

The background of the slide is a rich, multi-colored astronomical image. It features a dense field of stars in various colors, including white, yellow, orange, and blue. Two prominent nebulae are visible: a bright blue, filamentary nebula in the lower-left quadrant and a large, diffuse nebula in shades of purple and red in the upper-right quadrant. The overall scene is set against a dark, star-filled sky.

# The impact of the pointing strategy : TAROT Observation of GRB 081126

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# The TAROT telescope

*Télescope à Action Rapide pour les Objets Transitoires*

(Fast action telescope for transient objects)

- 25 cm diameter telescope
- Tarot – Calern (France)
- Tarot – Chile (La Silla)
- Field of view of 2 square degree
- Fully robotic (see A. Klotz talk)

## Main activities

- Satellites remnants
- Variable stars
- Erratic phenomena (supernovae)
- **Gamma Ray Bursts (main goal)**



# Pointing strategy

## Two pointing modes

- Normal « tracking » mode
- Special « trailing » mode

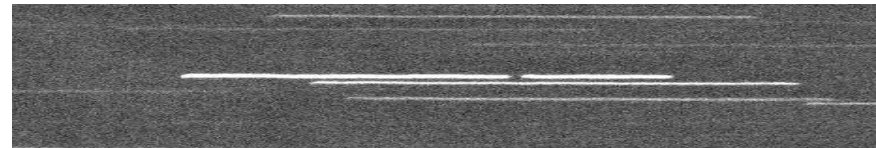
## Normal mode

- Good spatial resolution
- Poor temporal resolution due to acquisition dead time



## Trailing mode

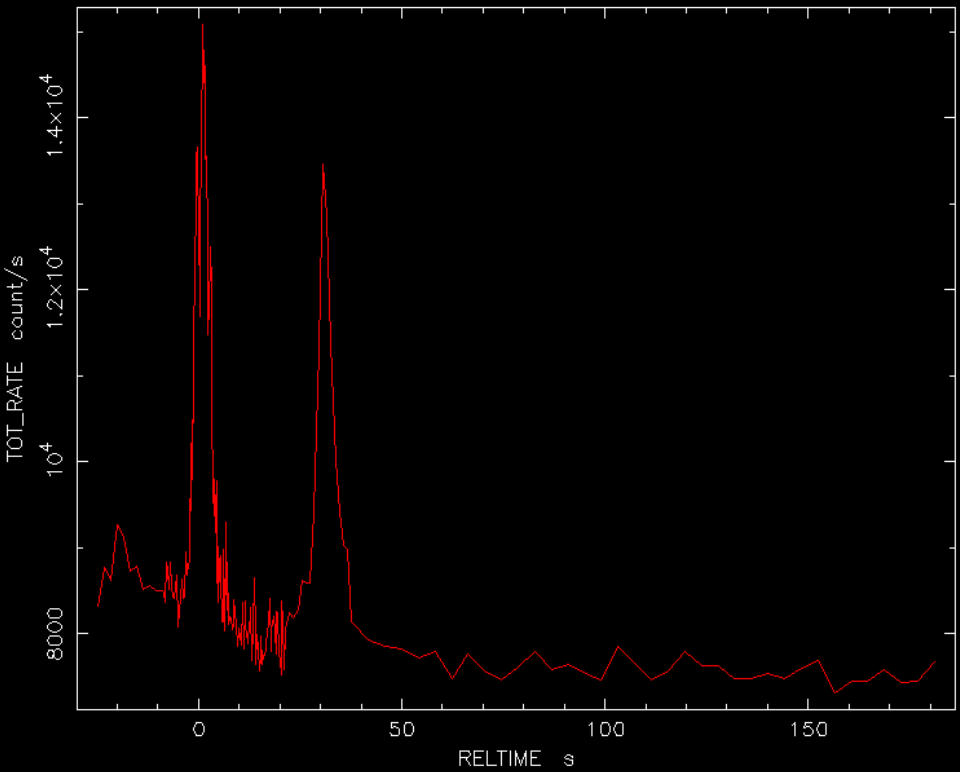
- Excellent and adjustable temporal resolution with continuous observation
- Source confusion in crowded field



## For GRB science

- 60 seconds of trailing mode at 6.5 s/pix
- 5 images of 30 seconds
- 12 images of 90 seconds
- If applicable, the remaining of the night is filled with 180 second exposures

# GRB 081126

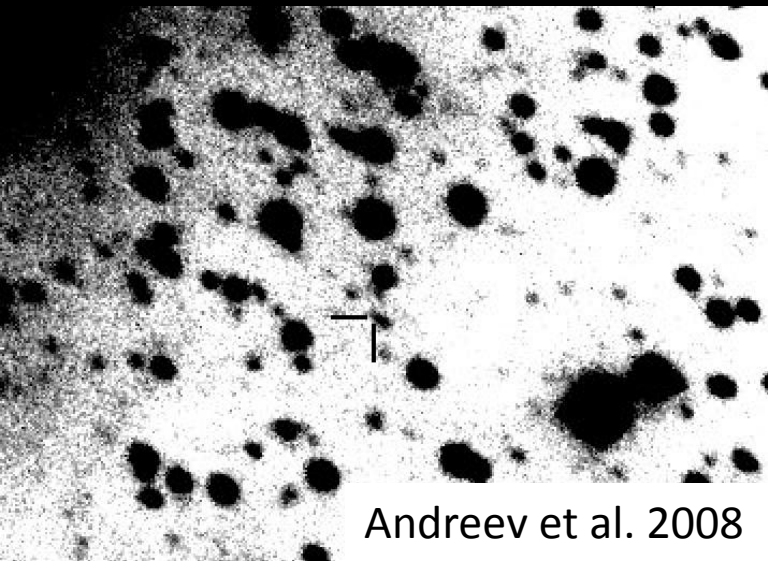


## Normal GRB

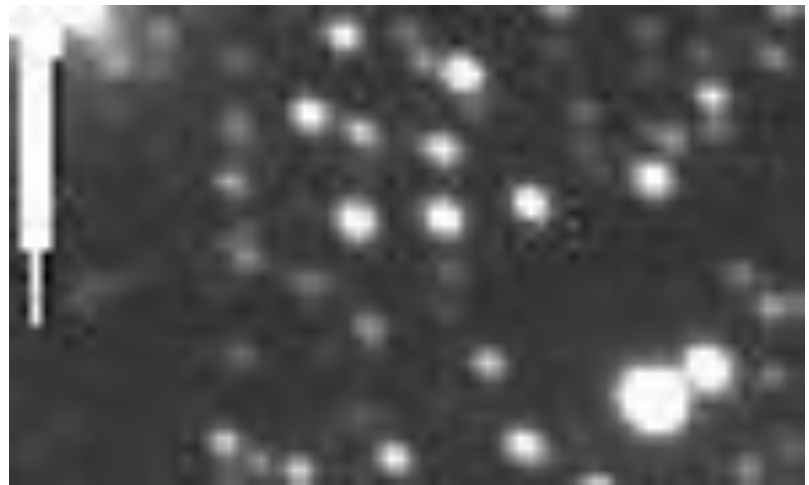
- Faint precursor
- Duration 54 +/- 4 s
- $E_{\text{peak}} \sim 180$  keV
- Redshift : 2.4-3.8
- 2 pulses

## Detected by Swift, Konus-Wind and Fermi

- Located in crowded area (galactic plane)
- ... leads to errors in Gendre et al. GCN !
- Detected by other ground telescopes



Andreev et al. 2008



# Light curve of GRB 081126

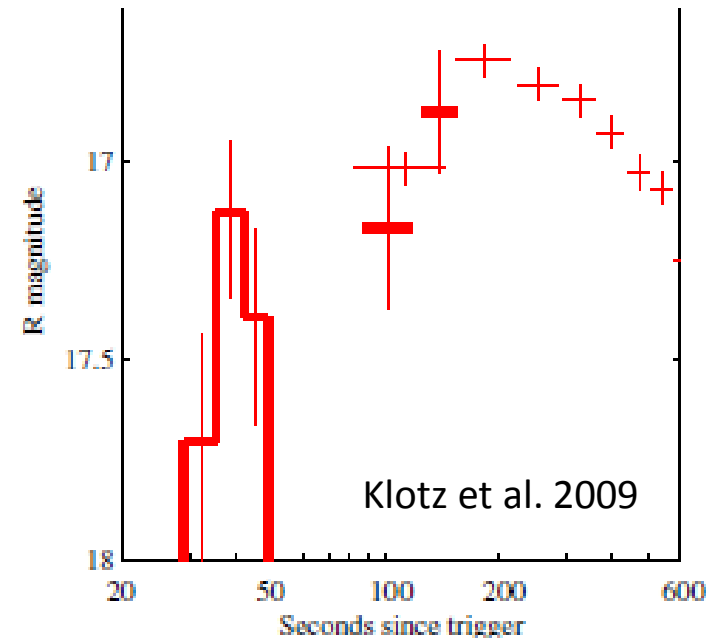
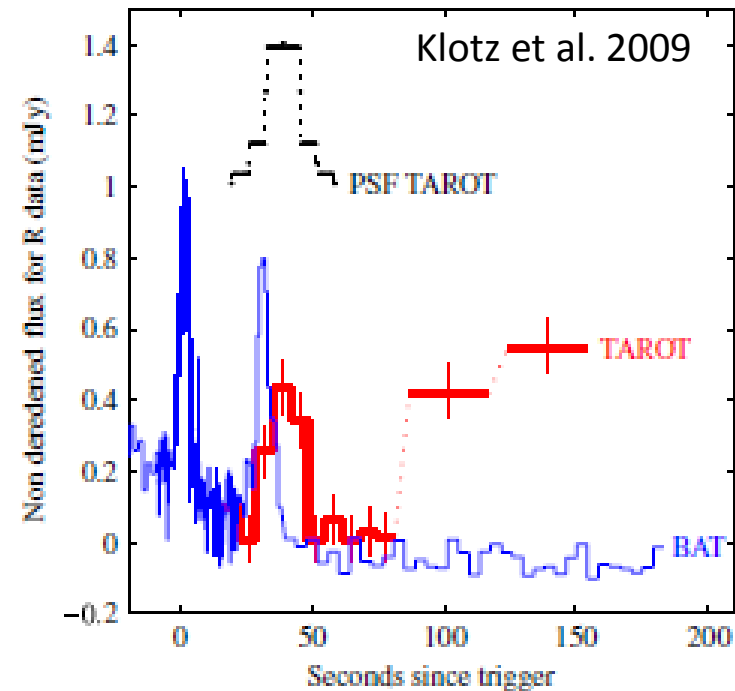
## TAROT observations of GRB 081126

- Rising afterglow, like others (see Klotz et al. 2009b)
- Detection of an optical flare
- No color information in optical
- X-ray observations started 60 s after the event, early part of the light curve missing

No info given during this talk on the rising part  
... see Gendre et al. 2008, Klotz et al. 2008

## Optical flare

- Spurious probability :  $\sim 10^{-8}$
- Cosmic ray probability :  $3.6 \times 10^{-6}$



# Optical-High energy temporal lag

Date of the maximal emission of the optical flare not in coincidence with any prompt pulse

Profile of the Swift pulses compatible with the optical flare once taken into account the PSF and temporal response of the instruments

Also compatible with an impulse of energy with duration less than 9s

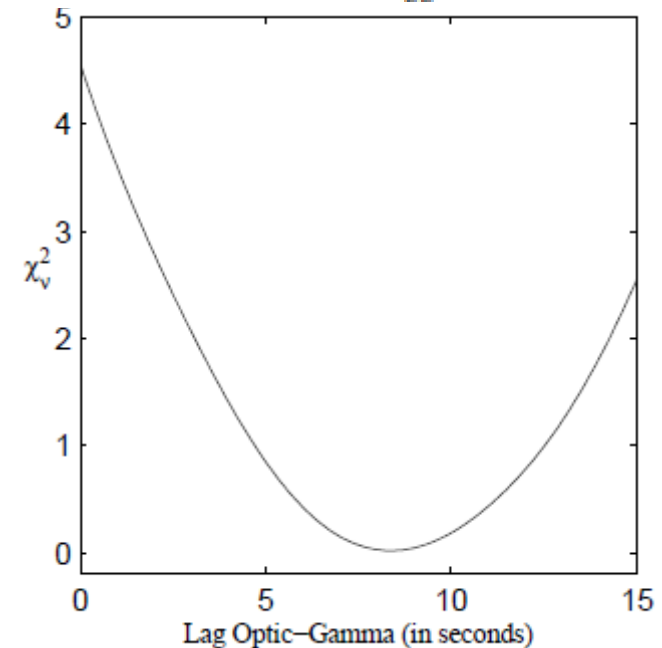
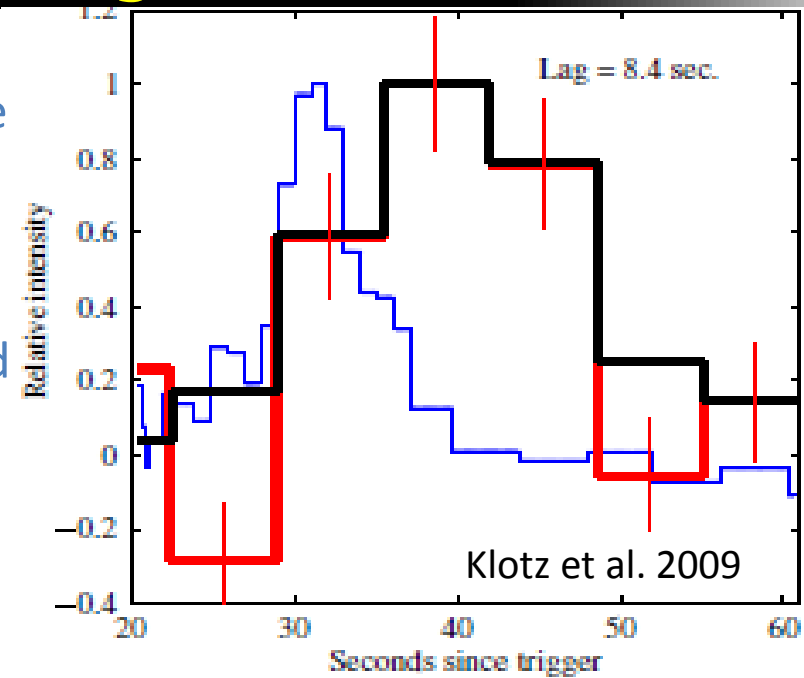
Temporal lag needed by a fit

- First pulse :  $38.4 \pm 3.9$
- Second pulse :  $8.4 \pm 3.9$

Difference of the peak flux

- Optical measurement : 0.45 mJy
- Optical expectation from high energy measurement :  $\sim 10^{-10}$  Jy

No clear explanation



# Conclusions

TAROT has a trailing mode suited for high variability studies

Detailed measurement of a small duration pulse in optical for a GRB

Possible temporal lag between optical and high energy photons confirmed for the first time

Previous claims for GRB 990123 (5–7 s) and GRB 041219A (1–5 s) under debate due to poor temporal resolution (Tang & Zhang 2006)

Constraints possible on exotic physics (string, branes and others)

This is an invitation for theorists to contact us !