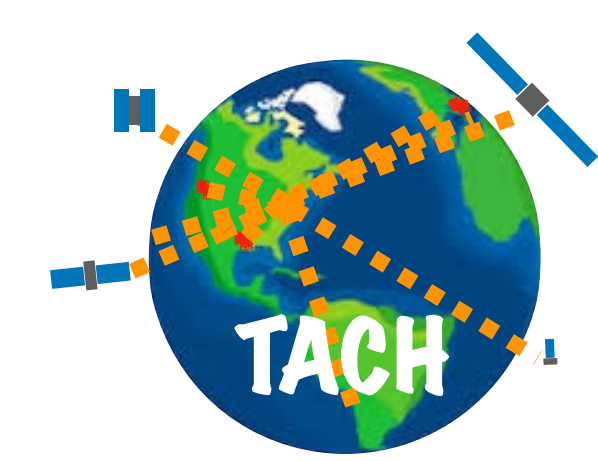


Time-domain Astronomy Coordination Hub (TACH)

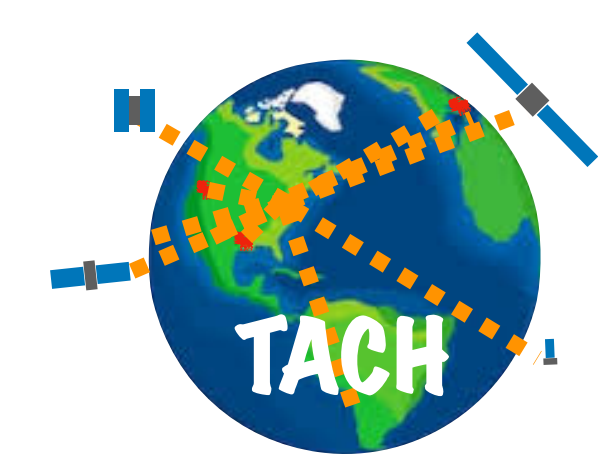
Judy Racusin (NASA/GSFC) on behalf of the
TACH Team:

John Baker, Eric Burns, Brad Cenko, Tito dal Canton, Tom McGlynn,
Jeremy Perkins, Jeremy Schnittman, Leo Singer, Donggeun Tak



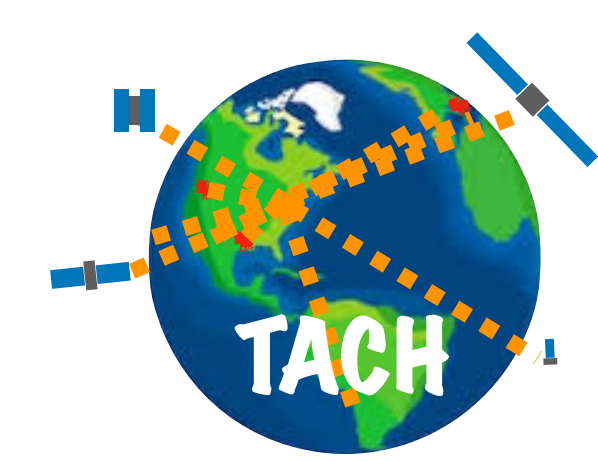
Time-domain Astronomy Coordination Hub (TACH)

- NASA project to build upon existing NASA resources to enable time-domain astronomy (especially GW-EM) in an era of multi-messenger astrophysics and upcoming large optical and radio surveys
- Components:
 - GCN Enhancements (GCN)
 - Multimission Transient Database (MTD)
 - Transient Localization Initiative (TLI)
- Timeline:
 - Begun in 2019, 3 year initial project



GCN Enhancements

- GCN has been the backbone of the GRB community for decades, and now the GW follow-up community
- It hasn't changed dramatically over the last ~years, and could use modernization, redundancy, new capabilities, better user interface
- Plans/Goals
 - modern protocols (already does email, socket, VOevent), add KAFKA (LSST)
 - automatically correlate transient notifications from ZTF, LSST, etc. with high-energy triggers
 - provide tool to help coordinate follow-up observations - work with other groups already doing this (e.g. TreasureMap)
 - modern user interface - be able to edit your settings without Scott implementing manually, more options and flexibility



GCN Enhancements

- GCN Circulares Viewer
 - Makes human-written circulars somewhat machine readable
 - Sortable and searchable and archive
 - Flags best localization and redshift
 - Backfilling archive
 - To be released by mid-2020

GCN Circular Viewer

Time-domain Astronomy Coordination Hub (TACH)

[Link to GCN Circulares Archive](#)

List of GCN circulars in | [2018](#) | [2019](#) | [2020](#) | [All](#) |

List of GCN circulars of | [Gamma-ray bursts \(GRBs\)](#) | [Gravitational waves \(GWs\)](#) | [Neutrinos \(ν\)](#) | [All](#) |

Contact: [Donggeun Tak](#)

Event Name	Trigger Time	R.A.	Dec.	Error Circle	Redshift	Telescopes/observatories	Wavelength	Messenger
GRB 200216B	2020-02-16 13:32:33	160.434	19.475	0.30"		Fermi/GBM Swift/BAT Swift/XRT VLT/X-shooter GMG NEXT NOT Swift/UVOT	radio optical X-ray γ-ray HE VHE	EM GW ν
GRB 200216A	2020-02-16 09:07:25	311.438	-11.658	3.00'		Fermi/GBM Swift/BAT MASTER	radio optical X-ray γ-ray HE VHE	EM GW ν
GRB 200215A	2020-02-15 14:39:28.087	34.079	12.771	1.50"		CALET/CGBM Fermi/GBM Swift/BAT Swift/XRT Liverpool MASTER NEXT RATIR Swift/UVOT UKIRT LIGO/Virgo DBSP IceCube Lulin MANGROVE MASTER NED ZTF AGILE/GRID AGILE/MCAL ANTARES APO AstroSat/CZTI CALET/CGBM	radio optical X-ray γ-ray HE VHE	EM GW ν
S 200213t	2020-02-13 04:10:40.328				0.0311	DDOTI/OAN FRAM Fermi/GBM Fermi/LAT GECKO GOTO GTC INTEGRAL/SPI Insight-HXMT/HE J-GEM KAIT MAXI/GSC NEXT P200 PAO Swift/BAT Swift/XRT	radio optical X-ray γ-ray HE VHE	EM GW ν
GRB 200212A	2020-02-12 10:49:49	126.9	8.8	17.90°		Fermi/GBM MASTER	radio optical X-ray γ-ray HE VHE	EM GW ν
GRB 200211A	2020-02-11 07:26:28	344.6	-5.6	1.90°		Fermi/GBM BALROG LIGO/Virgo AGILE/GRID AGILE/MCAL ANTARES CALET/CGBM FRAM Fermi/GBM Fermi/LAT HAWC INTEGRAL/SPI IceCube KAIT MASTER MAXI/GSC Swift/BAT	radio optical X-ray γ-ray HE VHE	EM GW ν
S 200208q	2020-02-08 13:01:17.991				0.3852	Fermi/GBM MASTER	radio optical X-ray γ-ray HE VHE	EM GW ν
GRB 200208A	2020-02-08 01:14:17	26.7	25.3	6.20°		Fermi/GBM MASTER	radio optical X-ray γ-ray HE VHE	EM GW ν

Developed by Donggeun Tak



GCN GRB Name Server

Level 1:
Instrument

Level 2:
Network

Level 3: Events

Prompt GRB
Monitors

Fermi-GBM

GBM170817529

INTEGRAL SPI-ACS

IGRACS 170817.52854

LIGO-Hanford

Virgo

LIGO-Livingston

S298048

GRB Stream

GRB 170817A

GW170817 (from LVC)

GW Network

AT2017gfo

JE170817

TNS

SSS17a

Swope

VISTA

DLT40

DECAM

LCO

MASTER

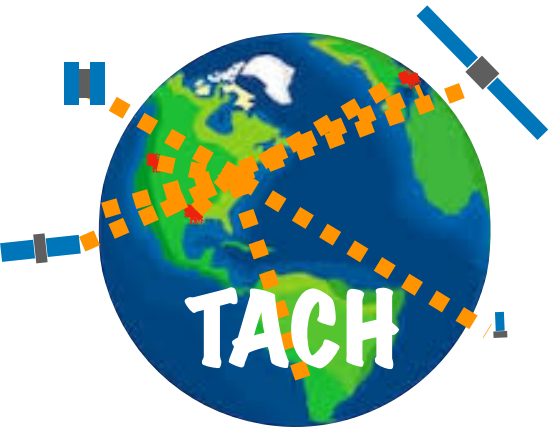
MASTER OT J130948.10-232253.3

As more GRB detectors come online, names need to be assigned automatically, rather than by humans in order of announcement

TACH will provide a Name Server (like TNS), need for the MTD event-based database

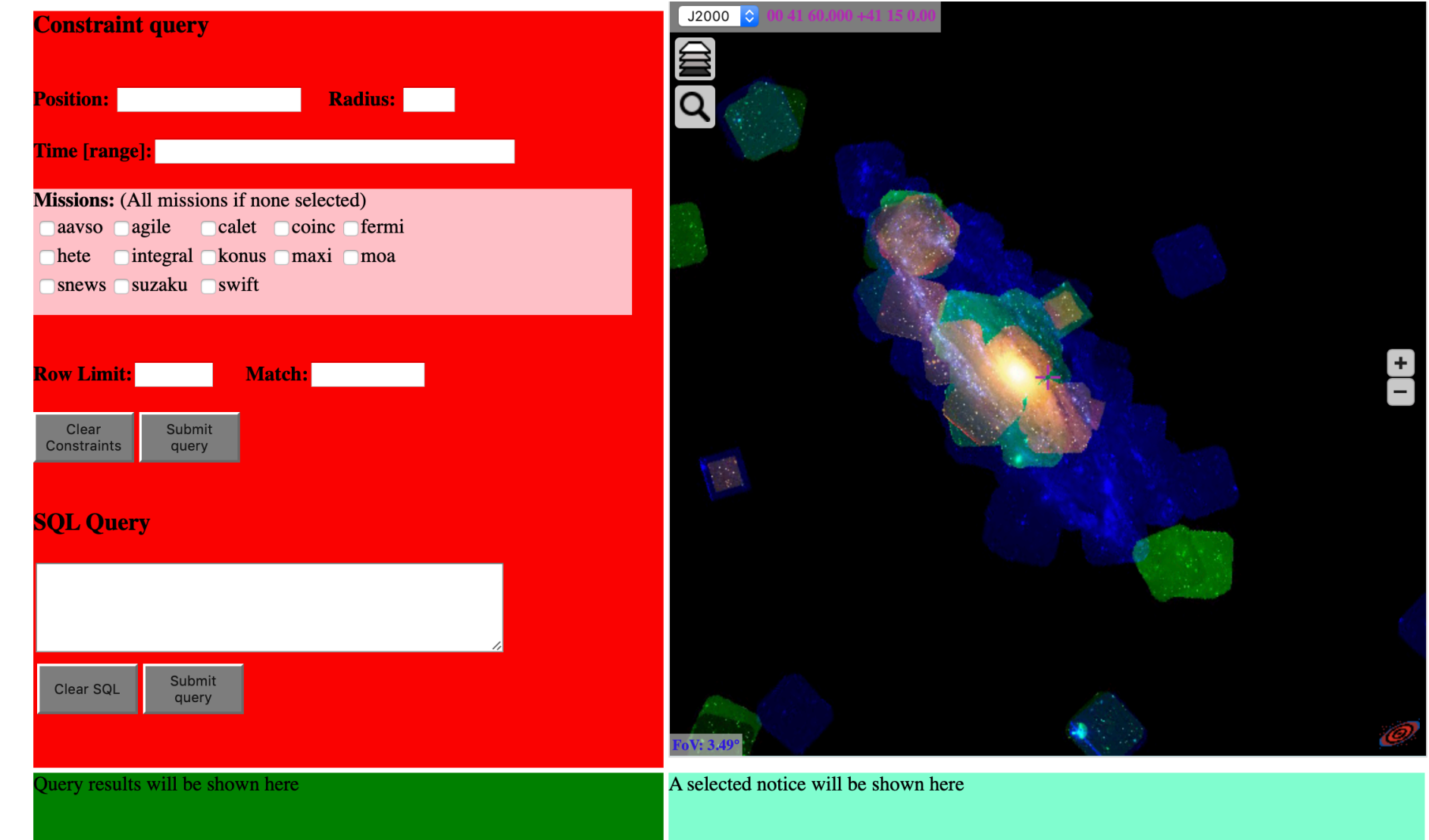
Credit: Eric Burns

GRB NanoSats Meeting, Feb 20, 2020

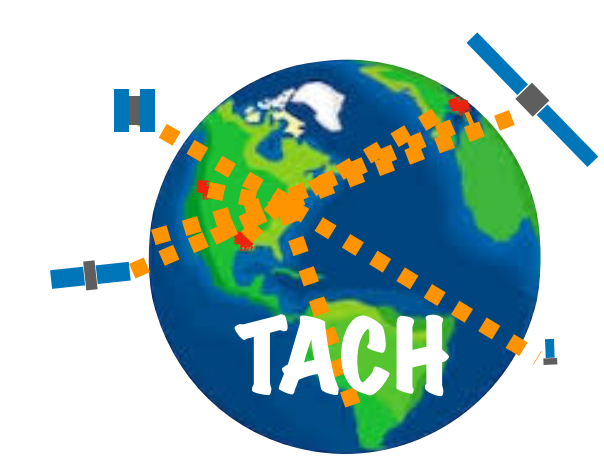


Multi-mission Transient Database

- New realtime HEASARC database that ingests GCN & other public data streams and catalogs to easily cross-correlate and be queryable by community
- Prototype database that has ingested all (~300k) GCN notices and is receiving new ones
- Event-based system, allowing you to view all information on a specific GRB or GW event in one place and search on criteria
- Provide user facilities to browse, explore and query the transient universe both in real-time and historically
- Will crossmatch GCN Circulars information



Credit: Tom McGlynn



Transient Localization Initiative

- Lots of new GRB detectors coming or proposed (many on CubeSats/ SmallSats) - missions are short, and more powerful as a network
- Provide open-source infrastructure to do joint relative-rates localizations with multiple GRB-detecting satellites (typically scintillator type detectors)
- Collect low-latency automated triggers from current and future wide-field gamma-ray transient detectors (e.g. SmallSats)
- Perform joint localizations in real time as data is collected, feeding alerts into GCN and MTD



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