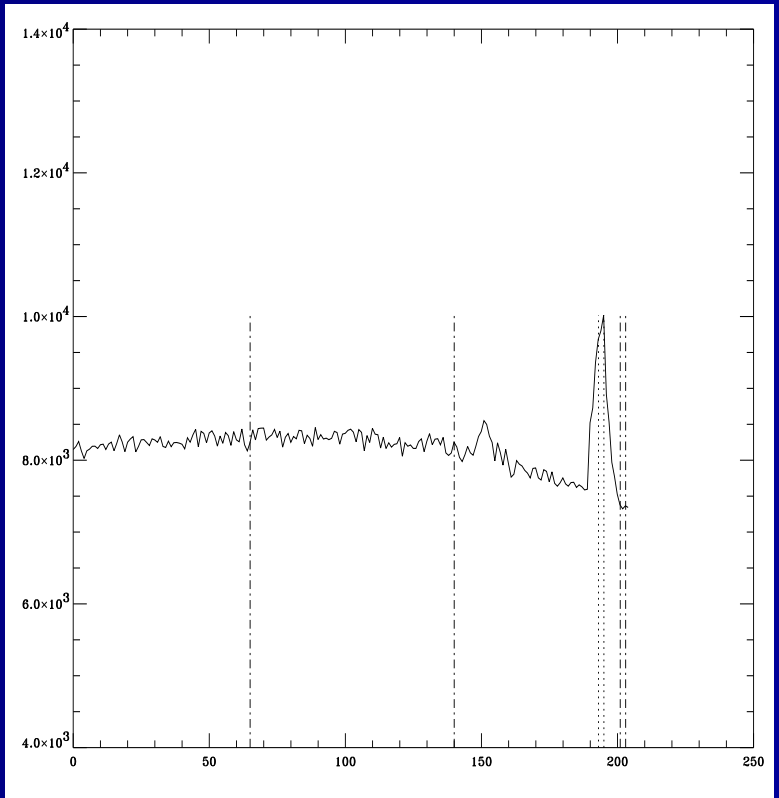
1. Presentation of the redshift indicator ➔ improvements (4/4)

GRB 020305

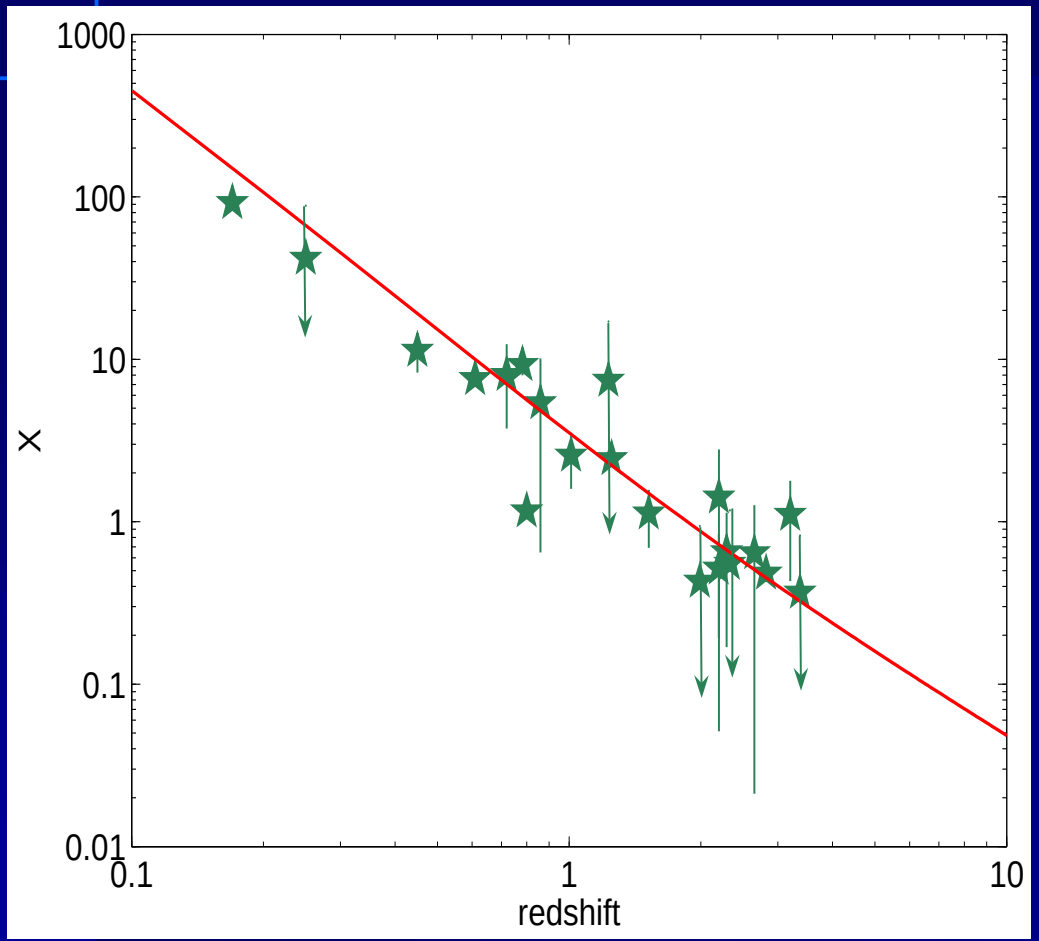
previous pz: **5.88** **(Atteia et al., 2004)**

spectroscopic constraints: **z<2.8**
(Gorosabel et al., 2005)

now: **pz= 1.98 +/- 0.70**
(see *http://www.ast.obs-mip.fr/grb/pz/catalog_pz.php*)

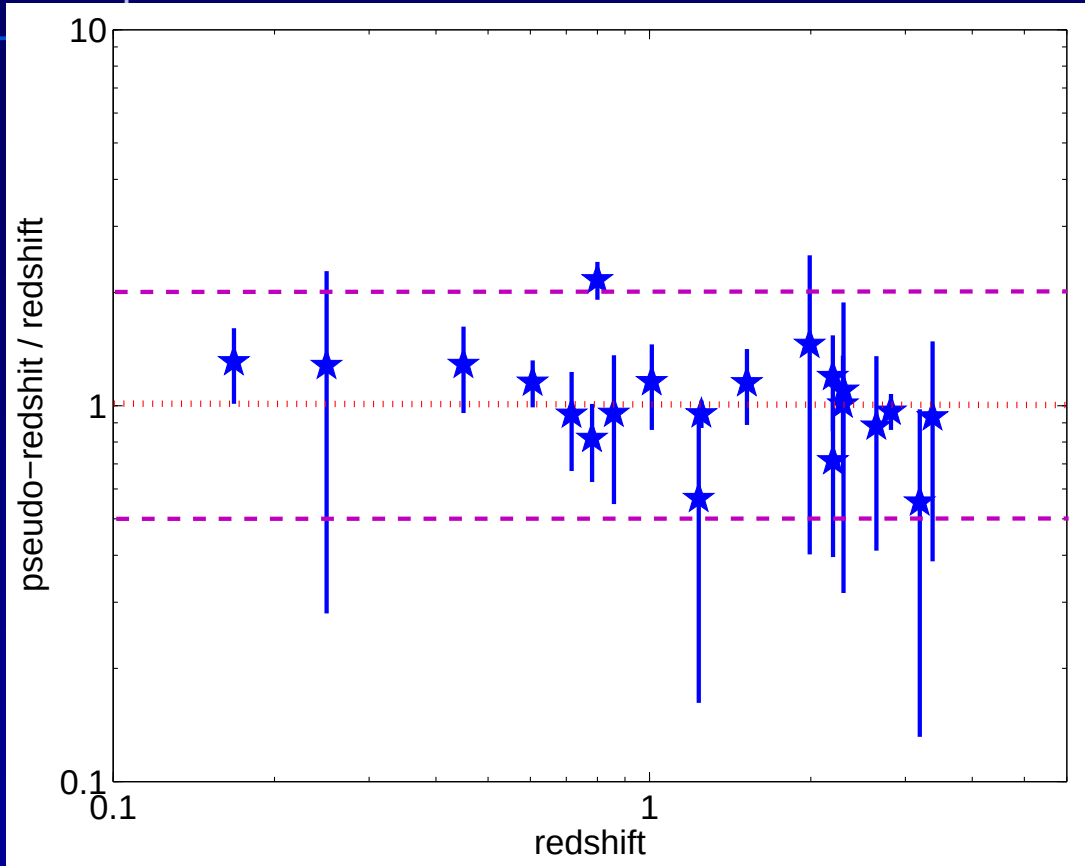


1. Presentation of the redshift indicator → calibration (1/2)



GRB	z	pz
GRB010921	0.45	0.58 +/- 0.15
GRB020124	3.20	1.77 +/- 1.35
GRB020813	1.25	1.19 +/- 0.10
GRB020903	0.25	0.32 +/- 0.25
GRB021004	2.33	2.53 +/- 1.80
GRB021211	1.01	1.17 +/- 0.30
GRB030115	2.20	1.57 +/- 0.70
GRB030226	1.99	2.90 +/- 2.10
GRB030323	3.37	3.15 +/- 1.85
GRB030328	1.52	1.75 +/- 0.40
GRB030329	0.17	0.22 +/- 0.05
GRB030429	2.65	2.34 +/- 1.25
GRB030528	0.78	0.64 +/- 0.15
GRB040924	0.86	0.82 +/- 0.35
GRB041006	0.72	0.68 +/- 0.20
GRB050408	1.23	0.70 +/- 0.50
GRB050525	0.61	0.70 +/- 0.10
GRB050603	2.81	2.73 +/- 0.30
GRB050922	2.19	2.63 +/- 0.75
GRB051022	0.80	1.72 +/- 0.20
GRB060124	2.29	2.32 +/- 0.80

1. Presentation of the redshift indicator → calibration (2/2)



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2. A TOOL AVAILABLE ON THE WWW.

http://www.ast.obs-mip.fr/grb/pz

3. DISCUSSION
(some interesting cases... 1/5)

- Pz confirmed ?

GRB 060105: pz= 4.0 +/- 1.3

- search for line in the early afterglow => no detection.
- @ pz= 4.0: extremely low upper limit of iron line equivalent width (EW < 15 eV).
- @ pz= 4.0: the soft lines are shifted below the XIS soft band, so undetectable.

(Tashiro et al., 2006)

3. DISCUSSION
(some interesting cases... 2/5)

- Pz confirmed ?

GRB 051028: **pz= 3.7 +/- 1.8**

- « gray » or « potentially dark » GRB.
- optical faintness not due to extra absorption in the host galaxy but to its high redshift.
- non-detection of the host galaxy down to R = 25.1 also consistent with the pz.

(Castro-Tirado et al., 2006)

3. DISCUSSION
(some interesting cases... 3/5)

- **Outliers (?)**

GRB 051022: pz= 1.73 +/- 0.2

- a « very dark » burst
  (Nakagawa at al., 2006) & (cf. Tim's talk)

impossible to determine the reason yet !
but is good within ~ a factor 2…

3. DISCUSSION
(some interesting cases... 4/5)

- **Outliers (?)**

GRB 060614: pz= 1.30 +/- 0.85

- z= 0.125: > factor 10 of error for the pz !!
- *H1*: wrong host galaxy ?
  (Schaefer & Xiao, 2006 ; Cobb et al., 2006)
- *H2:* GRB 060614 is actually a short-burst ?
  (Gal-Yam et al., 2006 & cf. J.Nousek's talk)

3. DISCUSSION
(some interesting cases... 5/5)

Outliers (?)

GRB 060927: pz= 2.37 +/- 0.75

- z= 5.6 (Fynbo et al., GCN 5651)

we need more pseudo-redshifts computed with Swift-BAT spectral parameters to give a conclusion…

SUMMARY

A www redshift indicator tool for GRBs…

- … that **everybody** can use, **…**
- **…** based on a redshift indicator **easily** computable **…**
- … with the **spectral parameters** of the **prompt emission ;** …
- … thus, an **estimation** of the redshift can be **rapidly** provided…
- … in order to inform the community of the nature of the detected burst (**low, intermediate or high-z GRB**)