Status with ESO
Followup

Few Notes prepared in collaboration with Luigi Stella

New Orleans - September 7 2004

Triggers - RRM

- As already stated the groups interested in GRBs in Europe in collaboration with ESO were able to set up a RRM procedure that allows the VLT to 1) stop the on going program (w/o loosing the data being collected), 2) point the coordinates of the trigger automatically received following a predetermined priority program, 3) start operation on a new target (assuming no time is lost for the target ID) in 6.5 Minutes. The programs approved are ready for fast activation.
- Other observations will be carried out according to the proposals submitted by different groups

Policy – ESO – See Web

- Exceptionally during P75 ESO will consider extending the ToO observing time (up to 5% now) to accommodate an expected increase of GRB triggers.
- Following an expected substantial in the number of detected GRB events and the Robotic Telescopes REM and Tarot becoming operational ….. ESO started to offer … UVES .. FORS1 .. FORS2 … in Rapid Response Mode (RRM).
  - No change of instrument is accepted in the automatic RRM
  - Activation during Service Mode runs only
  - No proprietary data period.
  - A case can be made by the PI of the proposal for a 3 months proprietary periodo.

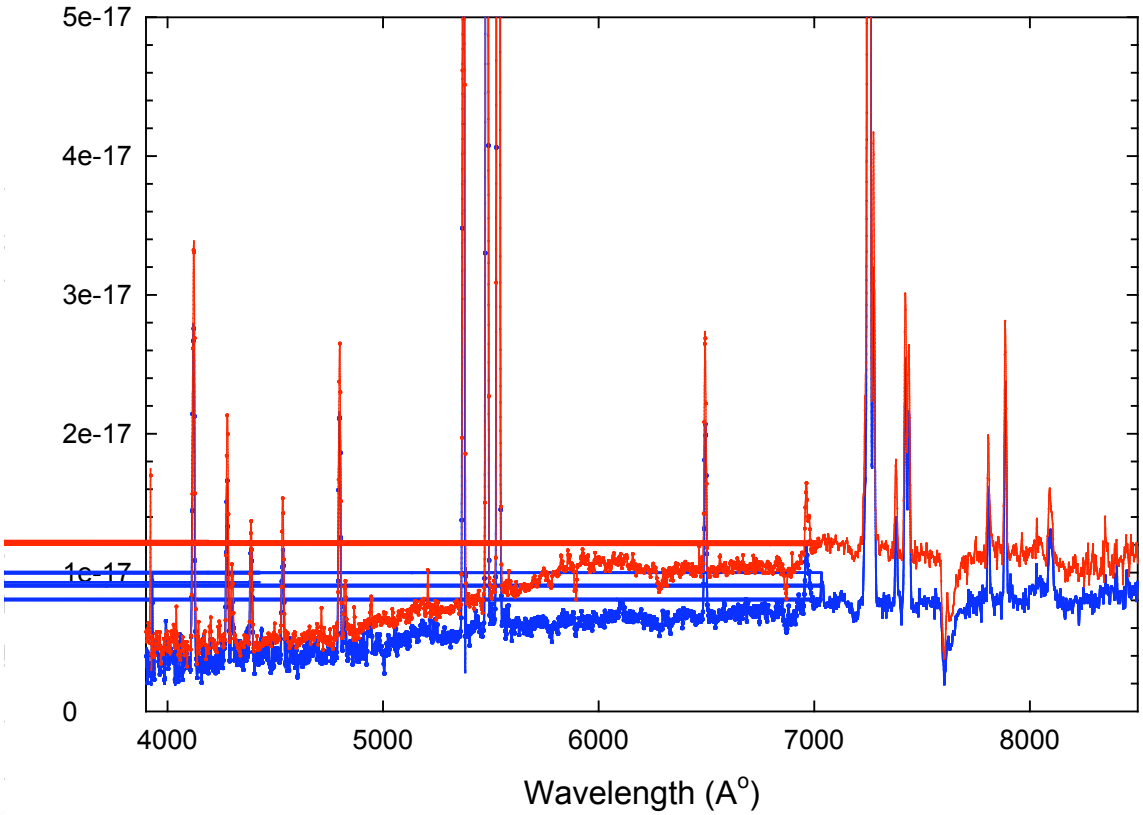
Organization – GRBs at ESO

- Much still needs to be done in the communication system within ESO staff and the guidelines to be received by the OPC (TAC).
- The new OPC guidelines tend to prefer well focused single science argument rather than favor a more general science approach needing eventually different observing strategies. See also Call P75.
- This approach could lead to confusion and a rather heavy load for the Staff of Paranal who is not particularly happy of being overloaded by different and too many triggers. Potential overlap and not clear triggering selection procedure.
- We feel we need better procedures and probably changes need to be further discussed within the ESO GRB community.
- The way may be that to organize the follow up more or less the way we organize the activity with the Swift Satellite.
- Any special strategy from the Ground Based US Large Telescopes?

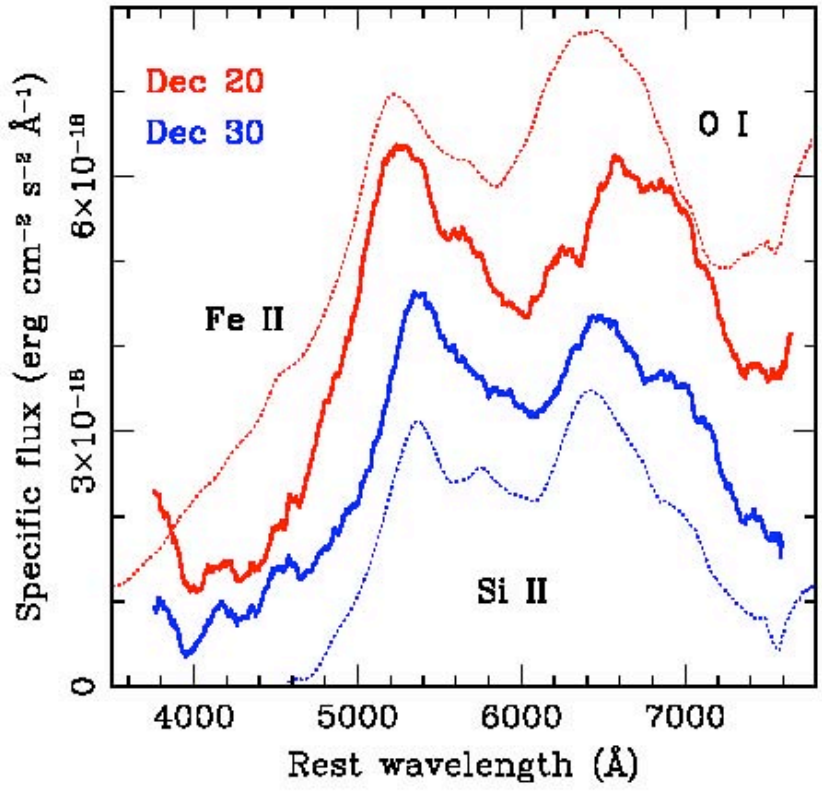
Others

- TNG Canaries Islands – we may be able to set up a sensible program. TBD.
- Chandra: we understand it may be possible to implement a faster response time. Anybody know about it?
- XMM: The project already improved the response time of the spacecraft and, especially thanks to some of the results obtained, we hope that Fred Jansen will be willing to invest more time in the GRBs.
- INTEGRAL: We all know about it and recently gave a reasonable number of triggers (obviously we have a Galactic Plane bias). See Mereghetti.

GRB 031203 - INTEGRAL



The 031203 SN



Spectra of the underlying SN after subtracting the spectrum taken On March 3rd from the spectra of the 20th and 30th of December.
The dotted lines refer to SN 1998 bw taken 2 days before and 7 days after the Maximum in V light (13.5 and 23.5 days after the GRB), Palat et al. 2001, Ap.J. 555, 900.

Malesani, Tagliaferri, Chincarini, Covino et al., 2004 ApJ.L. submitted

The REM Observatory:

The REM/ROS Team

Part of a more general presentation prepared by

Filippo Maria Zerbi

REM

REM

A fast moving telescope …

- Alt-az 60 cm f/8 RC silver-coated
- 2 Nasmyth foci (one idle)
- 60 deg 5 sec – to any α,δ in 60 sec

… with a high throughput NIR Camera…

- 10x10 am² FoV
- 1.2 as pixel scale (diff.limited)
- 0.9-2.3 microns (Z',J,H,Ks)
- 512x512 HgCdTe chip @77 Kelvin
- Wobbling plate for dithering

… and a Visible Imaging-Spectrograph

- 10x10 am² FoV
- 0.55 as pixel scale
- 30 bins between 0.45-0.9 μm (Amici Prism)
- 1024x1024 Marconi CCD in Apogee head

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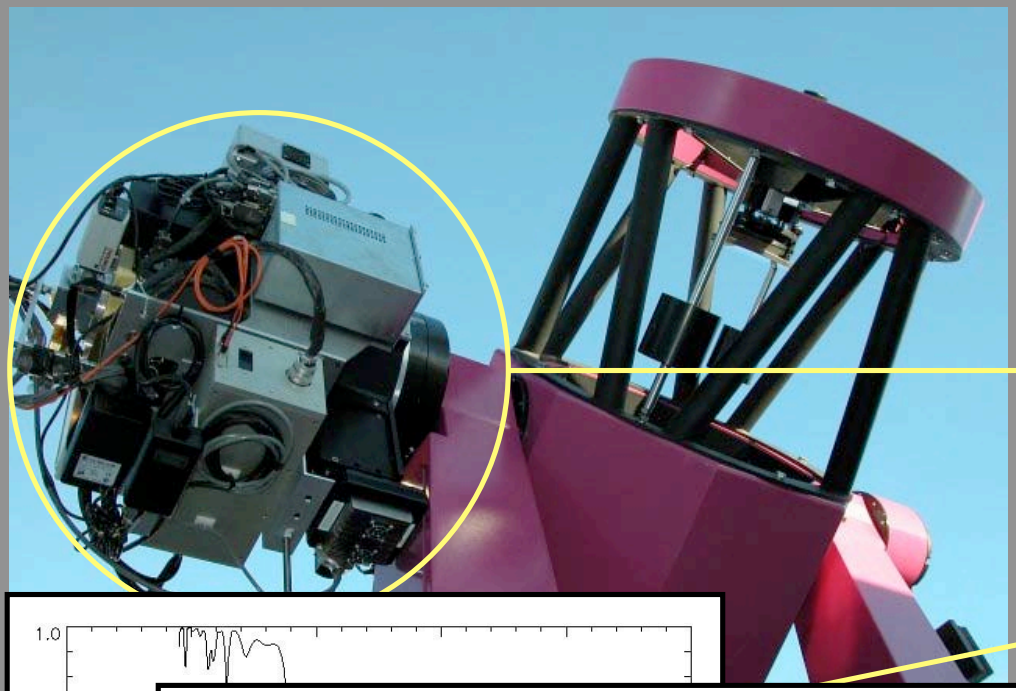
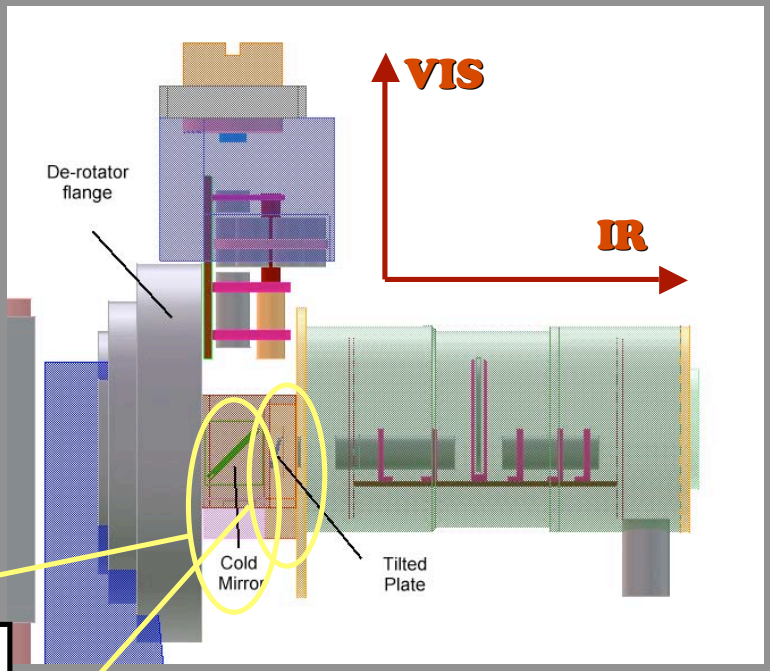
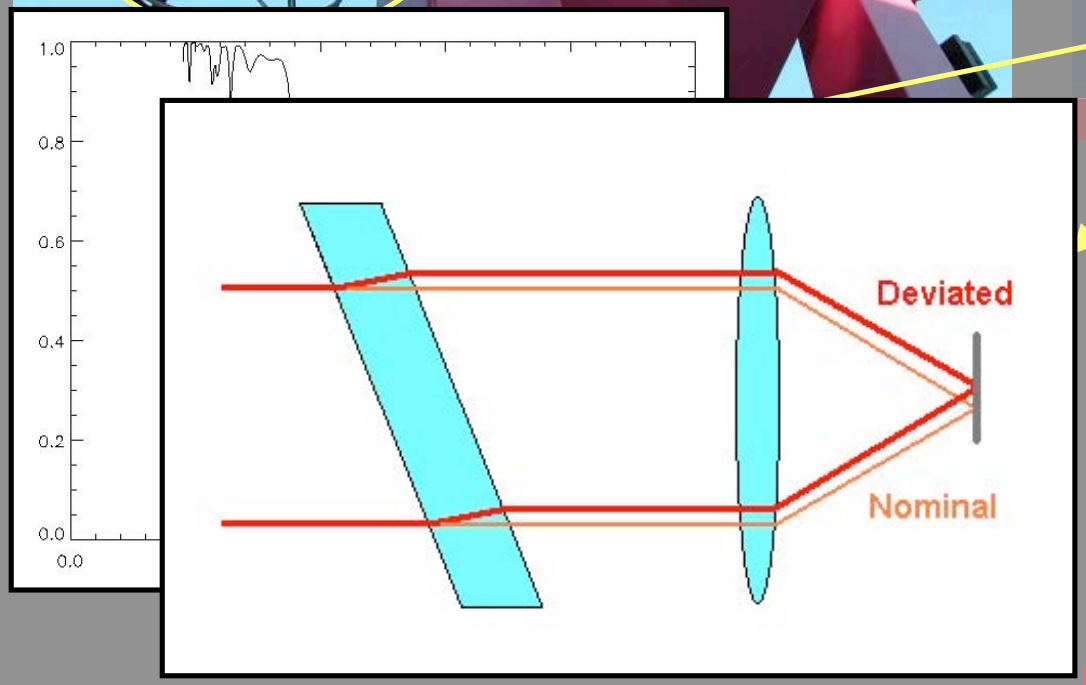
REM

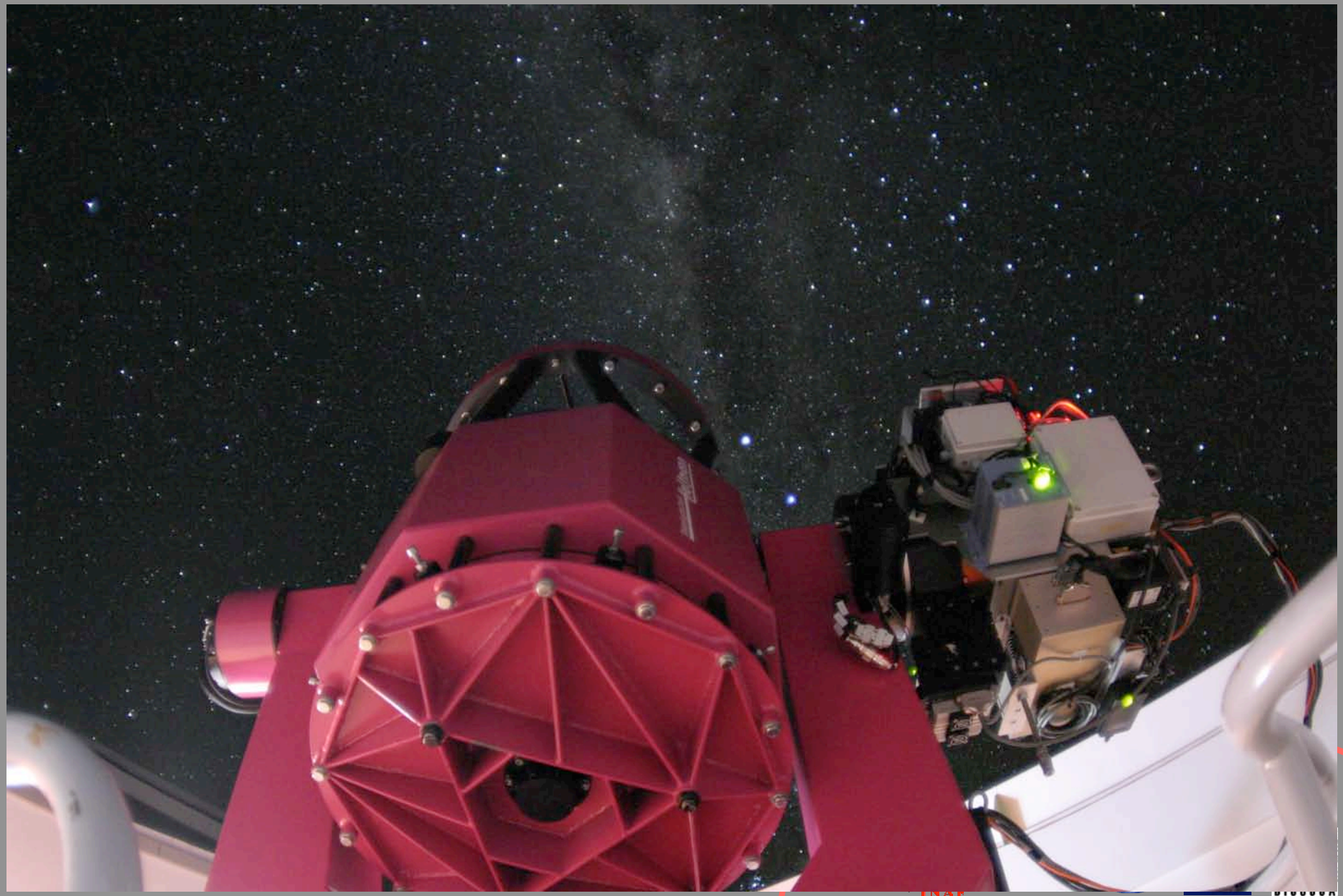
The Instrument Flange







REM



REMOS:
- Target acquisition
- Start observation

5-10 s up.tr.rec.

REMos
REM
Meteo Monitor
New Target
Archive
Dome
Connections Status

REM

Tools f
the R.E
telescop

REM Observing Software

Release: 0.12.1, August 7 2001

Status: code writing

REM OS responsible: Stefano Covino

Purpose: *Manage the REM OS*

Software structure:

Last update: 02/10/2001

Module 1	REM OS manager	status: code writing
Module 2	receive information from Swift or other sources and create or update the target list	status: approved
Module 3	read first target from list and evaluate actions	status: approved

La Silla Meteo Monitor

17/10/2001 UT: 06:05:04

Humidity:	16.00 (%)
Temperature:	14.80 (C)
Dew point:	-10.90 (C)
Wind:	2.10 (m/s)
Pressure:	772.70 (hPa)
DIMM seeing:	0.63 (arcsec)
Sun altitu	
Data upda	

Reloa

REM Dome status

The dome is open.

Close Window

General Presentation

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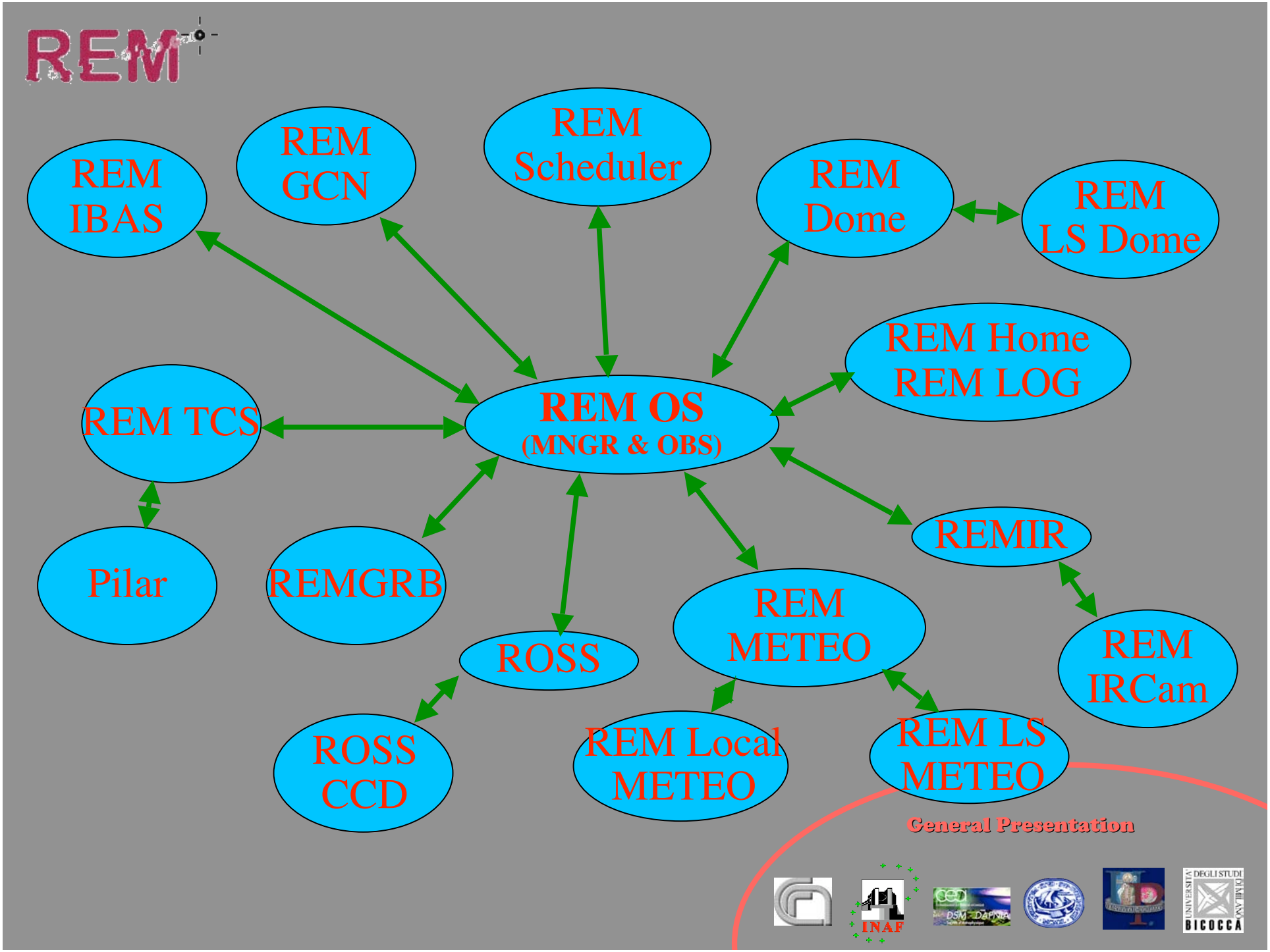
REM
REM IBAS
REM GCN
REM Scheduler
REM Dome
REM LS Dome
REM Home
REM LOG
REM TCS
REM OS
(MNGR & OBS)
Pilar
REMGRB
REMIR
REM METEO
REM IRCam
ROSS
ROSS CCD
REM Local METEO
REM LS METEO
General Presentation
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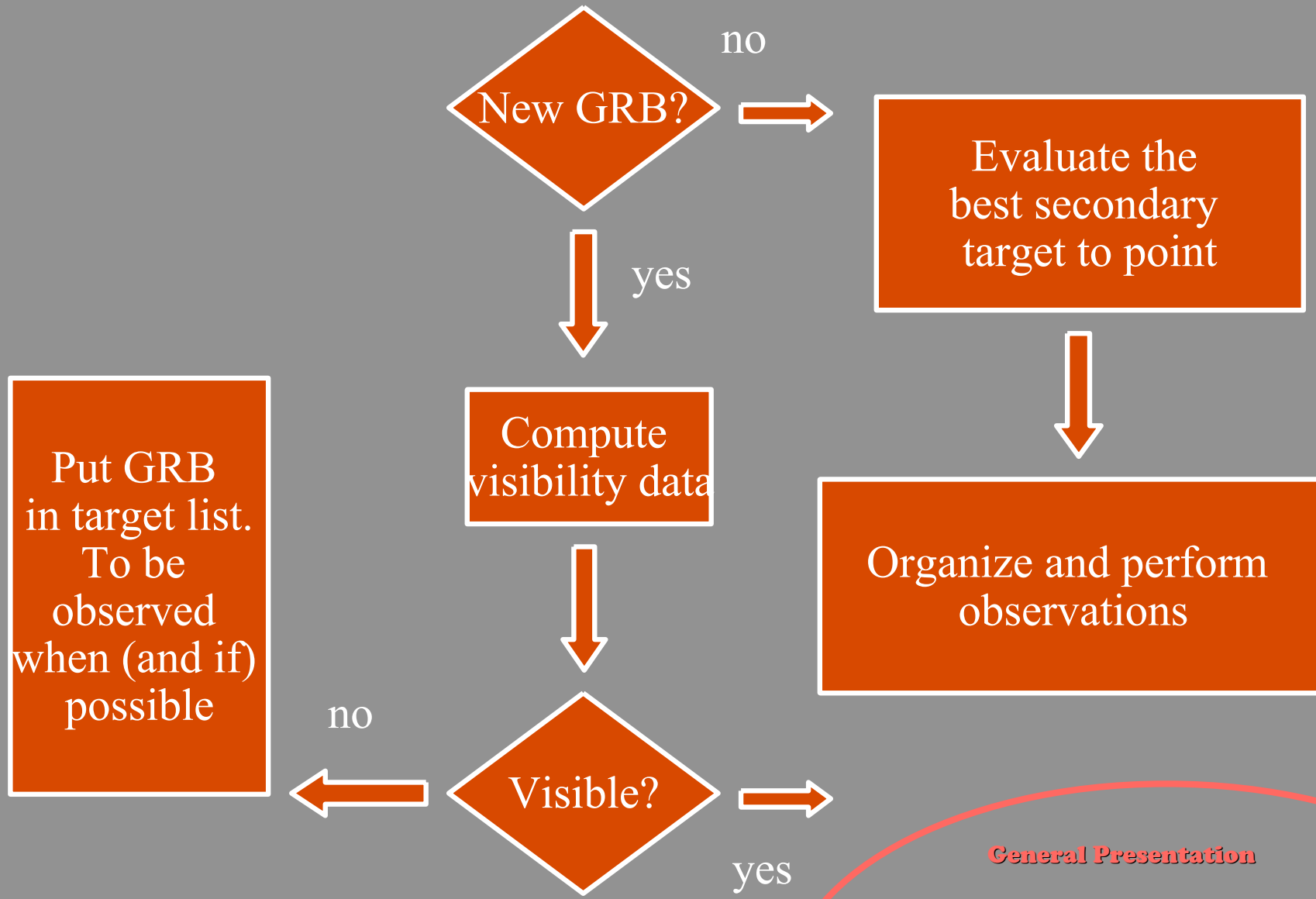
REM


New GRB?
no
Evaluate the best secondary target to point
yes
Compute visibility data
Organize and perform observations
Put GRB in target list. To be observed when (and if) possible
no
Visible?
yes

REMOS:
- Target acquisition
- Start observation

5-10 s up.tr.rec.

One Raw Image every 1.5 s

PREPROCESS:
Sky and Bias Subtraction
flat fielding and dithering reconstruction
5 images processed in 3.7 σ

One Cleaned Image every 7.5 s

Quick-Look Scientific pipeline
- Transient detection (SEXtractor) [.2 s]
- Coordinates determination [2 s]
- Photometry (Z'JHK) (any object in the frame above a S/N threshold) [6 s]

Coordinates → Web >15 s

RRM

UVOT
ROSS
Tarot-S

DECISION routine

Redshift

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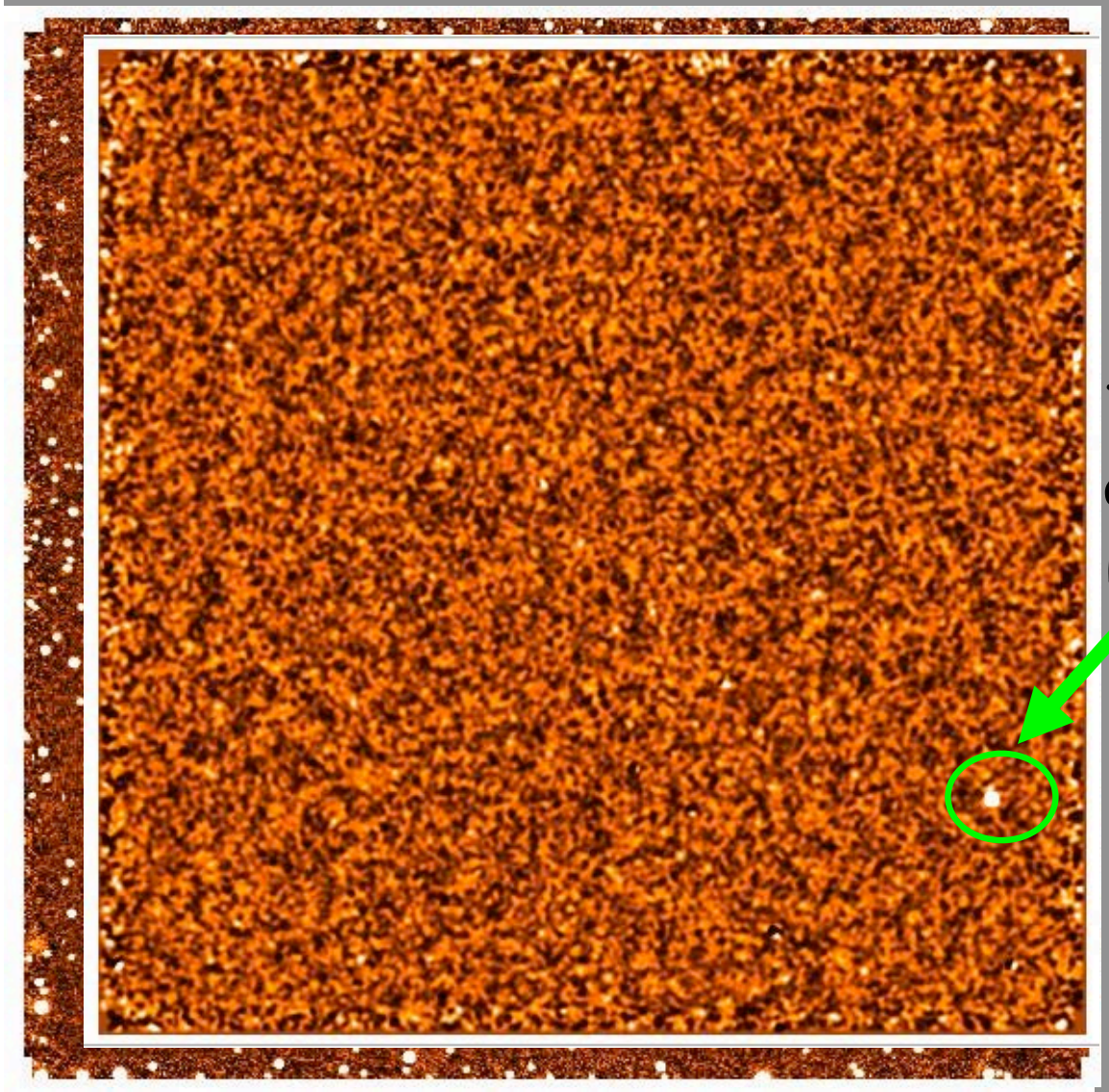
REM

AQuA



20 sec!

The five images are reduced and a first scientific image is obtained.

A first set of 5 dithered images is acquired.

The two scientific images are subtracted and smoothed then a source detection algorithm is applied to look for variable objects.

A second set of 5 images is acquired and reduced

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REM

Perform the first basic set of observations

OT and/or IT identified?

no

Increase exposure time and check further GCN messages

yes

Estimate photometric redshift and send coordinates to larger telescopes

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REM

What is REM for ?

REM is conceived as a link between transient phenomena detected at high energy from space AND Large ground-based facilities on the ground → Gamma Ray Bursts

REM

Such a link is needed for:

- Transient Coordinate determination

  High Energy detections have large error-boxes

- Pre-screen of transient characterisitics

  Cases selection for further observations

In both Cases crucial are:

a) Coverage up to NIR

b) Fast response

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Who triggers REM ?

What SWIFT gives us is

- **Position of the GRB - [15 sec] (4 am)**
- **Position of the XT [20-70 sec] (5 as)**
- **Position of the OT [20-70 sec] (n/10 as) (if there)**

Color Information 0.15-0.65 μm[600 sec]

What SWIFT does not give us

- **Position of the Red-T (above 0.65 μm) and NIR-T**

>150 trigger per year !

REM

ROSS acquires 30 simultaneous calibrated data points between 0.45 and 0.9 microns

This allows to:

- **Correlate the time of the optical peaks with the distribution of Lorentz Factors in the original cataclysm.**
- **Detect the possible time dependent obscuration of optical transients associated with GRBs.**
- **Possibly detect the peak energy that goes from gamma to optical within few hours.**

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REM

Any possible optimization of the Space-borne trigger source will let free REM observing time

INTEGRAL-AGILE few bursts
SWIFT-HETE II more bursts but
latitude/longitude constraints

- **Housekeeping and calibration**
- **Other Observing programs**

Anywhere Rapid multi-frequency observations are needed

1. **Multifrequency monitoring of AGNs**
2. **Black Hole Candidates –X-ray Novae**
3. **Flare Stars**

What has REM done so far?

Flat
Calibration
Flat
Calibration
Flat
Calibration
Flat
Calibration
Flat
Calibration

Error
Debugging
Error
Debugging
Error
Debugging
Error
Debugging
Error
Debugging

Modify the cable
Tune the motor
Change the port
UPS
Firewall
Redundancy
Etc.

- No degradation of expected performances
- Acceptable (and improving) duty cycle
- Acceptable reliability

REM

Hete II and Integral GRBs

All happened during La Silla day time!

Most of the "visible" GRBs from starting of operation have been observed.

- GRB 031203 (Zerbi et al. 2003)
- GRB 040106 (Palazzi et al. 2004)
- GRB 040223 (Israel et al 2004)
- GRB 040416 (not a real GRB!)
- Some SGRs!
- GRB 040511 (Testa et al. 2004)
- GRB 040624

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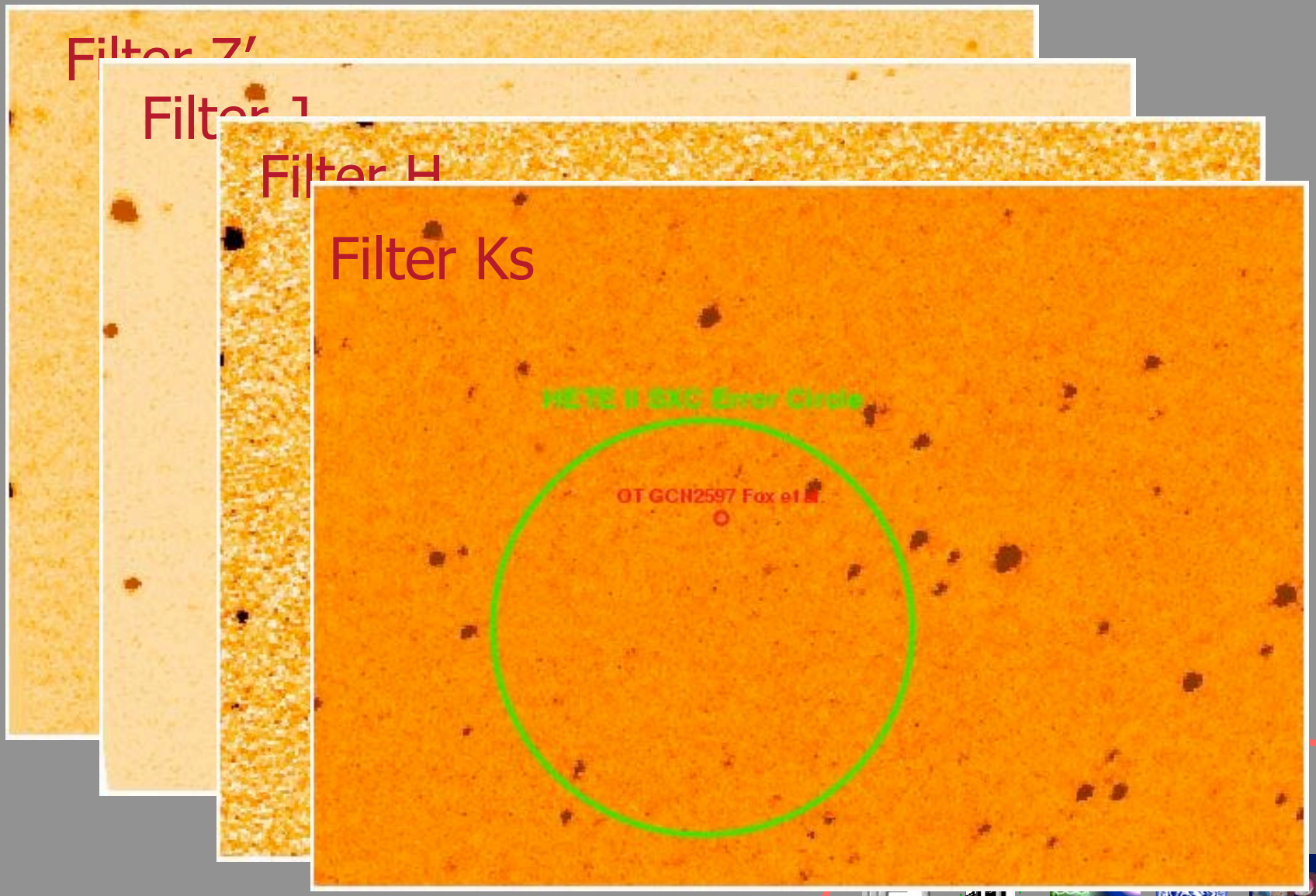
REM

GRB 040511



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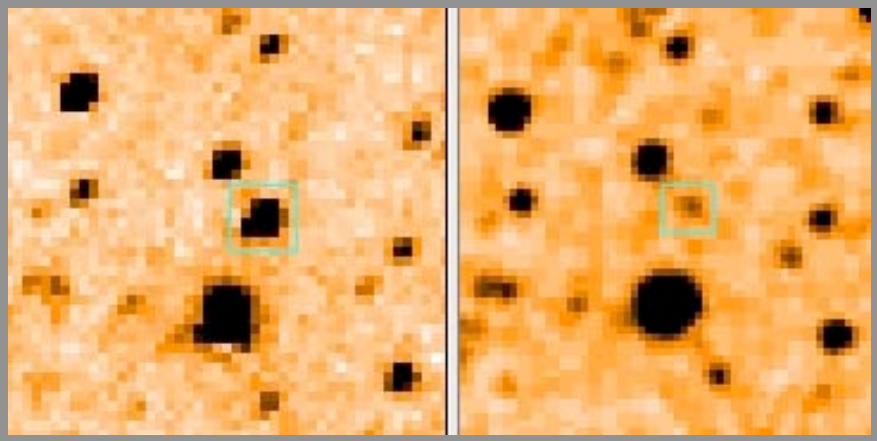
REM

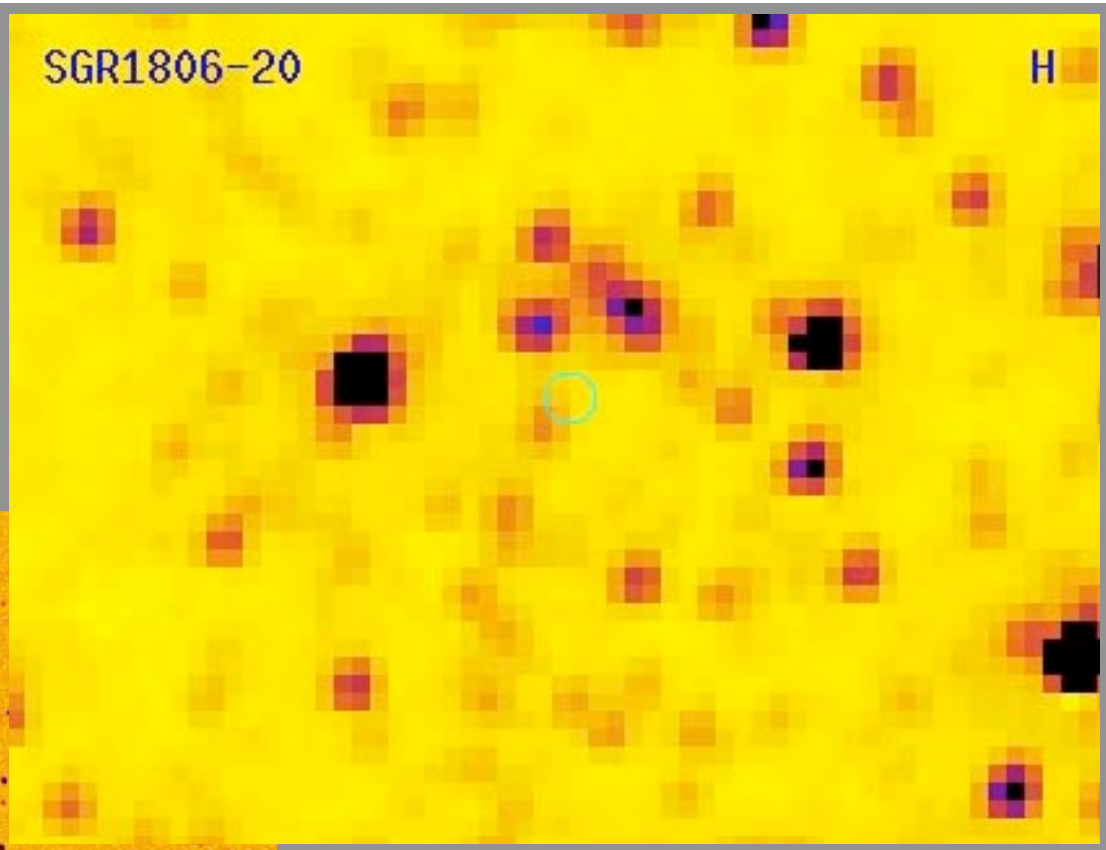
GX339-4 :
a BH candidate

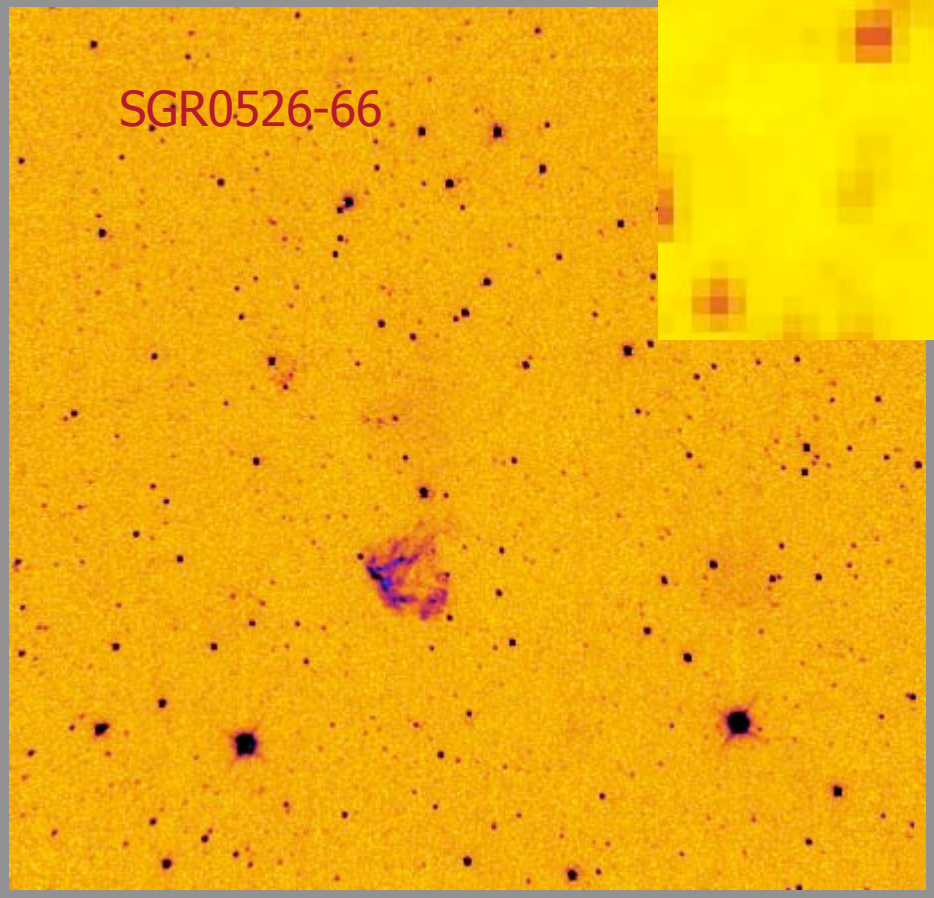


The bright status discovered by comparison with the 2mass catalogue

REM

Some SGRs...

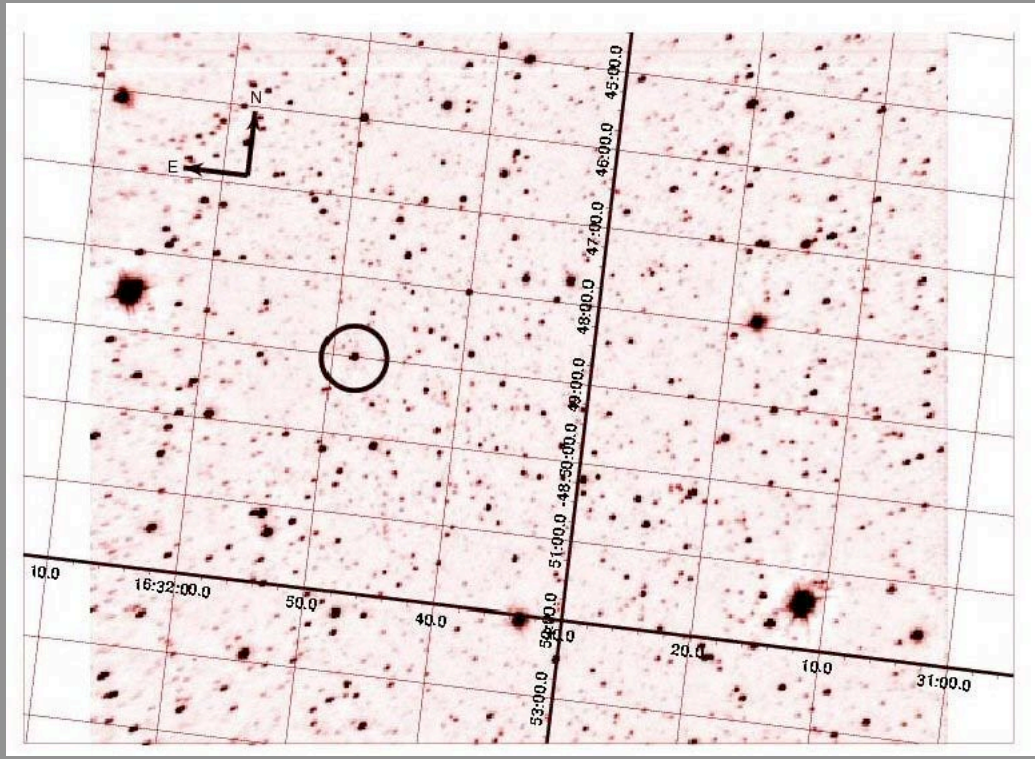




REM

HMXB IGR16318-4848

High Mass X-Ray Binary.



The first new gamma source discovered by the INTEGRAL IBIS/ISGRI imager on 2003, January 29

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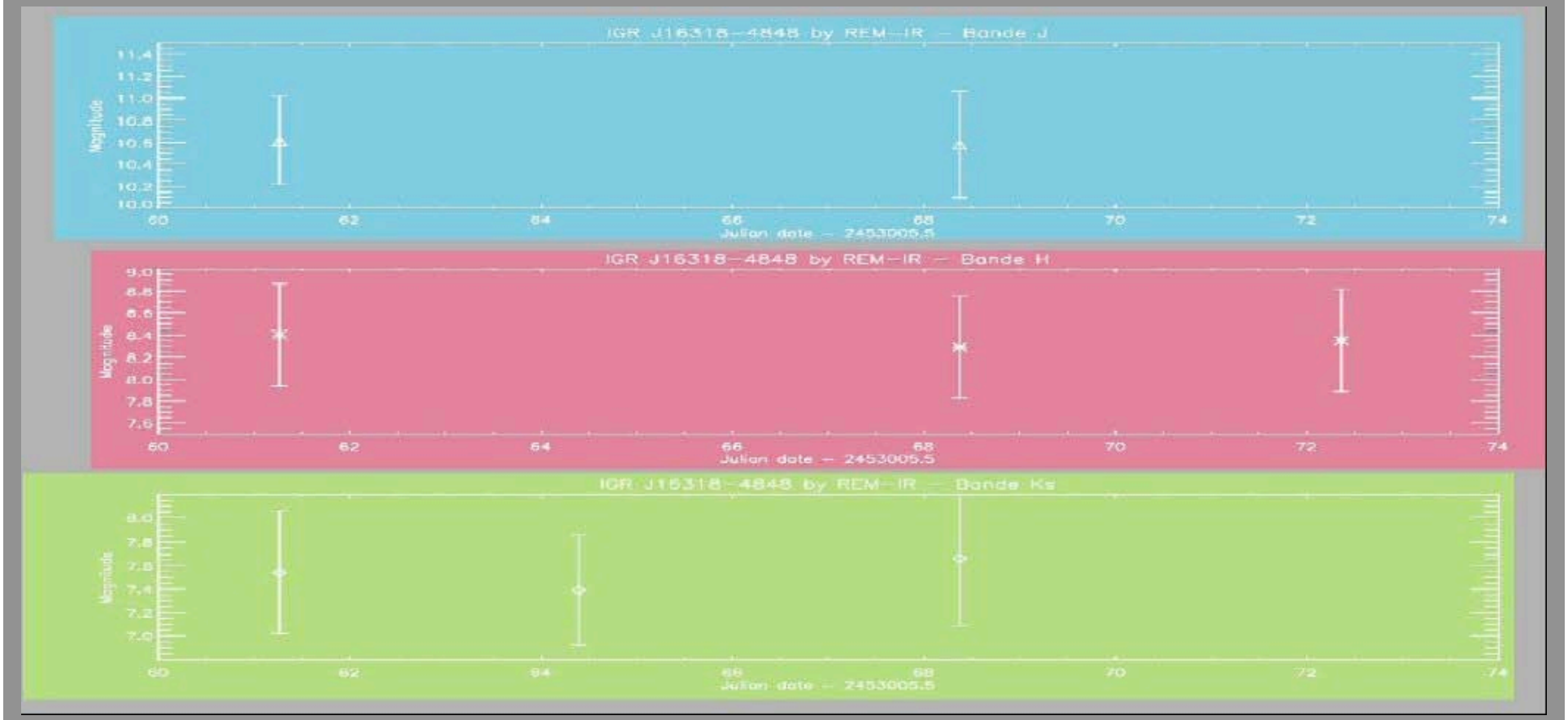
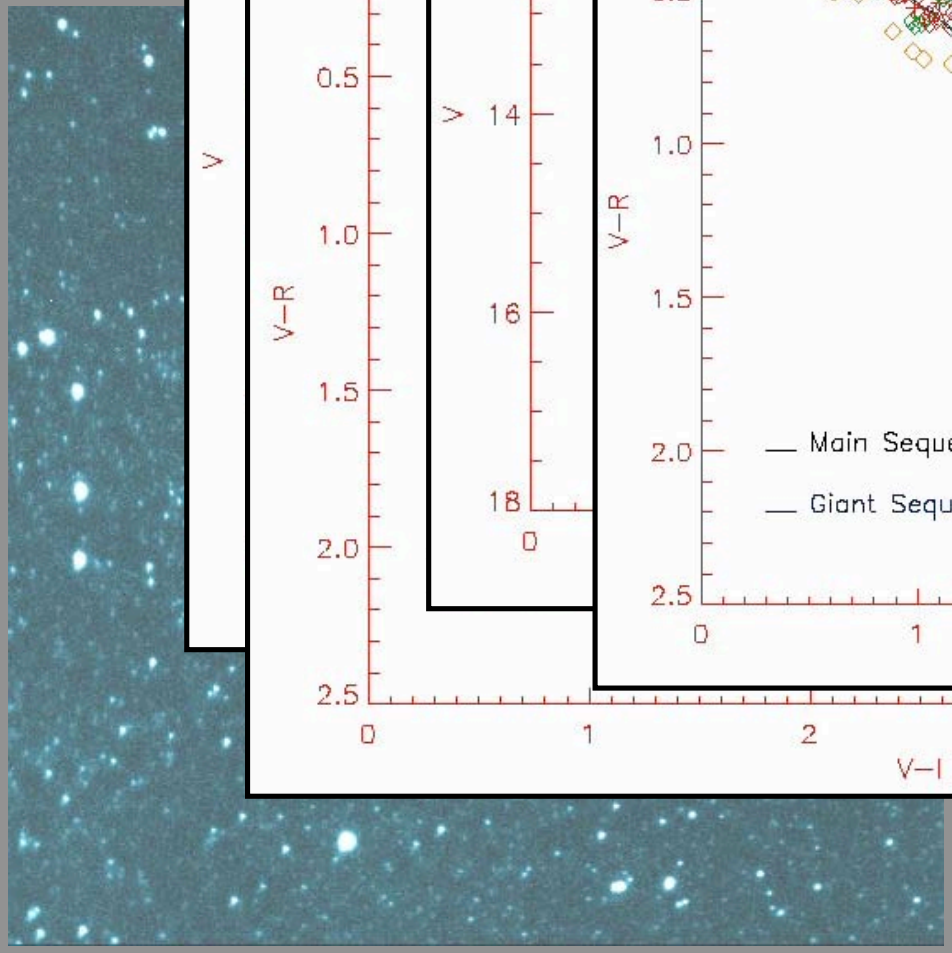
REM

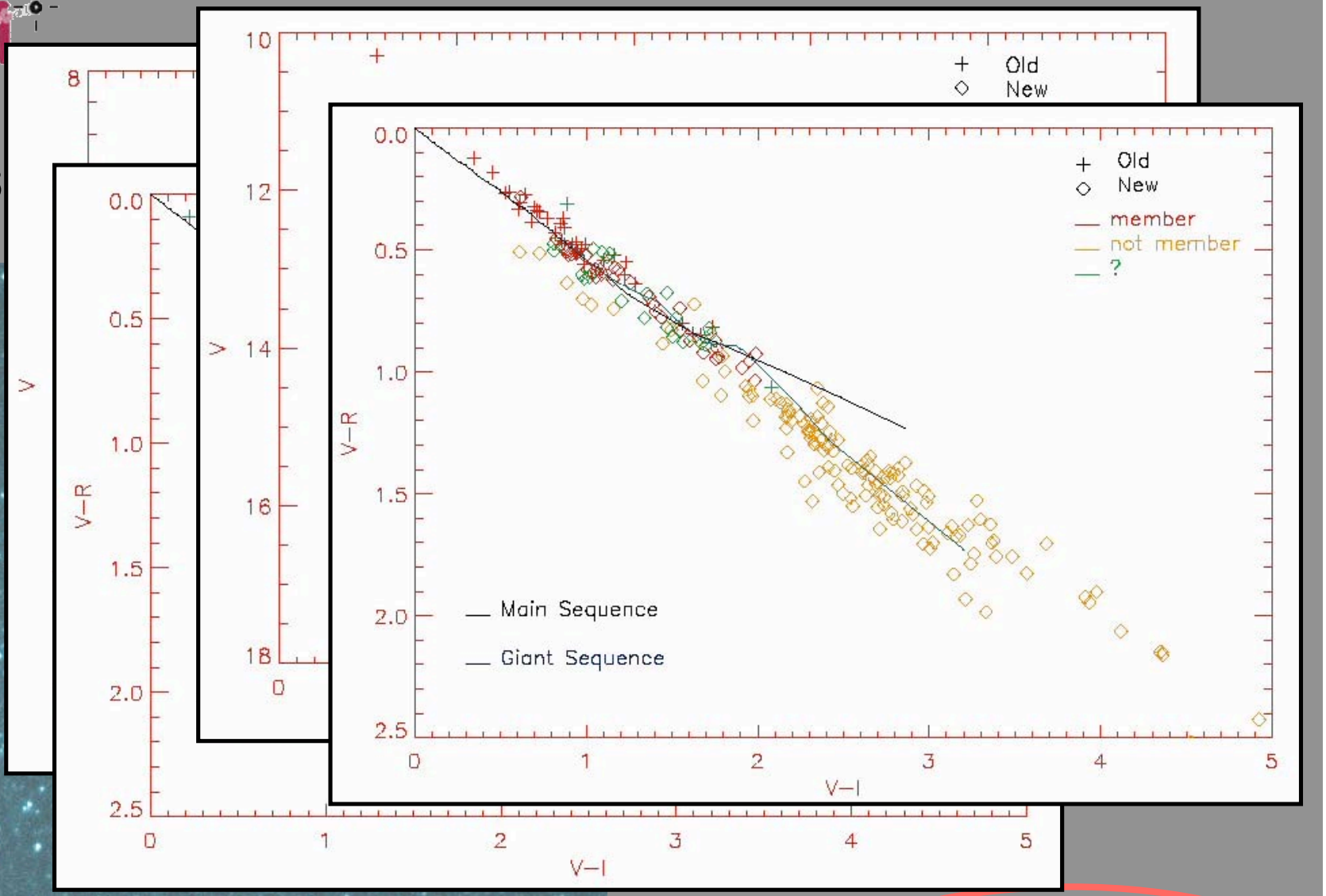


Looking for variability of the source to check then nature of the collapsed object

REM

ROSS





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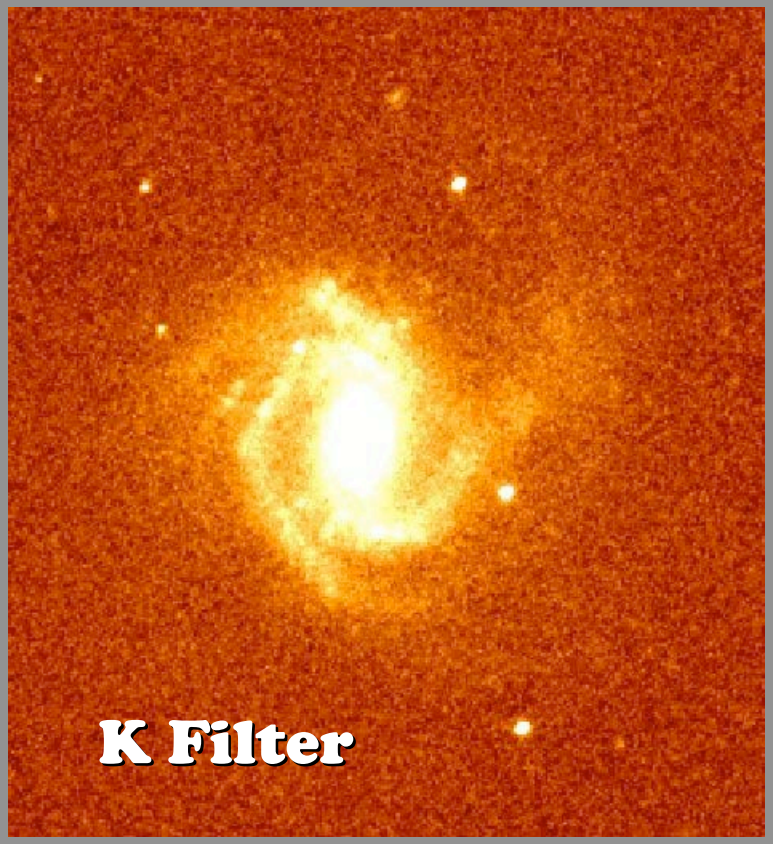
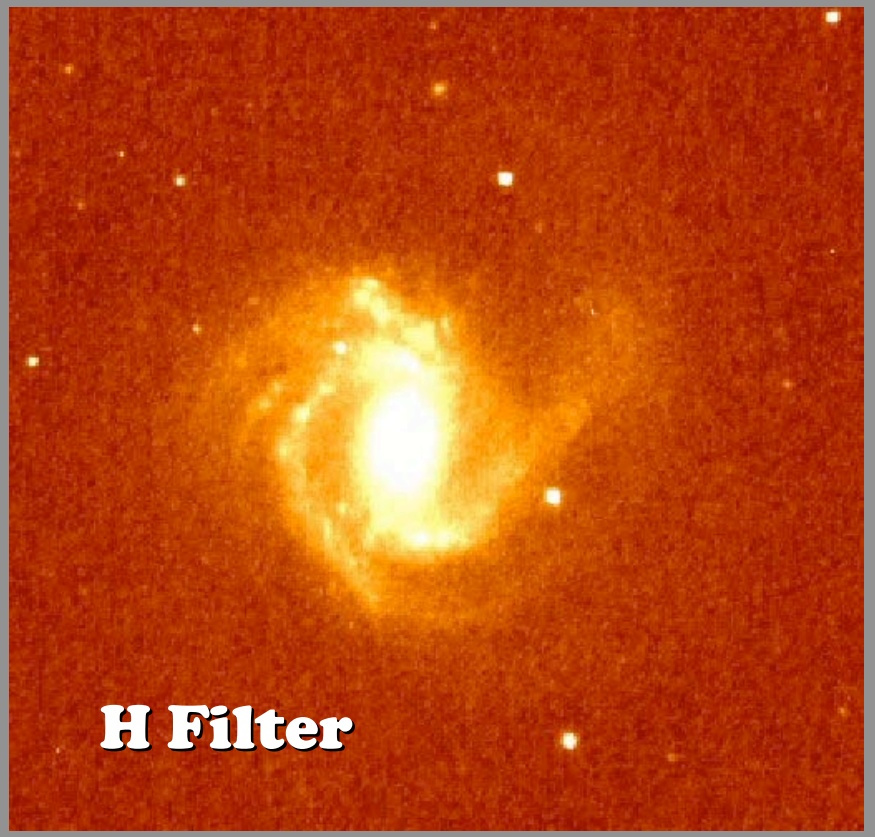
REM

VCC Galaxies





Extended object surface NIR photometry.

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REM

IRS 17
Mosaicing H2 images of Molecular Clouds

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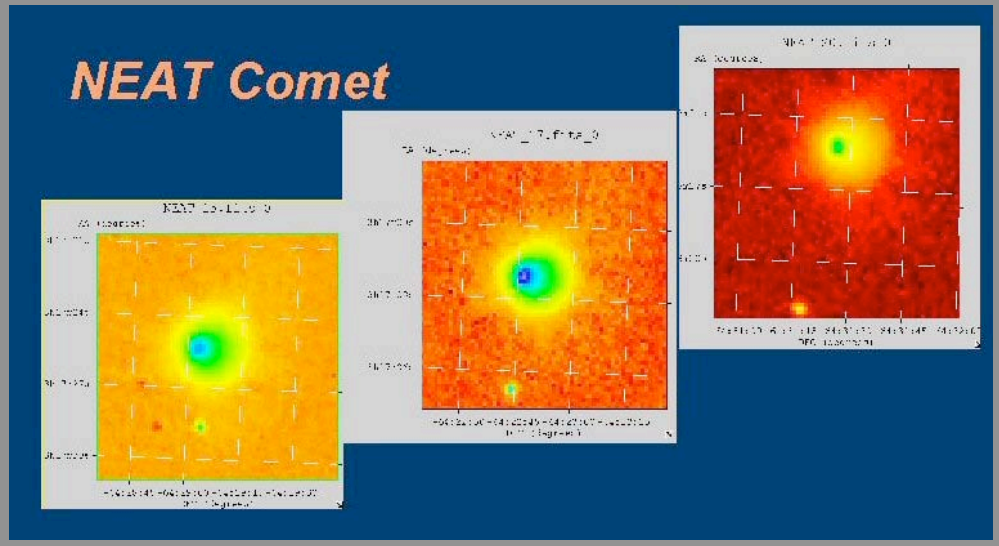
REM



Even Something Amusing...

.... The NEAT comet

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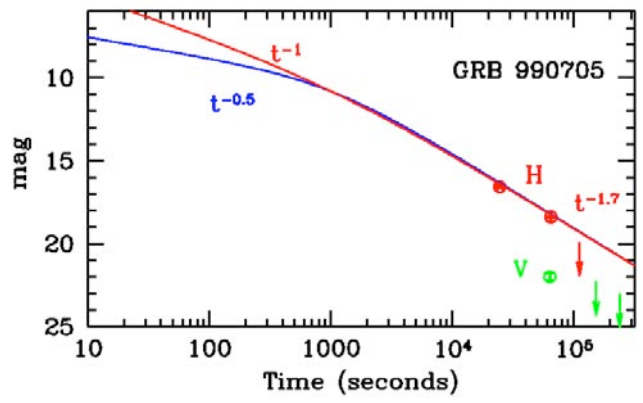
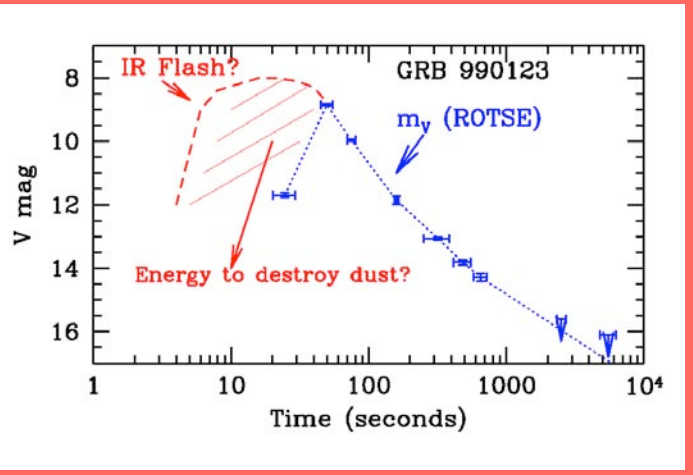
REM



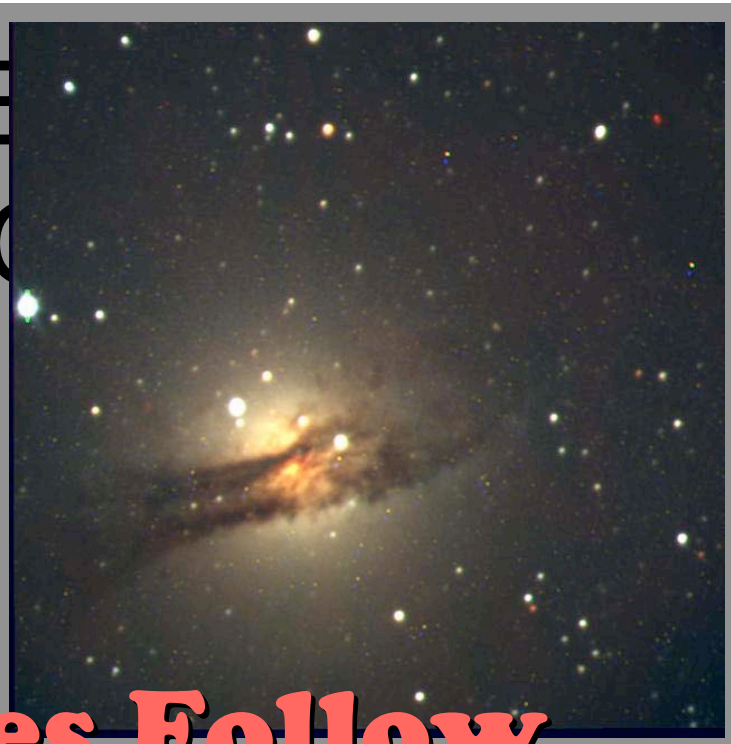


T int.	Z S/N=10	Z S/N=5	J S/N=10	J S/N=5	H S/N=10	H S/N=5	K S/N=10	K S/N=5
5 sec	17.0	17.7	15.7	16.5	14.5	15.3	13.2	14.0
30 sec	19.9	20.7	16.6	17.4	15.5	16.2	14.2	14.9
600 sec	24.5	25.3	17.6	18.3	16.7	17.4	15.5	16.3

Fast and NIR enough?

RE

RE



Back up slides Follow

tion

REM

The Telescope

- **Alt AZ mount**
- **Direct Torque Motors 12 deg/sec max speed both axis.**
- **Derotated Nasmyth Focal Station**
- **Etel/Heidenain – Profibus control system**
- **F/2.2 primary F/8 RC optical system**
- **Protected Silver Coating**
- **IR-optimized Mech. Structure**

REM

Who triggers REM ?

HETE II - W… …min errorbox

…e

What SWIFT gives us is

- **Position of the GRB - [15 sec] (4 am)**
- **Position of the XT [20-70 sec] (5 as)**
- **Position of the OT [20-70 sec] (n/10 as) (if there)**

Color Information 0.15-0.65 μm[600 sec]

…)

What SWIFT does not give us

- **Position of the Red-T (above 0.65 μm) and NIR-T**

>150 trigger per year !

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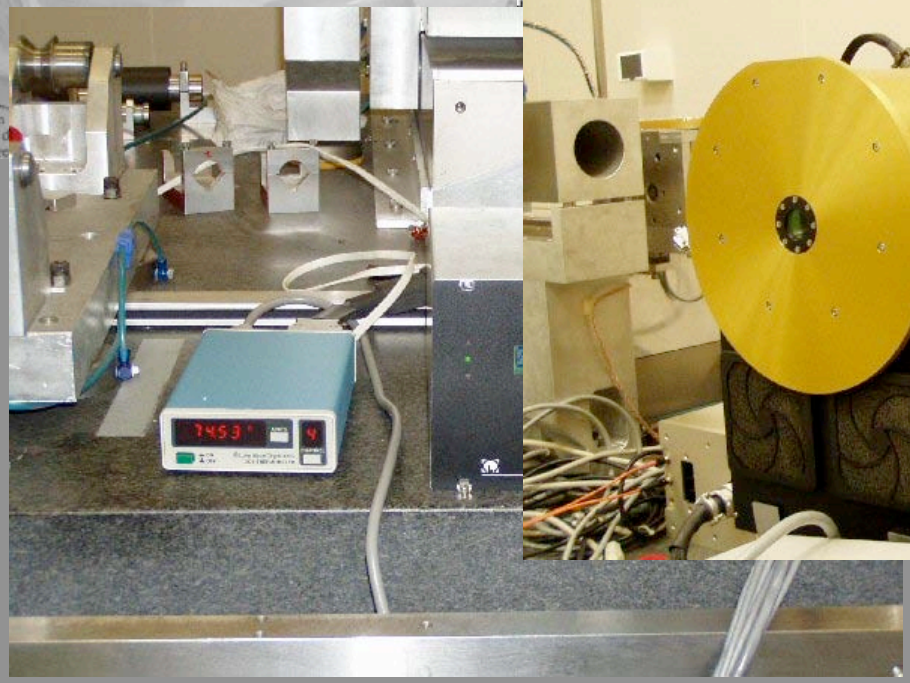
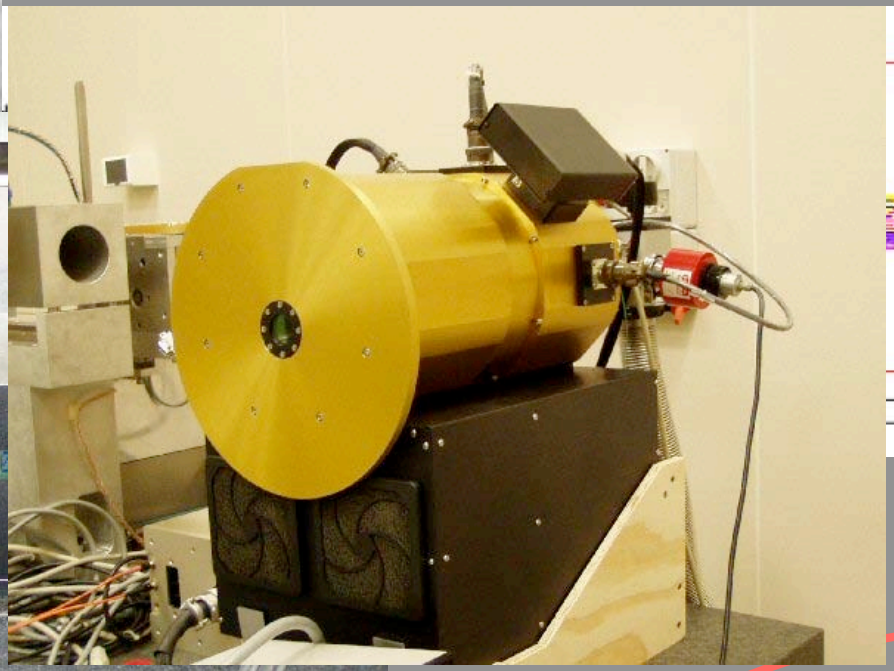
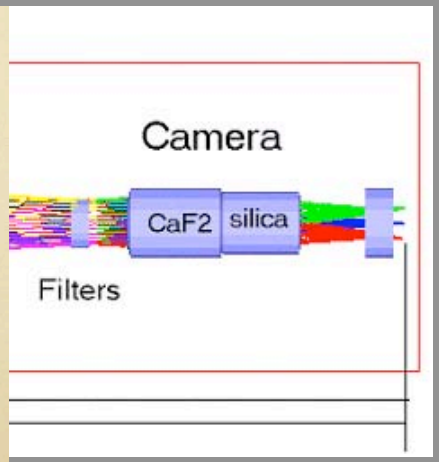
REM

The IR Camera



- **Focal Reducer Configuration**
- **Thick easy-to-align lenses**
- **Stirling cryocooled – no bath no helium lines**
- **Light self-cooled dewar**

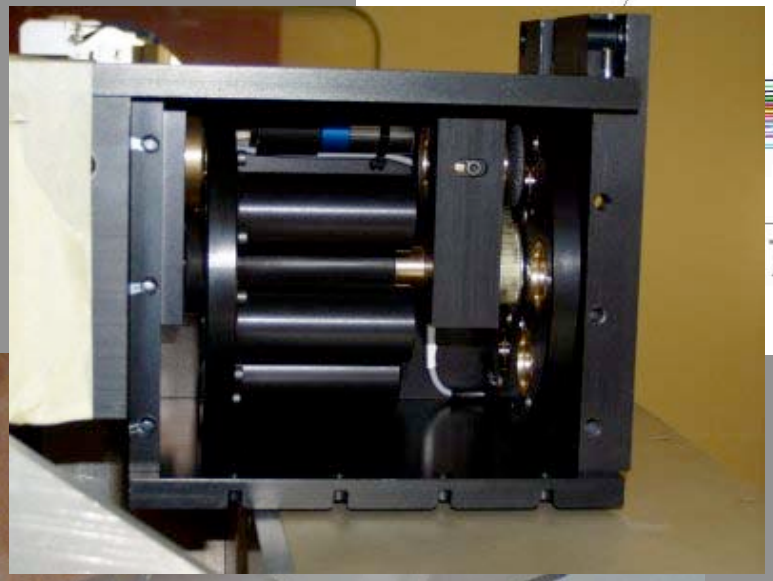


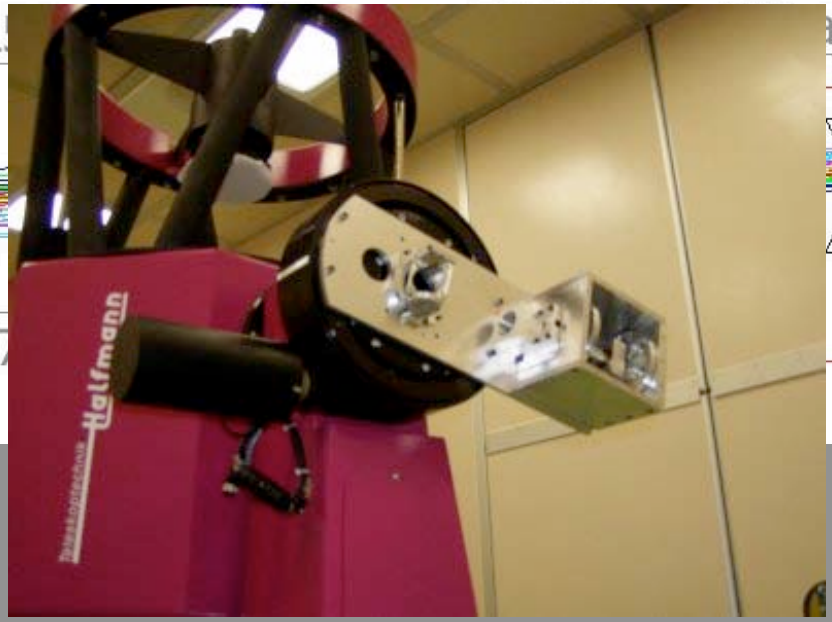


REM

The ROSS Spectrograph

- **Focal Reducer Configuration**
- **AMICI prism for slitless spec.**
- **Thick filters to match AMICI**
- **Mounted orthogonal to IR axis**





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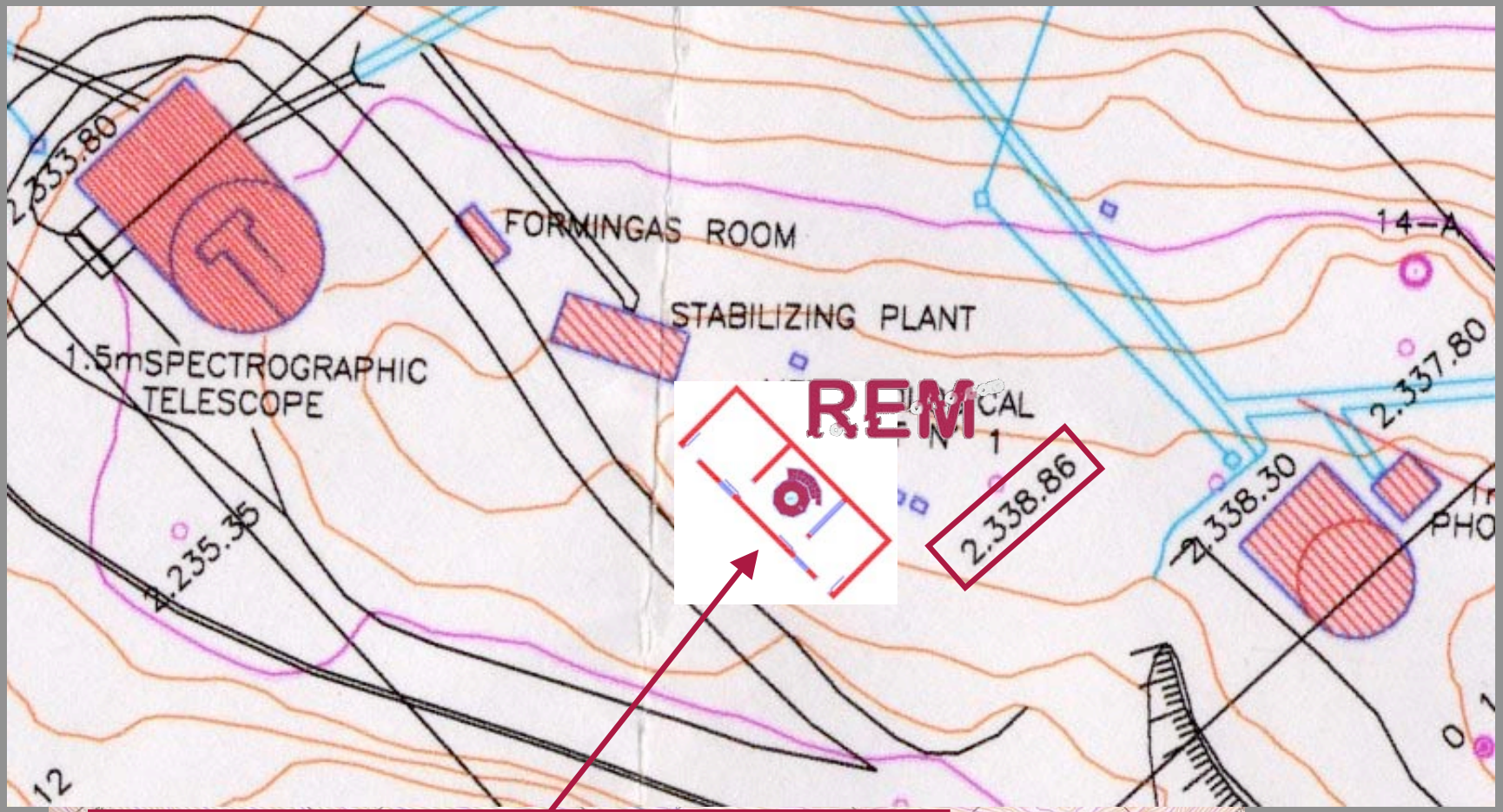
Nôtre Dome de la Silla



UTM (Zone 19) E 331,235 N 6,762,735

REM

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REM

50% of the known GRB do not show an Optical AG.

It could be dust or it could be Ly-α if the GRB is high-z

→Fast – NIR←

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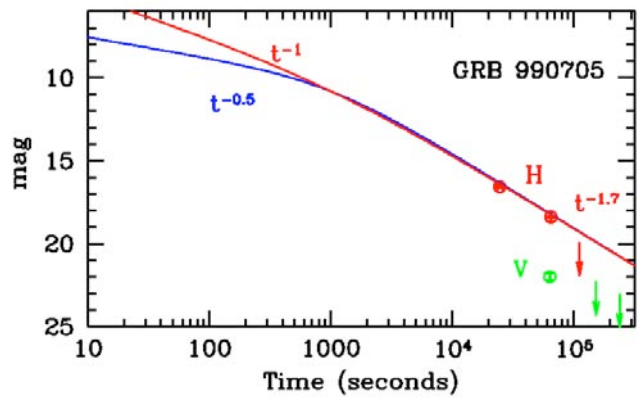
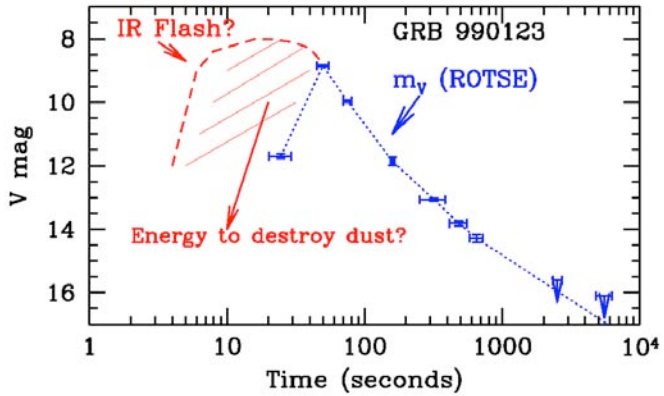
REM





T int.	Z S/N=10	Z S/N=5	J S/N=10	J S/N=5	H S/N=10	H S/N=5	K S/N=10	K S/N=5
5 sec	17.0	17.7	15.7	16.5	14.5	15.3	13.2	14.0
30 sec	19.9	20.7	16.6	17.4	15.5	16.2	14.2	14.9
600 sec	24.5	25.3	17.6	18.3	16.7	17.4	15.5	16.3

Fast and NIR enough?