

# THE GRACE Collaboration

The background of the slide is a photograph of a vast, deep blue ocean under a clear sky. A rainbow is visible on the left side of the image, extending from the horizon towards the top left corner. The text is overlaid on this image.

C. Kouveliotou on behalf of GRACE

# THE BEGINNING

The first version of what is today GRACE, started in late 1997 as a GRB afterglow collaboration between the Dutch (PI: van Paradijs), and Italian (PI: Frontera) groups. The agreement was that the two groups would lead alternate months, but would collaborate in the publication of the data.

# GRACE

## GRB Afterglow Collaboration at ESO

GRACE started in 2000 at the instigation of the ESO DG (Giacconi) to merge the proposals of 6 European groups into one collaboration. This would make life easy for ESO; it turned out it also made life interesting for some of us...

Today GRACE comprises 6 groups:

NL (Wijers), DK (Hjorth), IT\* (Pian), D (Greiner),  
ES (Castro-Tirado), US-UK (Tanvir)

\* The Italian team includes French participation led by Boer

# Collaboration Principles

- Duty Rotation (every 15 days); progression from one proposal and “finders-keepers” to several PI proposals and PI leads, despite which team is on duty
- Expert teams for science and data analyses
- Publication within 6 months, otherwise available for grabs to all teams

# Practical Issues

- Each team has a Captain who makes decisions in case of disagreements, and/or political issues. The team on duty decides on instrument configuration choices and proposal activation.
- There is continuous email communication among all GRACE members following a burst alert ([grace@astro.ku.dk](mailto:grace@astro.ku.dk))
- All captains have beepers and are available on a 24-7 basis
- Current ESO arrangement alternates monthly between GRACE and Italian teams

# GRACE "TOOLS"

- The four European Southern Observatory telescopes [4 Very Large Telescopes (VLT), New Technology Telescope (NTT)] and their instrument suites [optical, IR] are primarily used to perform imaging, polarization and spectroscopy.

# The 4 VLTs in Paranal, Chile



# Other Facilities

Additional data are obtained with several national and international observatories and combined with the ESO data in detailed GRB studies.

These have been at times:

- NOT, Tautenburg, Asiago, La Palma (ING, TNG), CTIO, KPNO, UKIRT, LT, Calar Alto, Gemini, Danish 1.5m, ANTF, SAAO
- HST, INTEGRAL, CXO, XMM, XTE, HETE-II, WSRT, MERLIN, VLA, JCMT



# Proposals currently active

Short GRBs, Testing X-ray Lines with VLT, Blast wave Physics, XRFs, Gemini SN search, Rapid Response Mode (UVES spectroscopy, short GRBs, Blast wave physics)

CXO Dark and Short GRBs, Swift dark and SN GRBs, INTEGRAL polarization of prompt emission, WSRT follow-up observations

# GRACE Statistics (end 2003)

	total	GRACE
Optical/IR counterparts	41	20 (49%)
Redshifts	29	19 (66%)
Redshifts > 1.5	12	11 (92%)
DLAs	6	6 (100%)

# HIGHLIGHTS

- Highest redshift ( $z=4.5$ ): Andersen, M. et al., A&A, 364, L54 (2000)
- Dust-poor extreme DLAs: Vreeswijk, P. et al., A&A, 419, 927 (2004)
- GRB 030329/SN 2003dh: Hjorth, J. et al., Nature, 423, 847, 2003.

# Beyond GRACE

Our collaboration developed into a Research and Training Network (RTN) within the 5<sup>th</sup> European Framework, on:

## **GRBs: an Enigma and a Tool**

with 9 postdocs (5 observational/4 theoretical) in the Netherlands, Denmark, Germany, France, Italy, UK, Sweden, Israel (the US is an associate member).

# Santorini 2005: RTN Fall meeting August 29 – September 2



## SOC

C. Kouveliotou  
W. Hillebrandt  
J. Hjorth  
N. Gehrels  
P. Mazzali  
S. Patel  
E. Pian  
T. Piran  
E. Ramirez-Ruiz  
R. Wijers  
S. Woosley

# Swift and GRACE

- Excellent ToO facilities at ESO
- Rapid Response Mode is already available for Swift triggers
- Team has proven and very successfully working track
- However: overload of Swift triggers may tax ESO and team – this is a test for both the team and the facility

# ENTER JANET (Joint **A**fteglow **N**etwork)

- JANET draws from GRB-Net, a successful collaboration established since 1998 between AAVSO (American Association of Variable Star Observers) and NSSTC (National Space Science Technology Center). The goals of the collaboration are to encourage, educate, mentor and assist amateur observers in their search and monitoring of GRB afterglows.

# GRB-NET

The network has so far imaged 5 GRB afterglows, discovered one (GRB 030725; B. Monard, Bronberg observatory in South Africa), and produced a multicolor light curve of GRBs 010222 and 030329 (the latter was monitored for 10 days).



# Some Misconceptions about Amateur Astronomers

- poorly equipped

Celestron, Meade, CCD cameras, good software for automation and Data analysis, belong to Clubs with group/college facilities

- Uneducated

Many are techies (doctors, engineers, software gurus), college degrees

- live in poor urban sites

Many live in exotic locations, highly desirable for longitudinal coverage

- poorly organized

250 members of the AAVSO HEN in 22 countries; tied into GCN, Vsnet

- can't go faint

Unfiltered can reach  $\sim 20$ , filtered  $\sim 19$  mags

# Using Amateurs

- Enthusiastic
- Motivated
- Tutorials on photometry, GRB observing, workshops on HEA
- Financial support for upgrades, especially foreign observers, CCD cameras, filters
- Network and organizational support



**Existing Recipients of CCDs:**

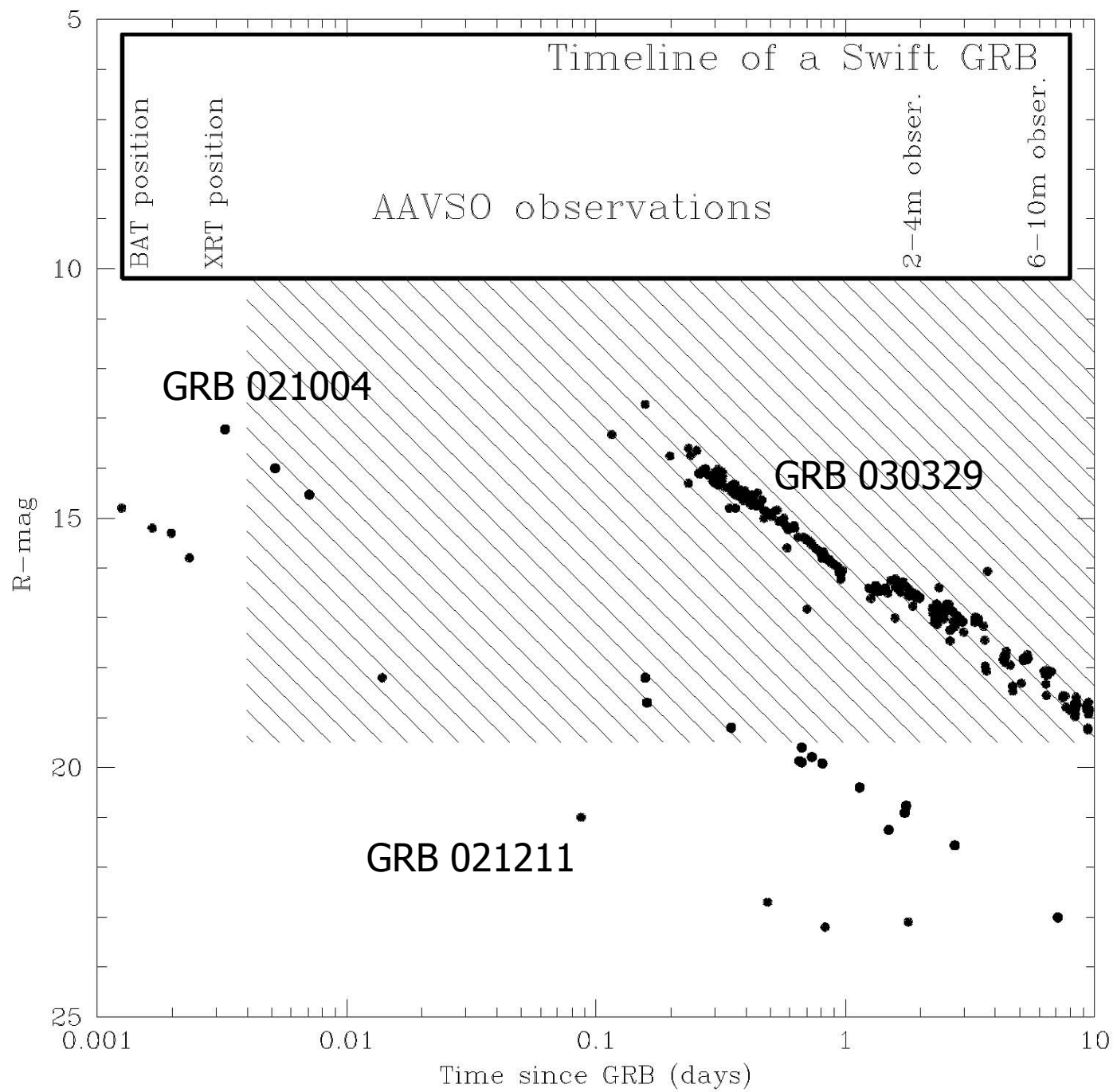
- 1 ■ Arto Oksanen, Finland
- 2 ■ Mt. John Observatory, New Zealand
- 3 ■ Peter Nelson, Victoria, Australia
- 4 ■ Zsolt Kerestzky, Hungary

**Proposed Recipients of new CCDs:**

- 5 ■ Mike Simonsen, Michigan, USA
- 6 ■ Rod Stubbings, Drouin, Australia
- 7 ■ Tim Cooper, South Africa
- 8 ■ Bhavnagar U., Bhavnagar, India

**Additional Equipment Recipients:**

- 9 - Cristovao Jacques, Belo Horizonte, Brazil (a set of BVRI CCD photometric filters)



# JANET and GRACE

- Data products obtained by JANET members will be sent to AAVSO, where they will be filtered, approved and posted on the Web.
- JANET results will be combined and published with observations obtained with GRACE.

# Lessons Learned

- It takes a village... to write papers
- It takes Job's patience... to run such a large, multinational collaboration
- It takes a miracle... to get the right burst at the right month, hemisphere, time of the day, weather permitted

**BUT** it only takes one burst to make our day,  
so bring them on!