Moskow State University
Sternberg Astronomical Institute
Moskow union «OPTICS»

Transient detections and other real-time data processing from wide-field chambers MASTER VWF

http://observ.pereplet.ru

E.Gorbovskoy,
behalf MASTER teem .

Optical emission of gamma-ray bursts and ways of its observations

Prompt emission

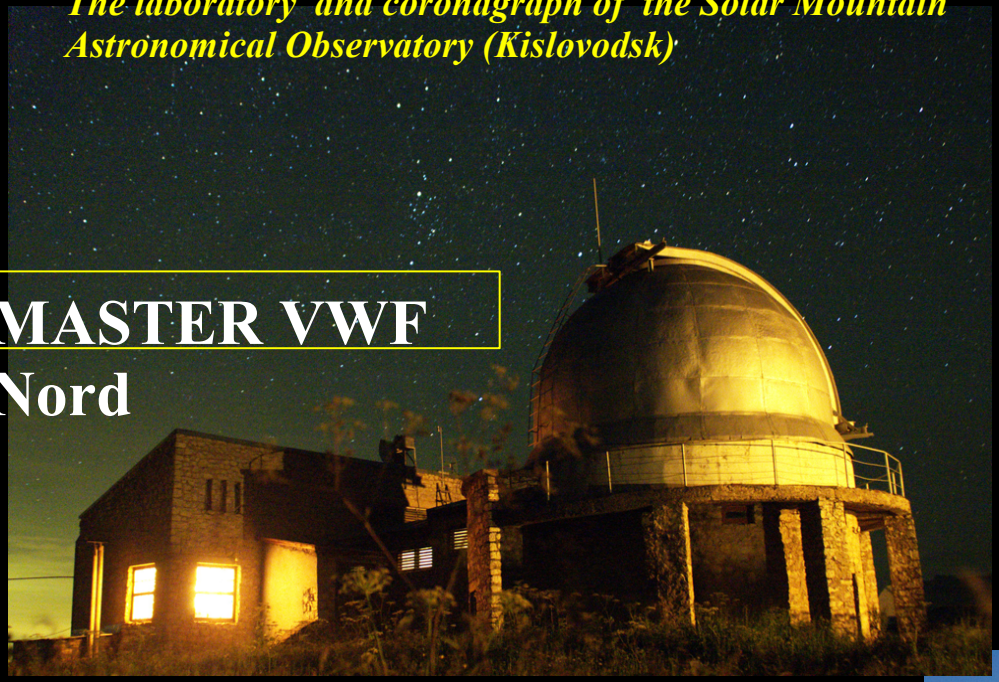
Comes directly from source of the grb, synchronously with gamma emission by duration from 1 second till 1-2 minutes. And have information about the **source** of grb.

Afterglow

Emission is born as result of interaction of shock waves in the environment round a grb source. Intensity decay by power law and can be observed about several days. Have information about the **environment** neat the central engine.

The laboratory and coronagraph of the Solar Mountain Astronomical Observatory (Kislovodsk)

MASTER VWF Nord



East and western chamber of northern mount

MASTER VWF South

Site of the new Caucasian mountain observatory of the Moscow State University

Southern mount from an installation site of the northern

MASTER WFC4 system in Kislovodsk and Irkutsk

Promlem:

0) Searth of GRB pre-emission

1) Orphan GRB searth

2) Continuous monitoring of the sky for the purpose of detection and the further research of any транзиентных the phenomena

3) meteors observations, definition of speeds, accelerations and heights

4) satellite observations, definition of speeds and heights

Instruments:

1) 6 CCD-Cameras Prosilica GE4000 11Mpix 24x36mm with total fov=6000 sq. Degree and 1 fast meteor camera Prosilica GG1380 with fov=2700 sq. degree

2) 3 automatic mount and roof developed in LNFM of

Order of the processing sets from wide field cameras.

Open the roof and given images

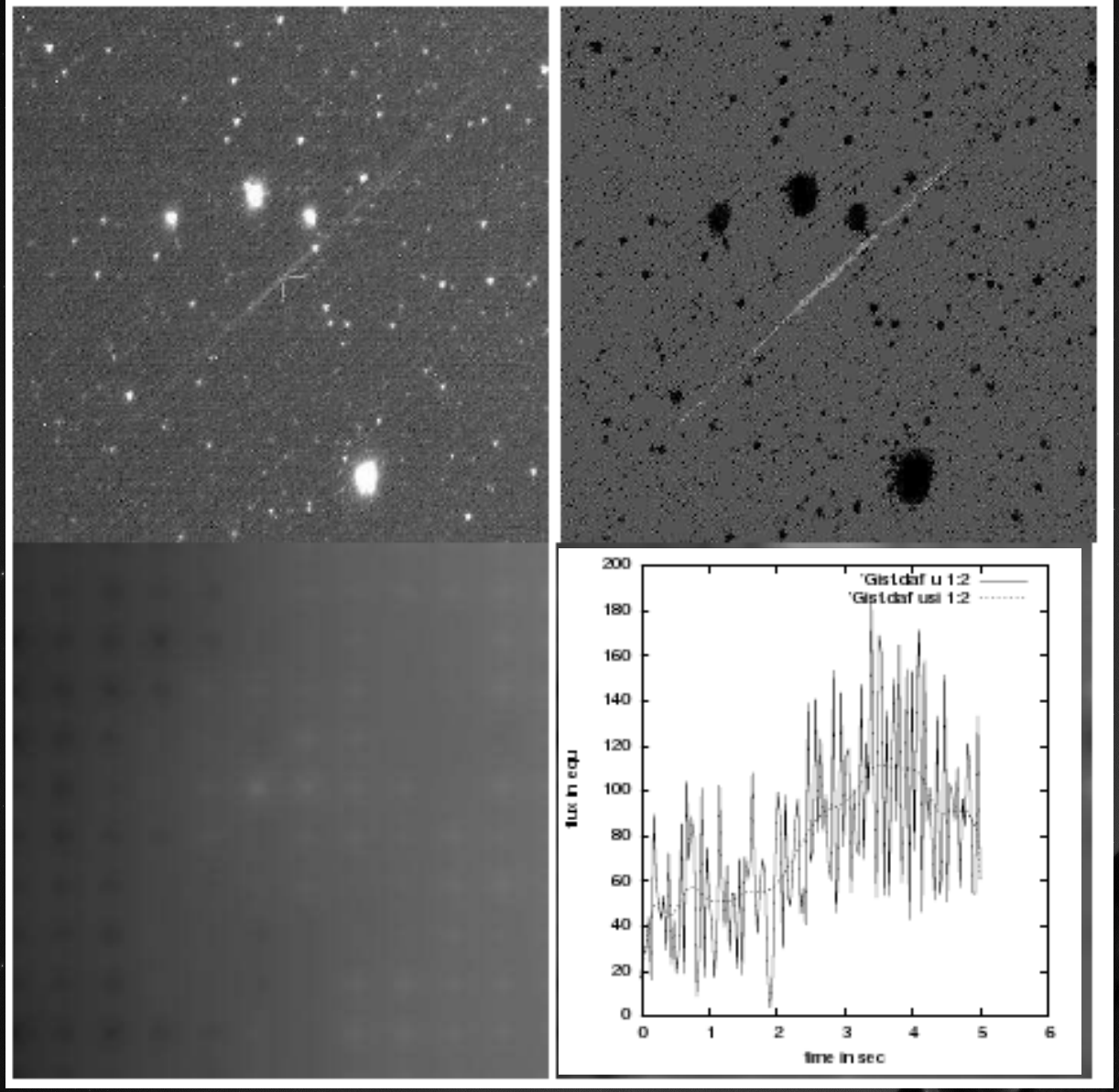
Extracting an objects and transmission them in to server

Astrometry (accuracy 5-arcsec for stars, 10 arcsec for line) and photometry (0.2m)

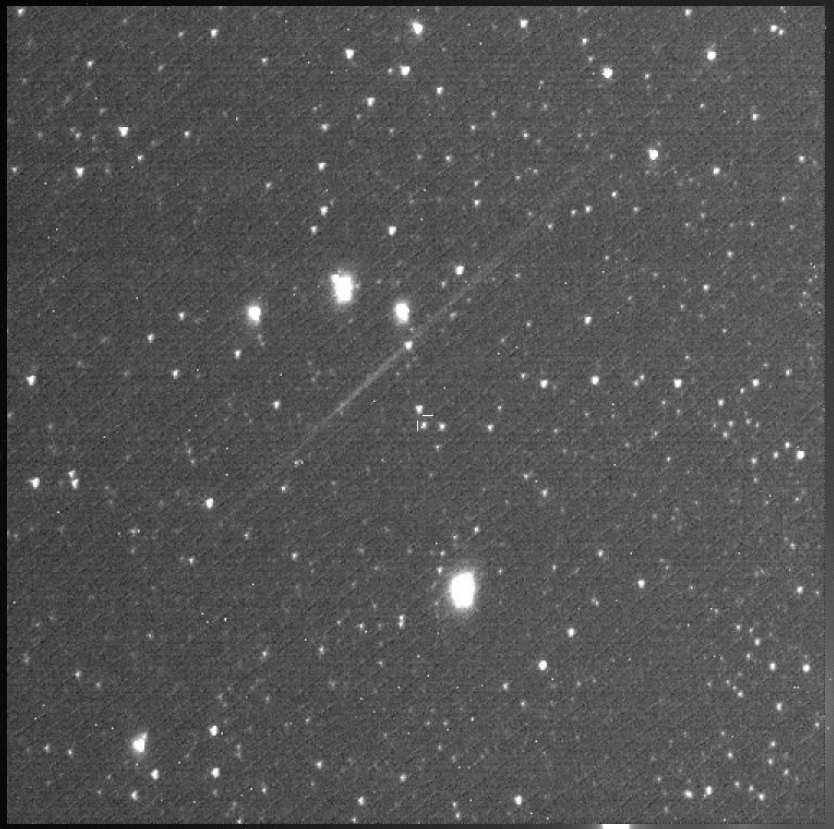
Transients searth and classification, NORAD db correlation

Coincidence scheme and height detection (if it possible).

Meteors extraction on MASTER VWF

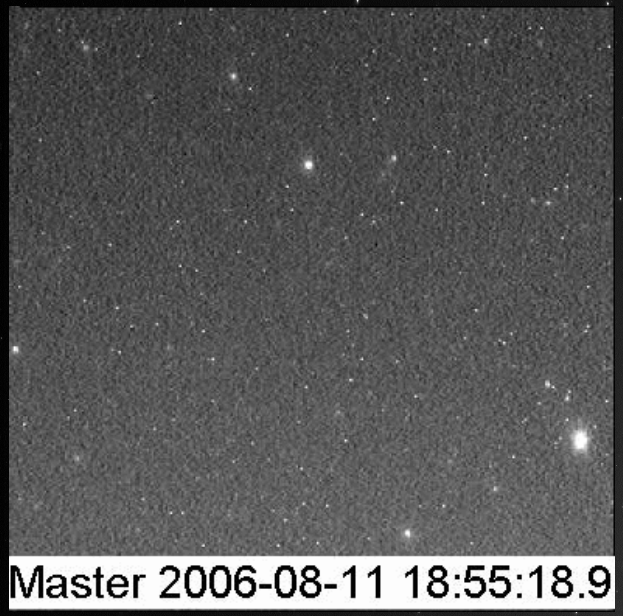


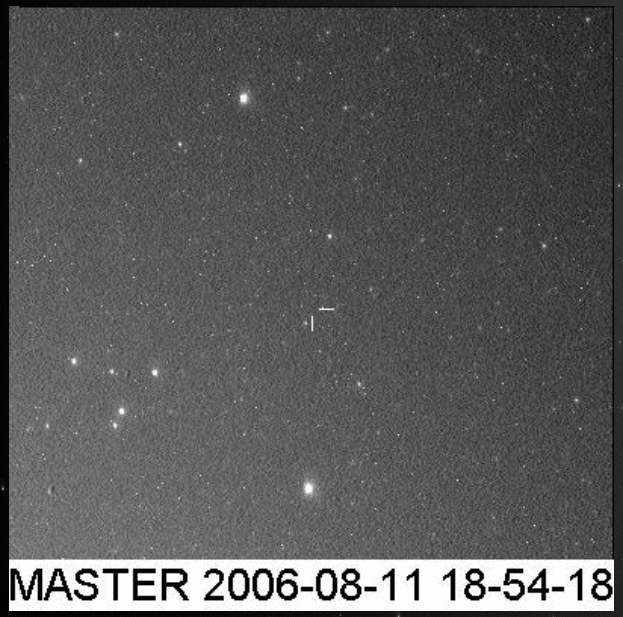
Meteors observation on MASTER VWF



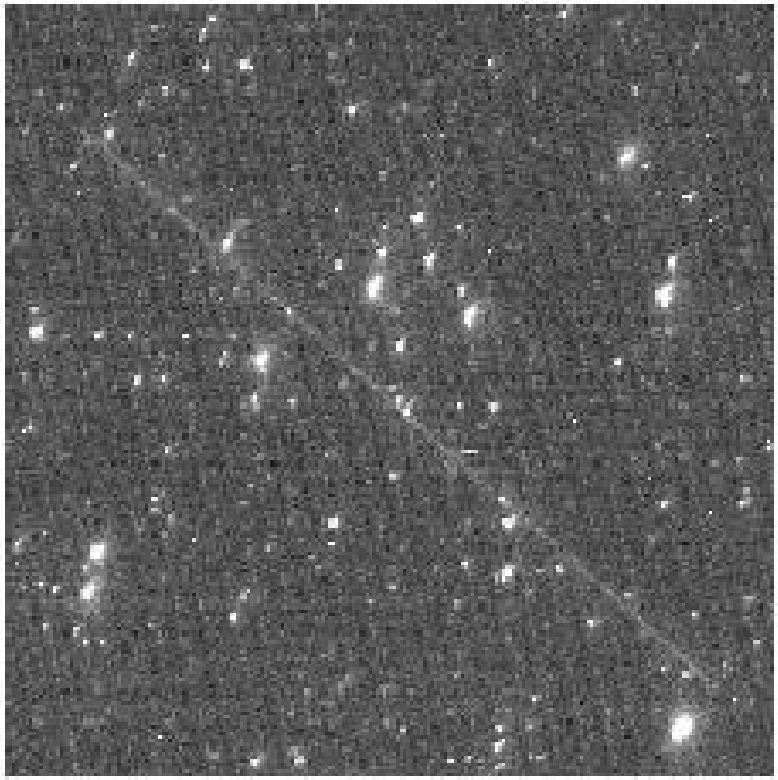
Detected by paralax method height of the meteor H_{meteor} = 72 +-1 км

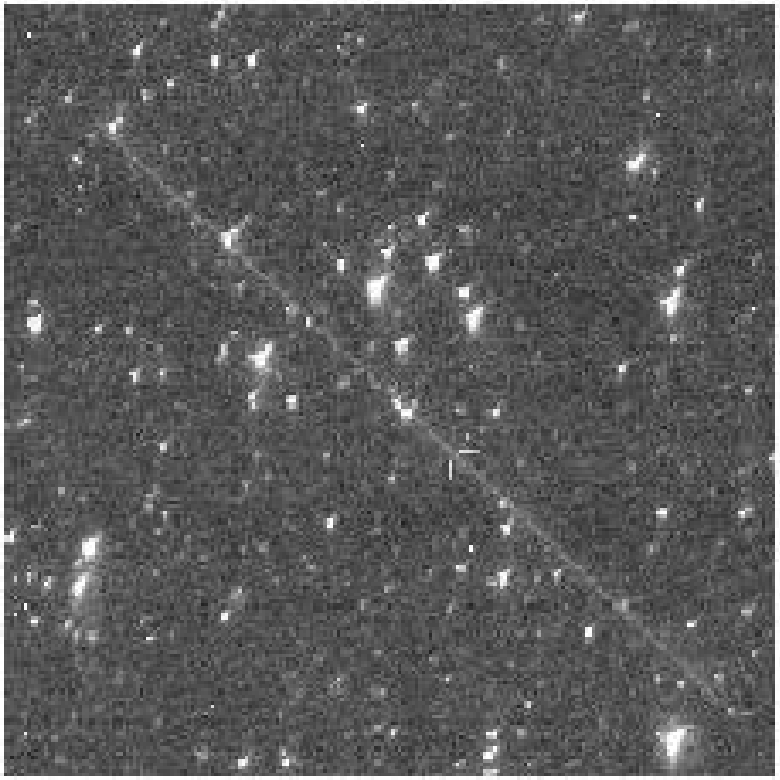
Part of MASTER VFC meteor collection



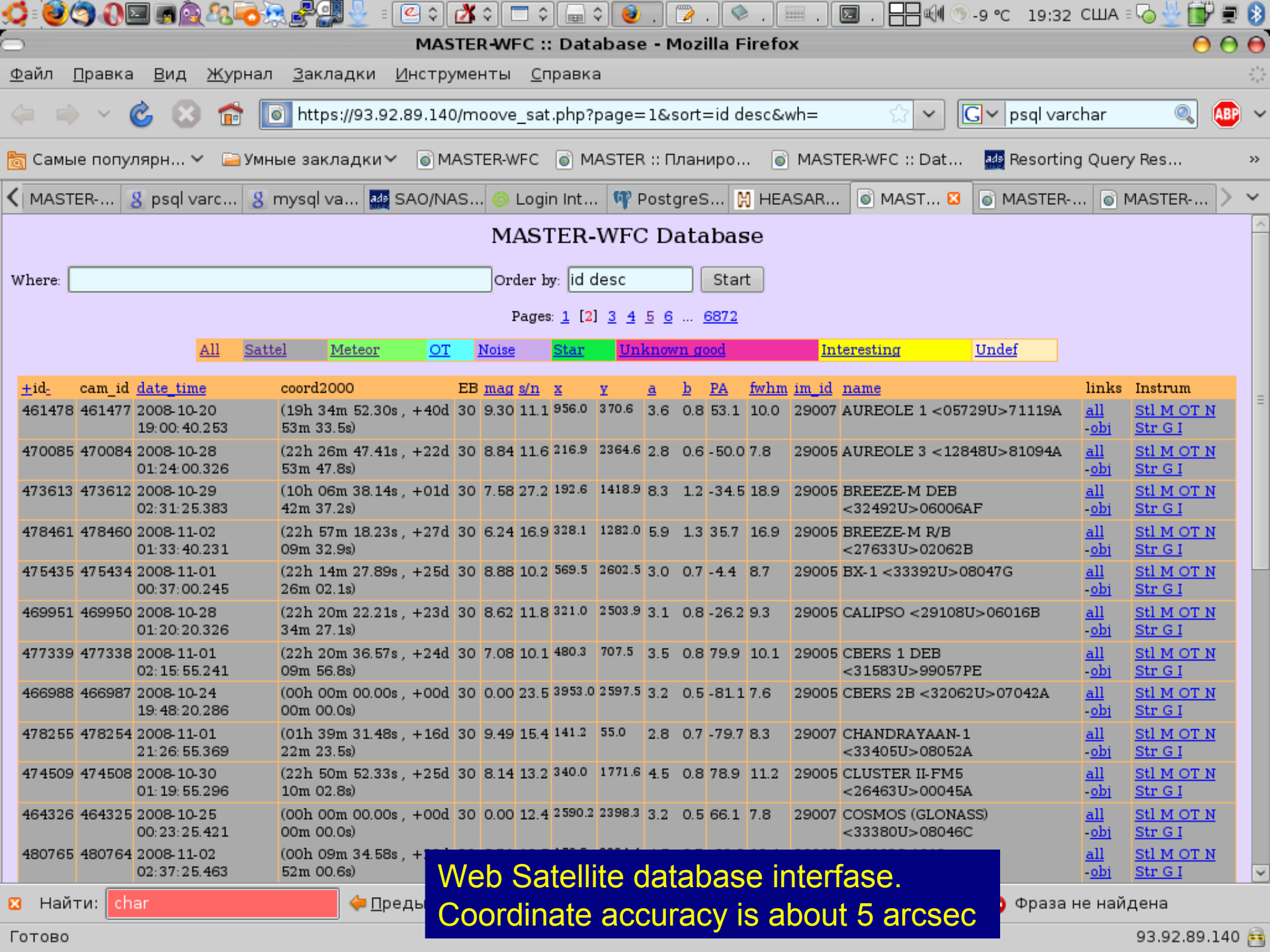


Satellite observations on MASTER VWF





For current satellite Hsat=4500km
The maximum posible detecteble height is ~10000 km.



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461478	461477	2008-10-20 19:00:40.253	(19h 34m 52.30s , +40d 53m 33.5s)	30	9.30	11.1	956.0	370.6	3.6	0.8	53.1	10.0	29007	AUREOLE 1 <05729U>71119A	all -obj	Stl M OT N Str G I
470085	470084	2008-10-28 01:24:00.326	(22h 26m 47.41s , +22d 53m 47.8s)	30	8.84	11.6	216.9	2364.6	2.8	0.6	-50.0	7.8	29005	AUREOLE 3 <12848U>81094A	all -obj	Stl M OT N Str G I
473613	473612	2008-10-29 02:31:25.383	(10h 06m 38.14s , +01d 42m 37.2s)	30	7.58	27.2	192.6	1418.9	8.3	1.2	-34.5	18.9	29005	BREEZE-M DEB <32492U>06006AF	all -obj	Stl M OT N Str G I
478461	478460	2008-11-02 01:33:40.231	(22h 57m 18.23s , +27d 09m 32.9s)	30	6.24	16.9	328.1	1282.0	5.9	1.3	35.7	16.9	29005	BREEZE-M R/B <27633U>02062B	all -obj	Stl M OT N Str G I
475435	475434	2008-11-01 00:37:00.245	(22h 14m 27.89s , +25d 26m 02.1s)	30	8.88	10.2	569.5	2602.5	3.0	0.7	-4.4	8.7	29005	BX-1 <33392U>08047G	all -obj	Stl M OT N Str G I
469951	469950	2008-10-28 01:20:20.326	(22h 20m 22.21s , +23d 34m 27.1s)	30	8.62	11.8	321.0	2503.9	3.1	0.8	-26.2	9.3	29005	CALIPSO <29108U>06016B	all -obj	Stl M OT N Str G I
477339	477338	2008-11-01 02:15:55.241	(22h 20m 36.57s , +24d 09m 56.8s)	30	7.08	10.1	480.3	707.5	3.5	0.8	79.9	10.1	29005	CBERS 1 DEB <31583U>99057PE	all -obj	Stl M OT N Str G I
466988	466987	2008-10-24 19:48:20.286	(00h 00m 00.00s , +00d 00m 00.0s)	30	0.00	23.5	3953.0	2597.5	3.2	0.5	-81.1	7.6	29005	CBERS 2B <32062U>07042A	all -obj	Stl M OT N Str G I
478255	478254	2008-11-01 21:26:55.369	(01h 39m 31.48s , +16d 22m 23.5s)	30	9.49	15.4	141.2	55.0	2.8	0.7	-79.7	8.3	29007	CHANDRAYAAN-1 <33405U>08052A	all -obj	Stl M OT N Str G I
474509	474508	2008-10-30 01:19:55.296	(22h 50m 52.33s , +25d 10m 02.8s)	30	8.14	13.2	340.0	1771.6	4.5	0.8	78.9	11.2	29005	CLUSTER II-FM5 <26463U>00045A	all -obj	Stl M OT N Str G I
464326	464325	2008-10-25 00:23:25.421	(00h 00m 00.00s , +00d 00m 00.0s)	30	0.00	12.4	2590.2	2398.3	3.2	0.5	66.1	7.8	29007	COSMOS (GLONASS) <33380U>08046C	all -obj	Stl M OT N Str G I
480765	480764	2008-11-02 02:37:25.463	(00h 09m 34.58s , +52m 00.6s)	30											all -obj	Stl M OT N Str G I

MASTER-WFC :: Database - Mozilla Firefox

File Edit View History Bookmarks Tools Help

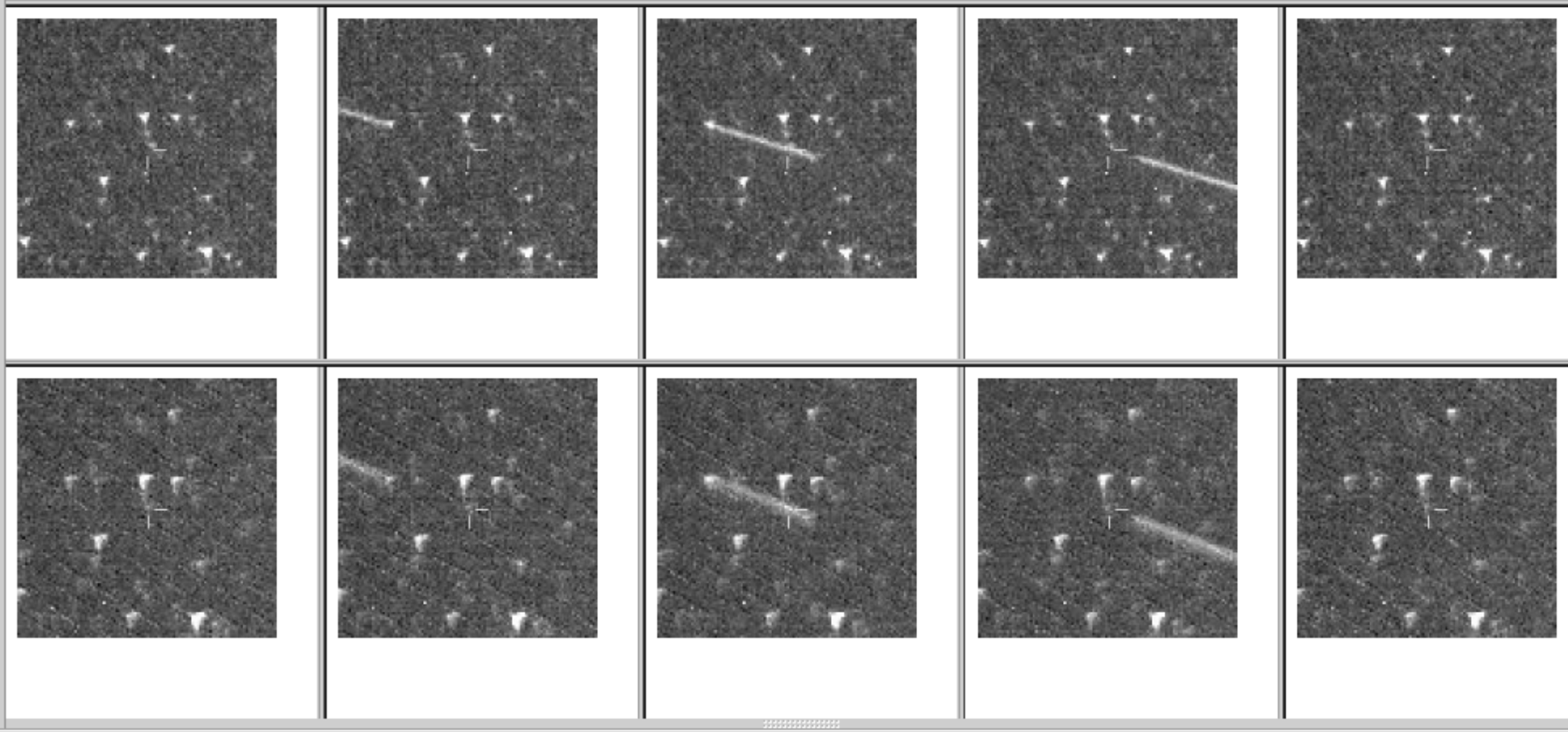
https://93.92.89.140/crossflash.php?id1=1416789&id2=1418618&n=2&x

Bad for loop variable

Самые популярн... Умные закладки MASTER-WFC MASTER :: Планиро... MASTER-WFC :: Dat... Наблюдателя

MASTER-... 134135 MASTER-... MASTER-... MASTER-... VizieR Re... MASTER-... MASTER-... MAS... MA

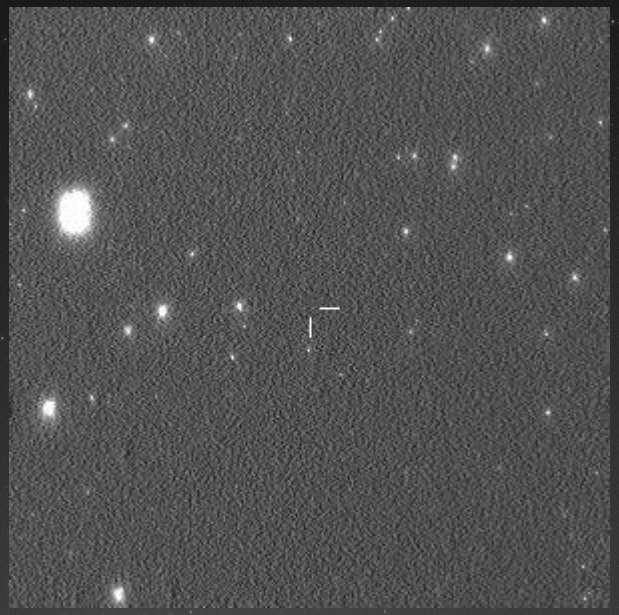
+id-	cam_id	date_time	coord2000	EB	mag	s/n	x	y	a	b	PA	fwhm	im_id	name	Instrum
101007	101006	2008-10-20 19:21:10.339	(19h 25m 36.21s , +38d 51m 58.3s)	30	8.75	19.1	3557.3	2004.6	2.8	1.0	10.6	9.8	29008		Stl M OT N Str G I
101006	-1	2008-10-20 19:21:10.255	(19h 25m 39.36s , +38d 52m 14.1s)	30	7.52	32.5	663.8	427.6	6.4	1.6	26.4	19.0	29007		Stl M OT N Str G I

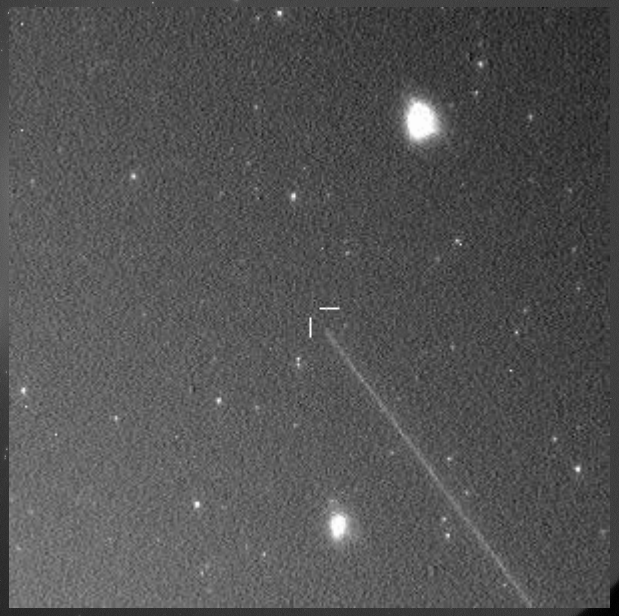
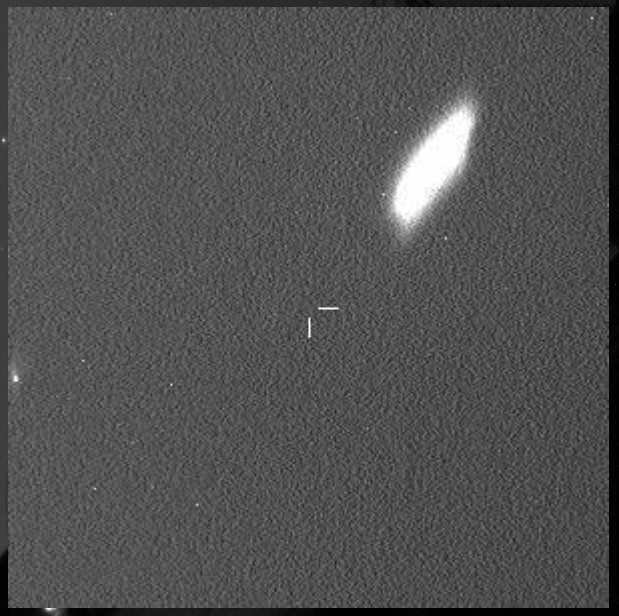


Done

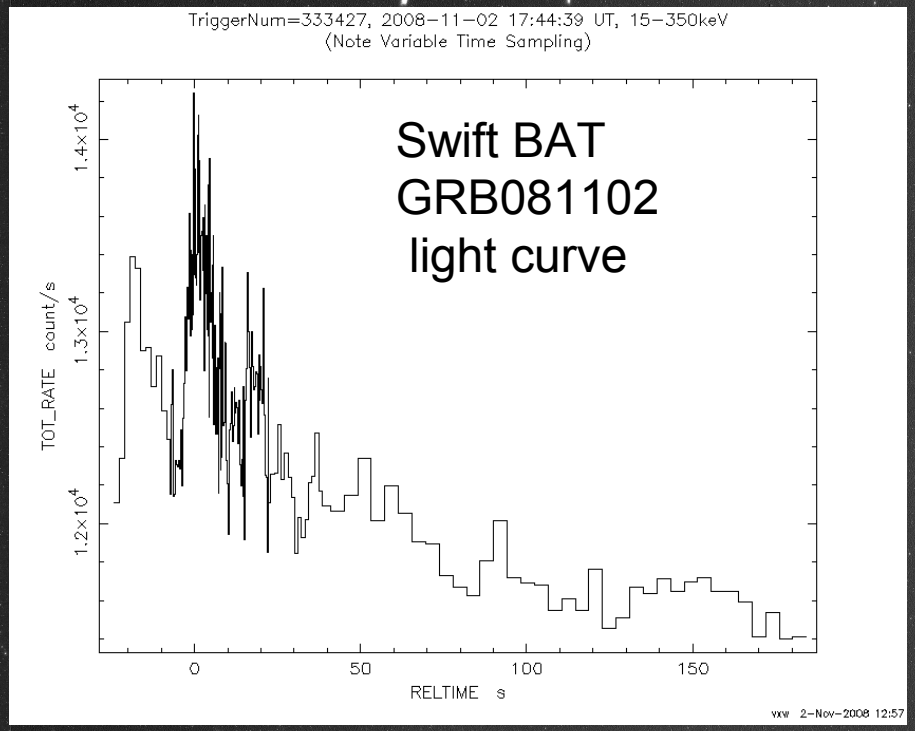
93.92.89.140

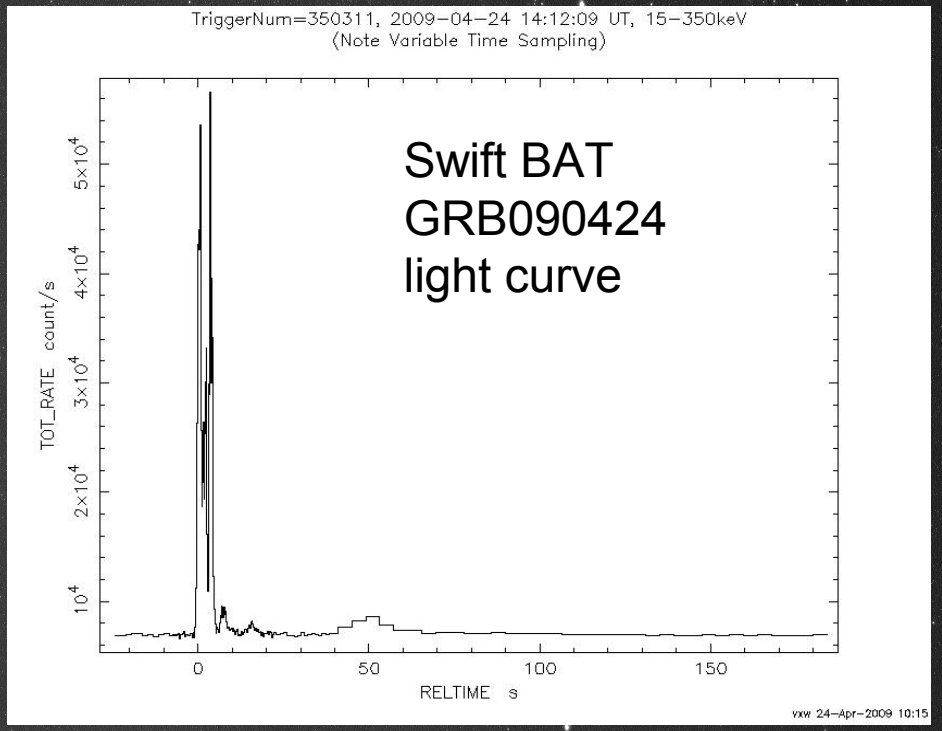
Part of MASTER VFC satellite collection

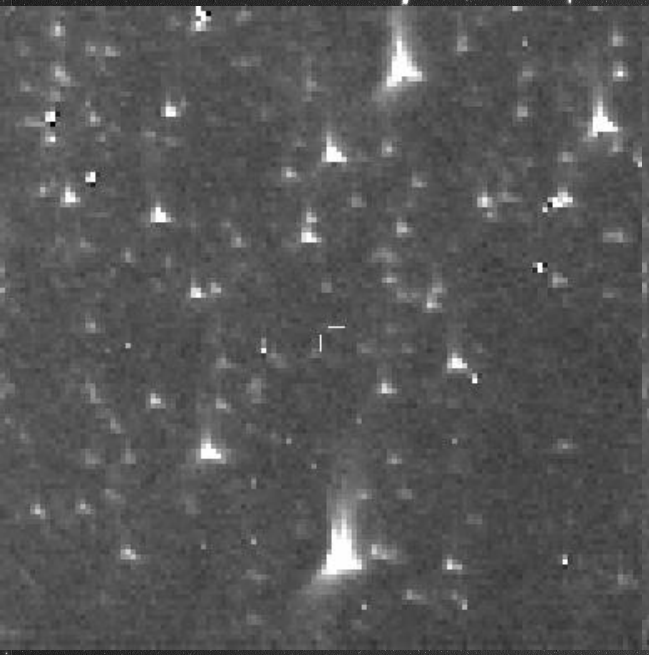




Swift
GRB081102 and GRB090424
MASTER VWF Swift GRB observation

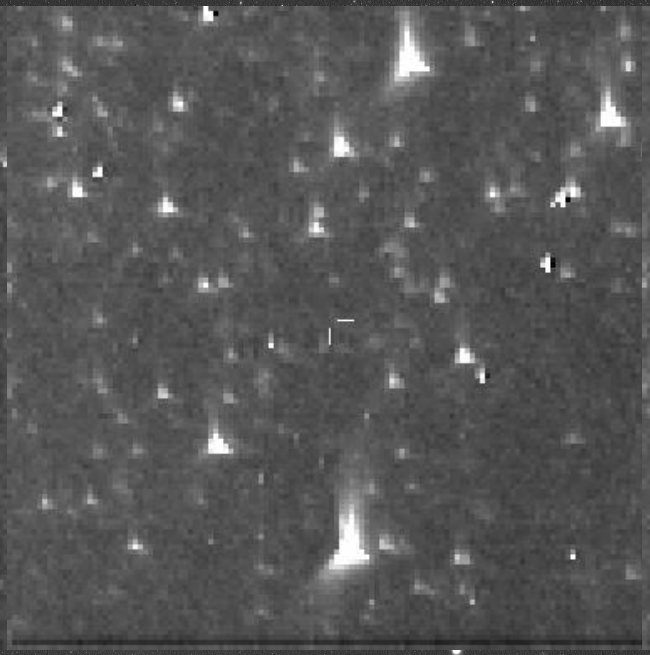




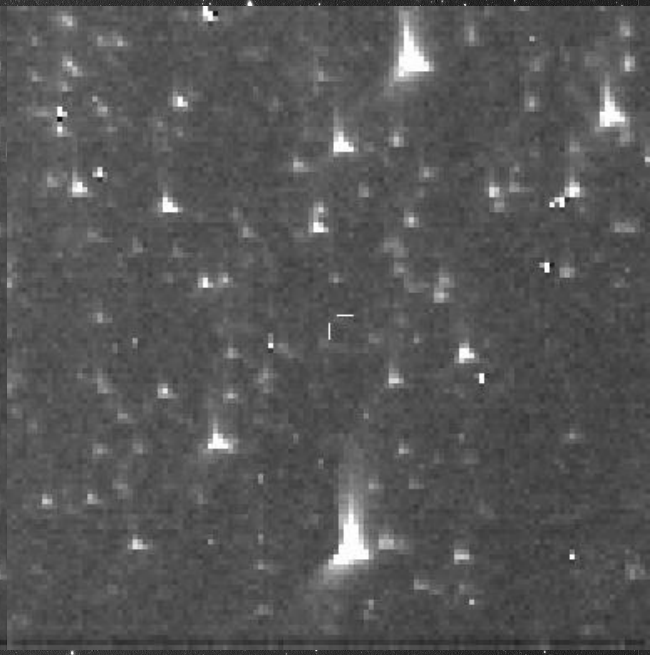
Prompt GRB 081102 MASTER VWF4 observations



-30-0 сек



0-30 сек

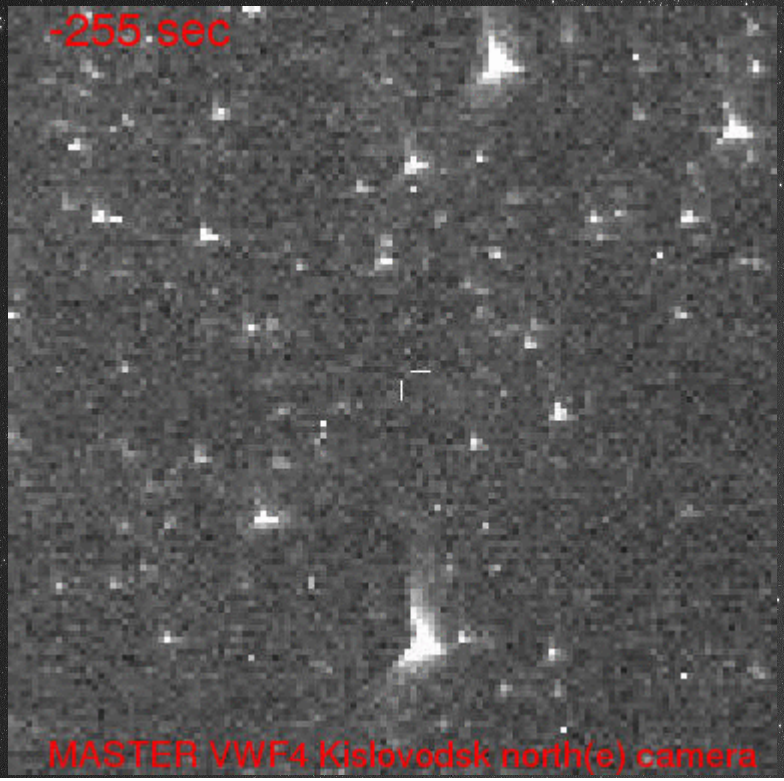


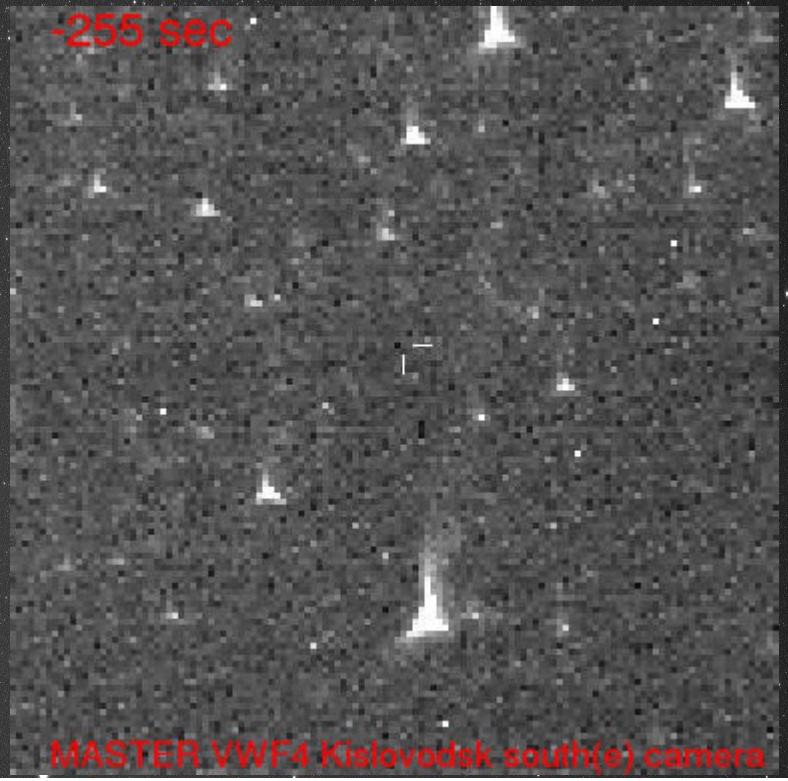
30-60 сек

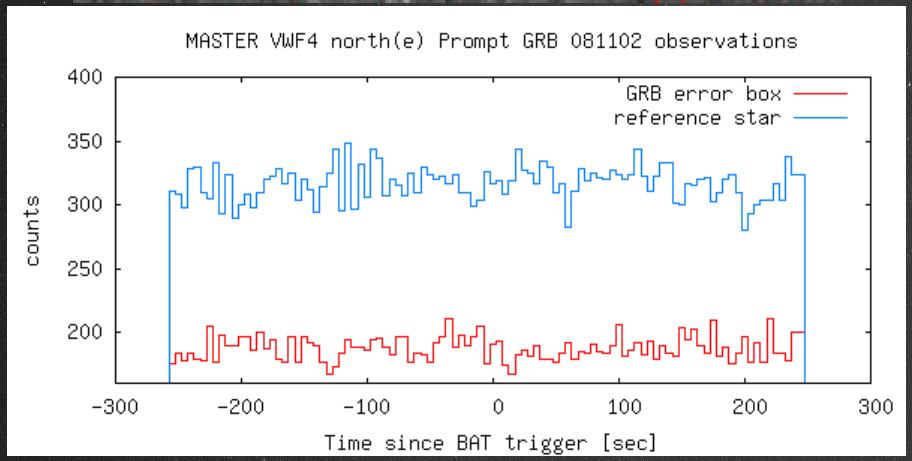
Coadd 12 5-seconds sets (6 from each camera)

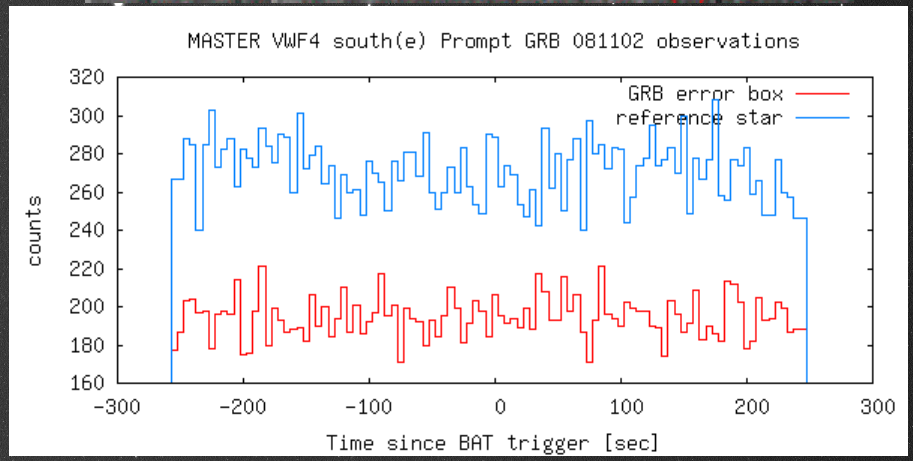
Total exposure 1 minutes at each preview sets.

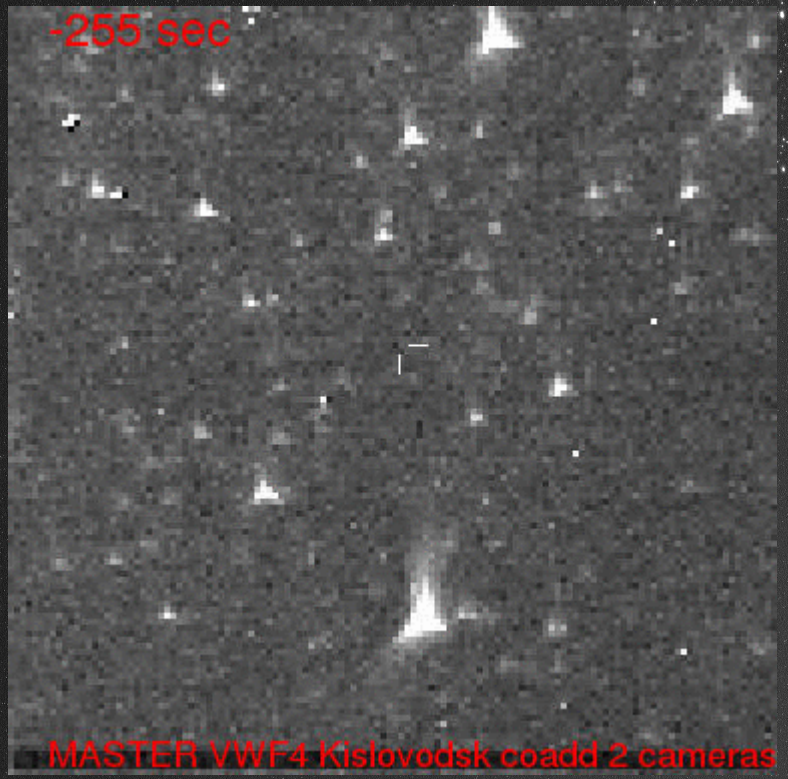
Prompt GRB 081102 MASTER VWF4 observations

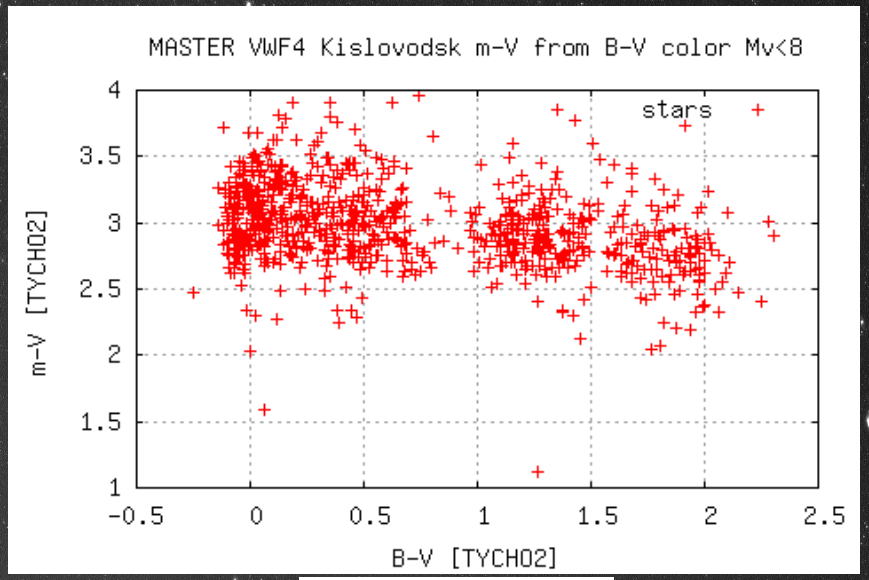






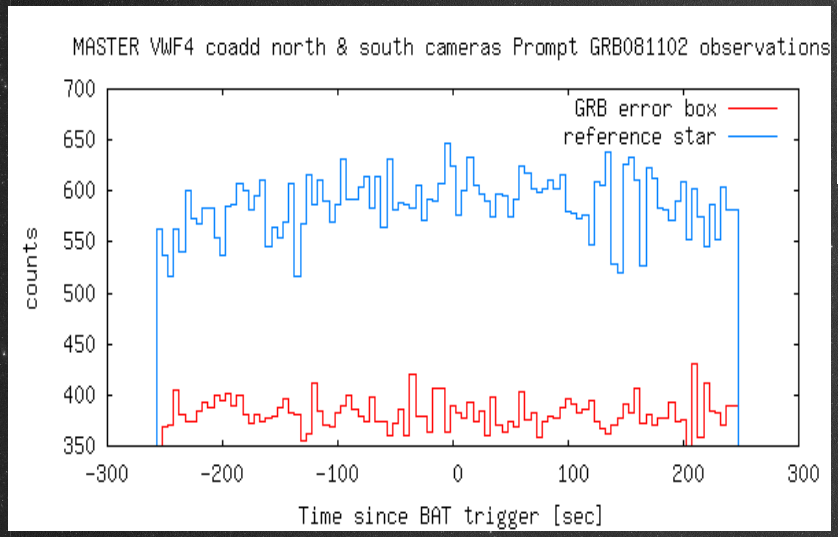






$$\tau_V = 5.2 \cdot 10^{-22} N_H$$

$$\tau_V^{grb081102} = 5.2 \cdot 10^{-22} \cdot 4.9 \cdot 10^{21} = 2.548 => \delta m = 2.8^m$$



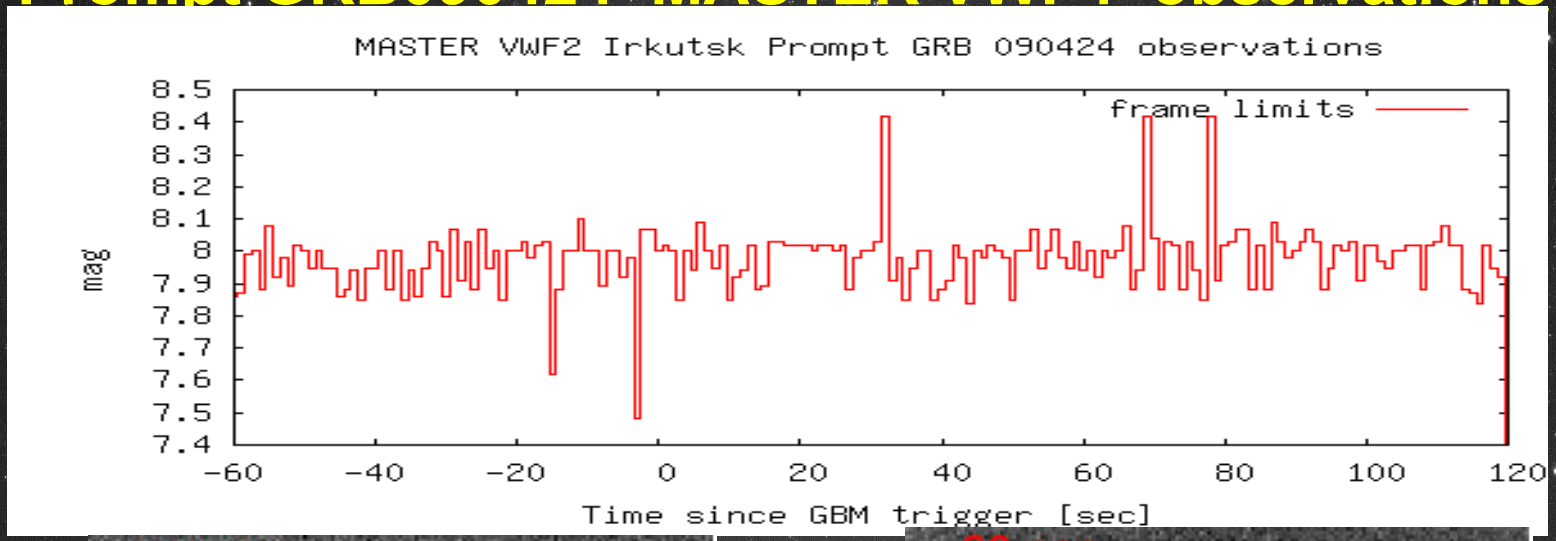
$$\frac{F_{opt}^{grb081102}}{F_\gamma^{grb081102}} < \frac{2.512^{m^{Vega} - (m^{grb081102} - \delta m)} \cdot F^{Vega} \cdot T_{90}^{grb081102}}{F_\gamma^{grb081102}}$$

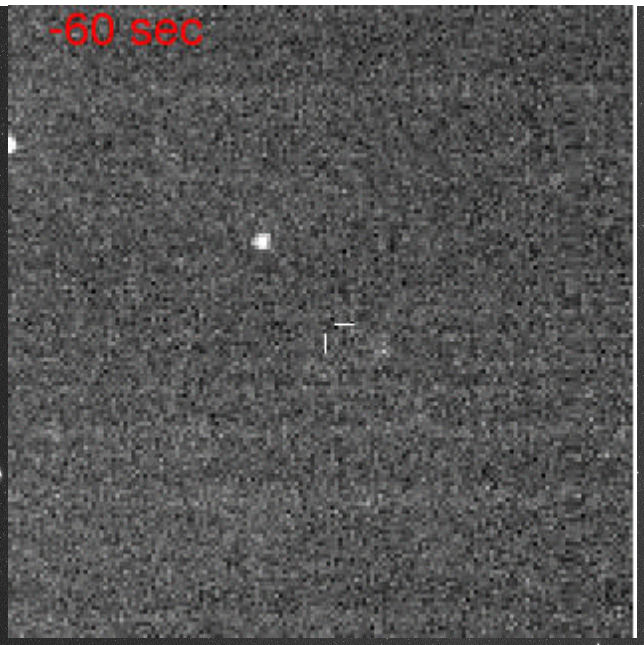
$$\frac{F_{opt}^{grb081102}}{F_\gamma^{grb081102}} < \frac{2.512^{0-13.0+2.8} \cdot 6.4 \cdot 10^{-6} erg/s/cm_2 \cdot 40s}{2.3 \cdot 10^{-6} erg/cm_2} = \frac{1}{140}$$

$$\frac{F_{opt}^{grb080319B}}{F_\gamma^{grb080319B}} = \frac{2.512^{m^{Vega} - (m^{grb080319B} - \delta m)} \cdot F^{Vega} \cdot T_{90}^{grb080319B}}{F_\gamma^{grb080319B}}$$

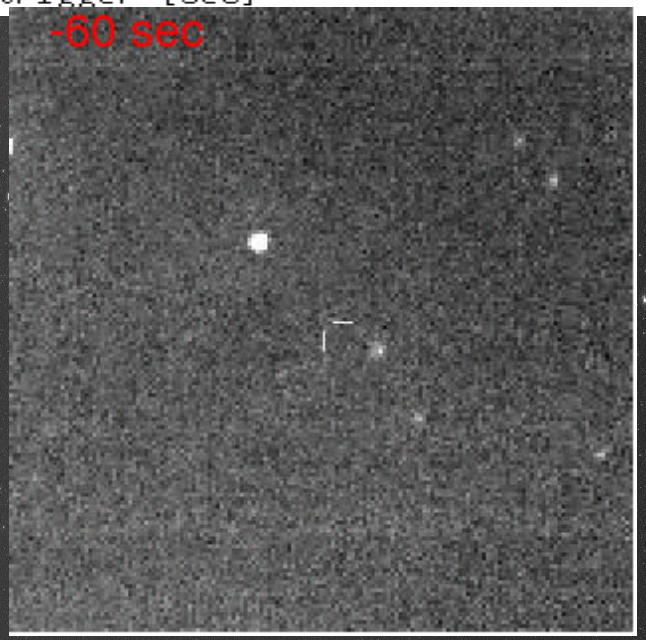
$$\frac{F_{opt}^{grb080319B}}{F_\gamma^{grb080319B}} = \frac{2.512^{0-13.0+2.8} \cdot 6.4 \cdot 10^{-6} erg/s/cm_2 \cdot 50s}{8.1 \cdot 10^{-5} erg/cm_2} = \frac{1}{23}$$

Prompt GRB090424 MASTER VWF4 observations



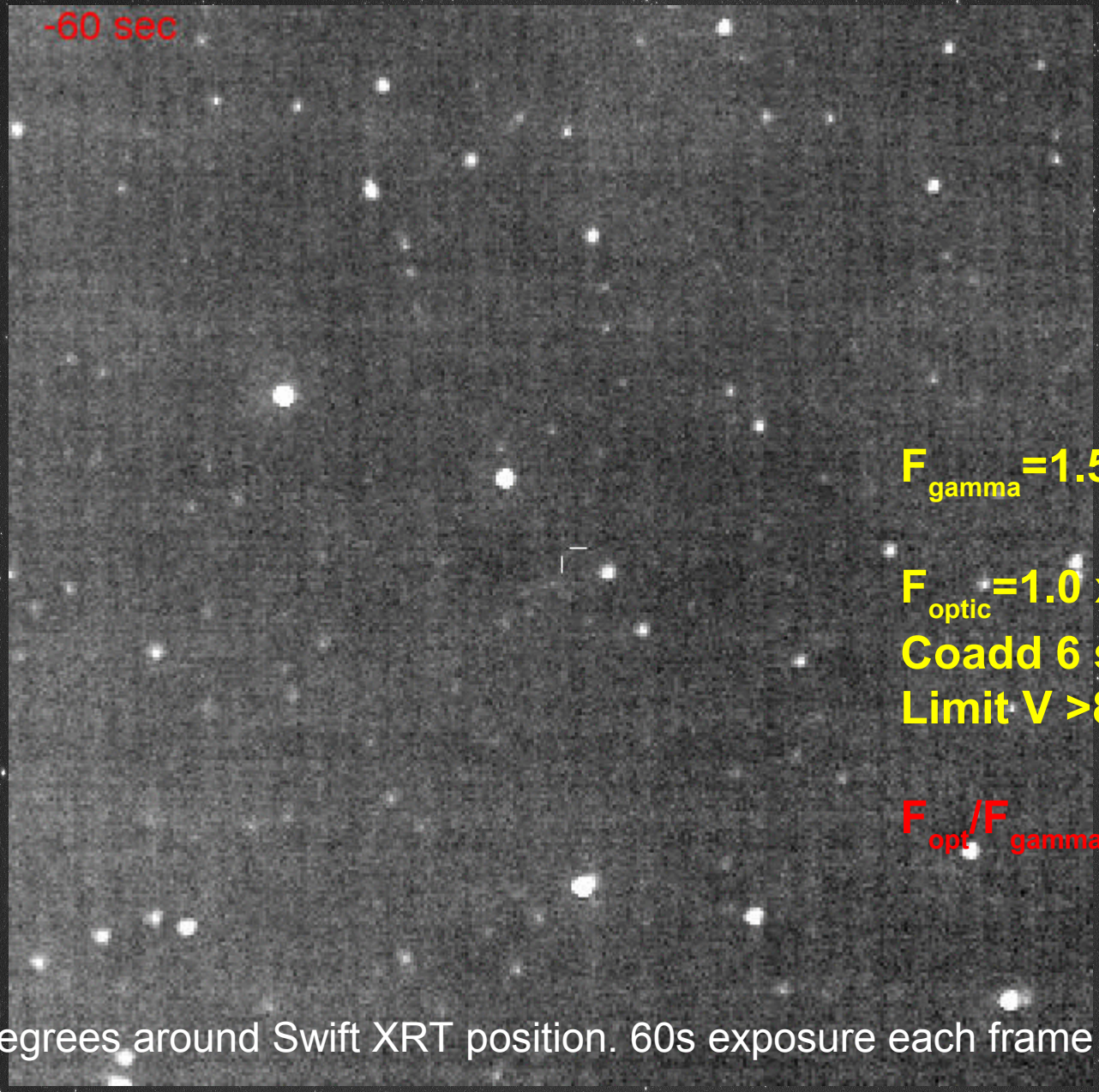


3x3 degrees around Swift XRT position. 1s exposure each frame



3x3 degrees around Swift XRT position. 6s exposure each frame

Prompt GRB090424 MASTER VWF4 observations



$F_{gamma}=1.5 \times 10^{-9}$ erg/cm^2

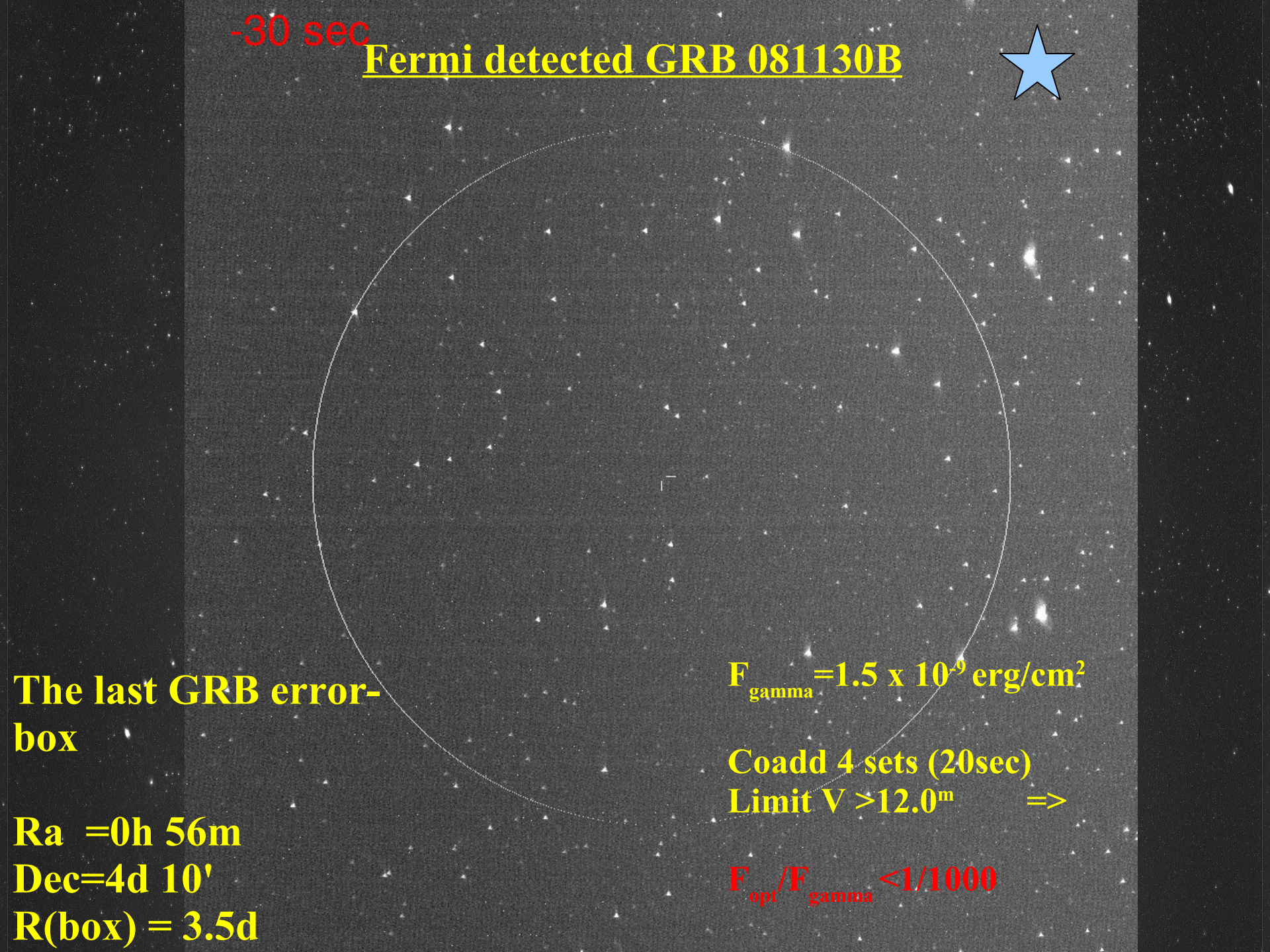
$F_{optic}=1.0 \times 10^{-7}$ erg/cm

Coadd 6 sets (6sec)

Limit V >8.9^m =>

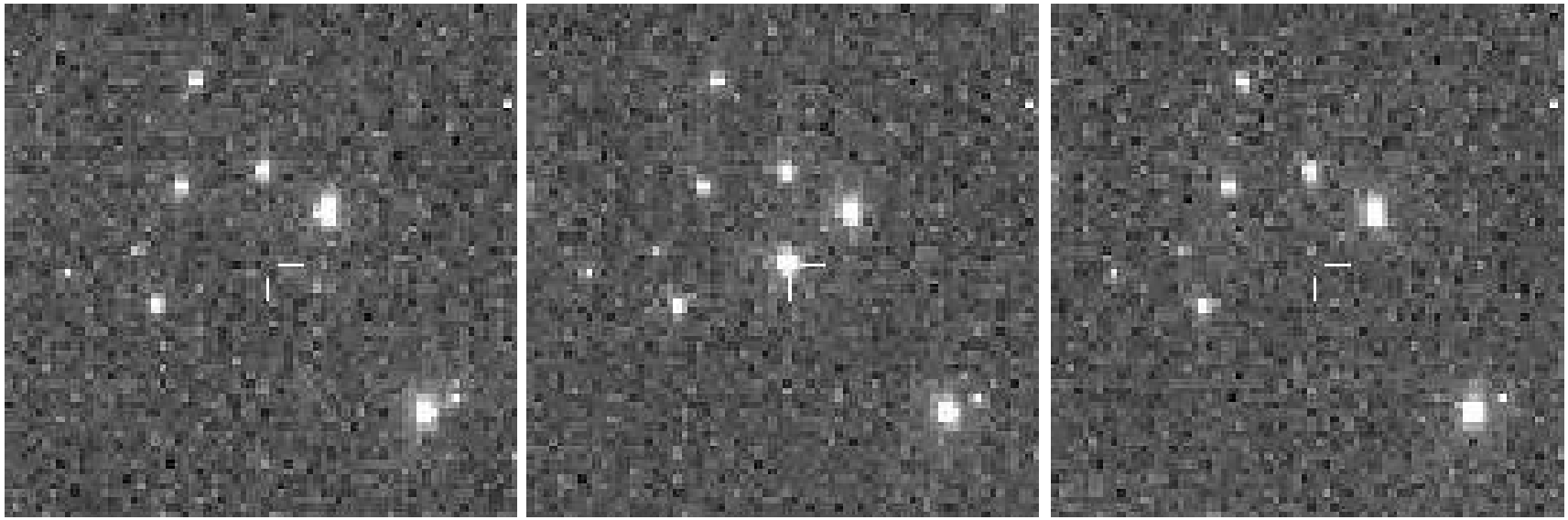
F_{opt}/F_{gamma} <1/500

5x5 degrees around Swift XRT position. 60s exposure each frame


-30 sec
Fermi detected GRB 081130B
The last GRB error-box
Ra =0h 56m
Dec=4d 10'
R(box) = 3.5d
F_{gamma}=1.5 x 10^{-9} erg/cm^2
Coadd 4 sets (20sec)
Limit V >12.0^m =>
F_{opt}/F_{gamma} <1/1000

Fermi detected **GRB 081130B**

Itneresting objects observed time to time with GRB 081130B incide 3-sigma FERMI error-box



After the correlation with NORAD database robot find that this phenomena explainad as short flash of «MOLNIA» satellite, and not a GRB.

FERMI detected short GRB090305 MASTER prompt observations

$F_{gamma}=1.0 \times 10^{-6}$ erg/cm^2

$F_{optic}=1.0 \times 10^{-8}$ erg/cm

Coadd 2 sets (2sec)

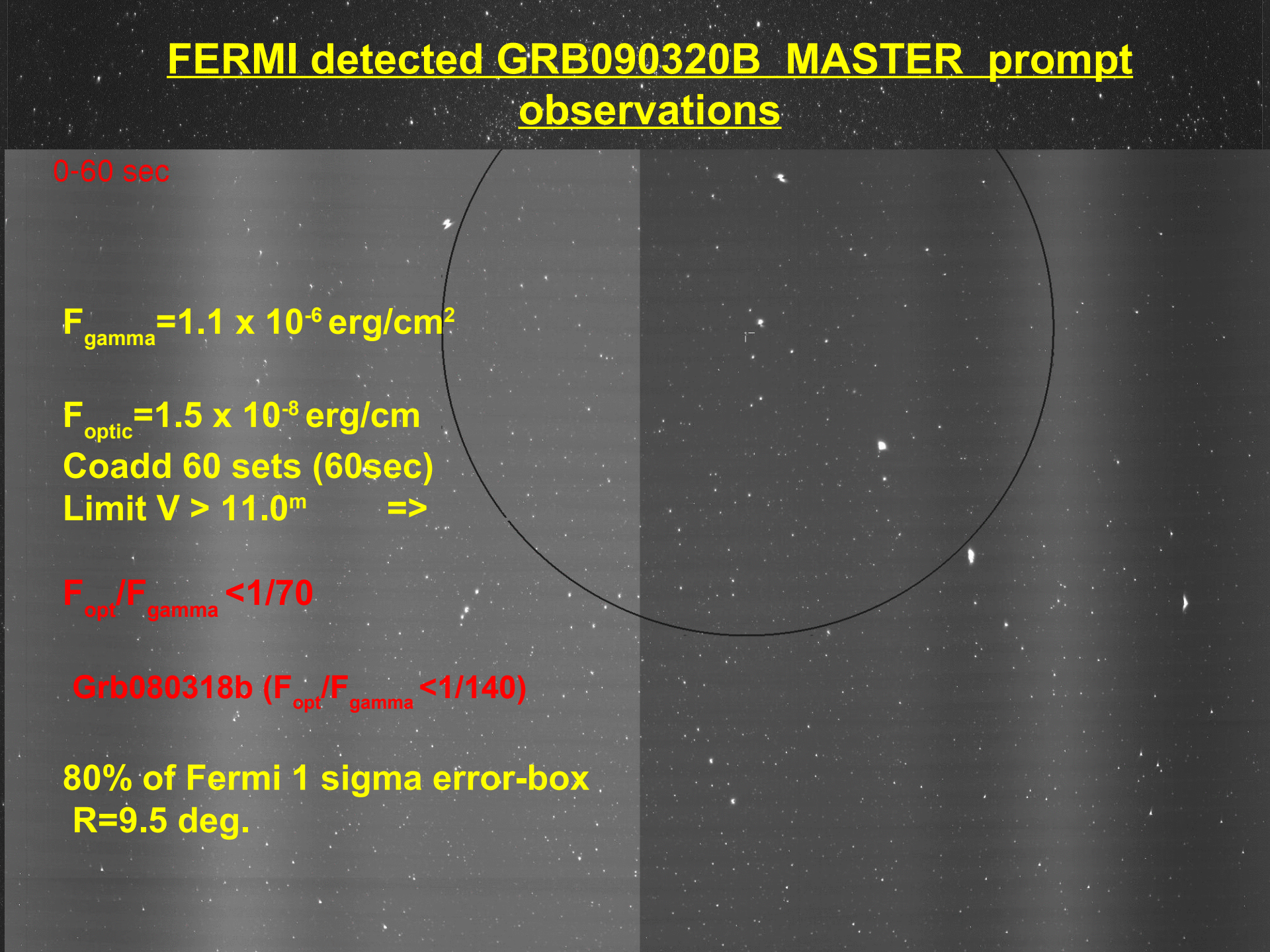
Limit V >9.5^m =>

F_{opt}/F_{gamma} <1/100

Fermi 1 sigma error-box (white) R=5.4 deg. Rectangular is IPN triangulation error-box

MASTER-WVF4-Kislovodsk GRB090305B observations -9 sec

FERMI detected GRB090320B MASTER prompt observations



FERMI detected short GRB0928B MASTER Irkutsk prompt observations

$F_{gamma}=9.6 \times 10^{-7}$ erg/cm^2

$F_{optic}=3.0 \times 10^{-9}$ erg/cm

1 sets (1 sec)

Limit V > 11.0^m =>

F_{opt}/F_{gamma} <1/300

Grb080318b (F_{opt}/F_{gamma} = 1/140)

25% of Fermi 1 sigma error-box

R=7.9 deg.

GRB090328B MASTER-VWF-2 Irkutsk -9 sec

- **Astrophysics, abstract astro-ph/0609161**
- From: Bohdan Paczynski [view email] Date: Wed, 6 Sep 2006 15:13:17 GMT (12kb) **Astronomy with Small Telescopes**
- Authors: **Bohdan Paczynski**
  Comments: 11 pages, submitted to PASP
  The All Sky Automated Survey (ASAS) is monitoring all sky to about 14 mag with a cadence of about 1 day; it has discovered about 10^5 variable stars, most of them new. The instrument used for the survey had aperture of 7 cm. A search for planetary transits has lead to the discovery of about ten confirmed planets, so called 'hot Jupiters', providing the information of planetary masses and radii. A large fraction of telescopes had an aperture of 10 cm.
  We propose a search for optical transients covering all sky with a cadence of 10 - 30 minutes and the limit of 12 - 14 mag, with an instant verification of all candidate events. The search will be made with a large number of 10 cm instruments, and the verification will be done with 30 cm instruments. We also propose a system to be located at the L_1 point of the Earth - Sun system to detect 'killer asteroids'. With a limiting magnitude of about 18 mag it could detect 10 m boulders several hours prior to their impact, provide warning against Tunguska-like events, as well as to provide news about spectacular but harmless more modest impacts.

Thanks for you attantion