



# Recent results of MAXI on ISS

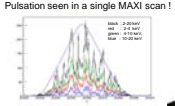
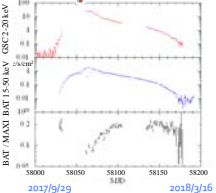
T. Mihara, M. Matsuoka (RIKEN, Institute of physical and chemical research, JAPAN)  
H. Negoro (Nihon university) and the MAXI team



## Swift J0243.6-6124

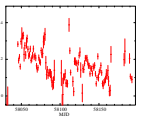
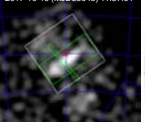
- 2018/9/29 nova-alert system detection
  - Position consistent with LS 1+61 303 (Sugita+ ATel #10803)
- 2018/10/3 Swift/BAT trigger and XRT found a new source (9.86 s pulsar) (Kennea+ GCN 21963, ATel #10809)
- Flux increase and report of a new source (Sugita+ ATel #10813)

~10 Crab  
Brightest NS binary  
in this century



## MAXI J1621-501

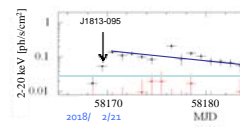
X-ray burst in a MAXI scan  
2017-10-19 (MJD58045) 11:37:01



- 2017/10/19 discovery (Hashimoto ATel. #10869)
- MAXI and Swift detected X-ray burst (Bult #11067) → NS-LMXB
- INTEGRAL: Burst peak →  $d = 8 \pm 2$  kpc (Chenevez #11272)

## MAXI J1813-095

- 2018/2/20 discovery (Kawase+ ATel #11323)
- Refined pos. by Swift/XRT (Kennea #11326)
- Radio-quiet BHXB (Russel #11356)
- INTEGRAL: Power-law spec. 140 keV cutoff → BHC hard state (Fuerst #11357)



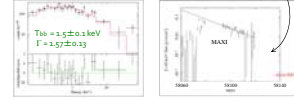
## MAXI J1820+070

- 2018/3/11 discovery (Kawamuro ATel #11399)
- +4h optical candidate (Deniseko #11400)
- Refined position by Swift/XRT (Kennea #11403)
- Optical, radio, X-ray obs. → BHC hard state (#11418, 11420, 11423)

Now brightening!

## MAXI J1630-276

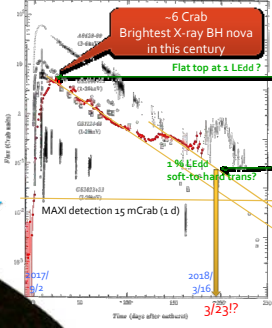
- 2017/11/18 discovery (Negoro ATel. #10984)
- 15.8 deg from the sun → no follow-up
- LMXB-like spectrum (#11373)
- 2018/1/18 Swift/XRT no candidate (Kennea #11198)



sudden flux drop by a propeller effect?

## MAXI J1535-571

- 2017/9/2 14:40 MAXI first trigger
- 20:00 Swift/BAT trigger (Markwardt GCN 21788)
- 23:55 MAXI second trigger (Negoro ATel. #10699)



~6 Crab  
Brightest X-ray BH nova  
in this century

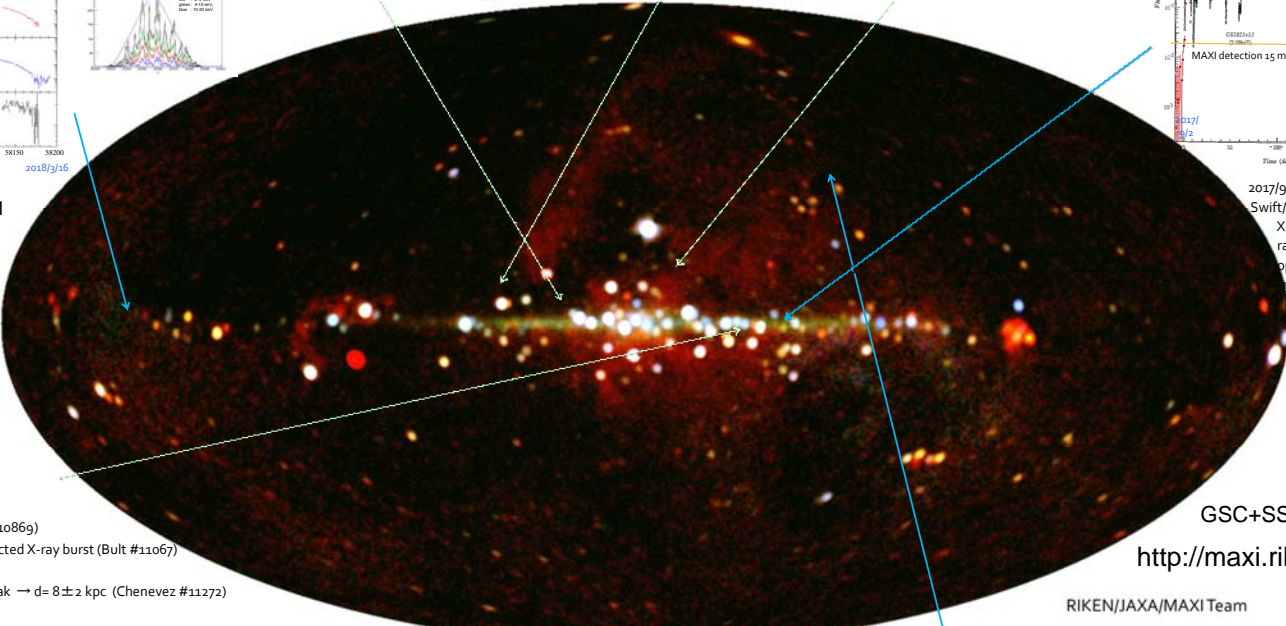
Flat top at 1 LEdd?

2% LEdd soft-to-hard trans?

MAXI detection 15 mCrab (1 d)

- 2017/9/3 Refined position by Swift/XRT (Kennea #10700)
- X-ray (Negoro #10708)
- radio (Russell+ #10711)
- optical (Scaringi #10702)
- near IR (Dincer #10716)
- detections suggested BHC.

Nakahira+ in prep.



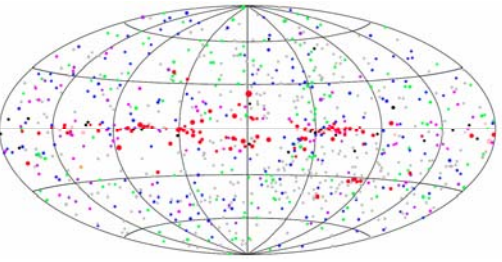
GSC+SSC Image

<http://maxi.riken.jp/>

RIKEN/JAXA/MAXI Team

## MAXI 3rd catalog

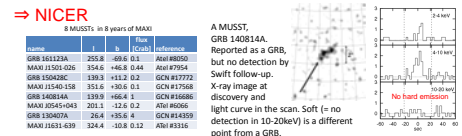
Horii+ 2017 ApJS in print  
Kawamura+ to be submitted to ApJ



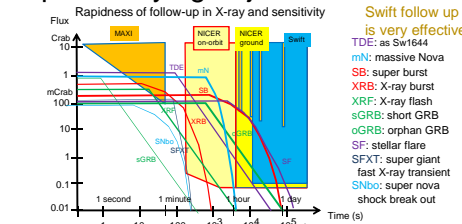
- Seyfert Cluster
- Quasar Galaxy
- X-ray Binary Pulsar
- CV Star
- SNR Unidentified

## MUSST (MAXI Unidentified Short Soft Transient)

- Soft**: Detected only in X-ray band (MAXI 2-10 keV)
    - No detection by Swift/BAT (15-50 keV)
  - Short**: Fades out before Swift/XRT follow-up (0.5 d later).
  - Unidentified**: Because of no localization by Swift/XRT
    - MAXI's error (0.3deg) is large for optical follow-ups.
- ⇒ Rapid X-ray follow-up is needed.  
(100 mCrab in 1 minutes, 1 mCrab in 20 minutes).



## Rapid decaying objects

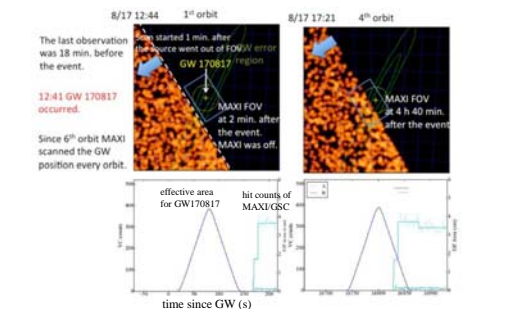


- Swift follow up is very effective.
- TDE: as Sw1644
- mN: massive Nova
- SB: super burst
- XB: X-ray burst
- XRF: X-ray flash
- sGRB: short GRB
- oGRB: orphan GRB
- SF: stellar flare
- SFXT: super giant fast X-ray transient
- SNbc: super nova shock breakout

## GW170817

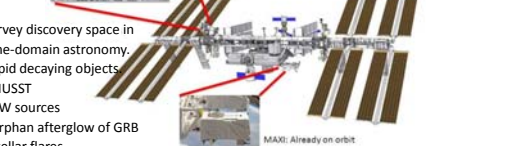
Sugita+ to be submitted to PASJ

At 12:41 on 2017 August 17, when GW170817, the first NS-NS merger occurred, MAXI was in a high bgd region and HV was off. In  $t_0+20 \sim 130$  s MAXI scanned over GW170817 by chance, but still HV was off. At  $t_0+170$  s MAXI resumed the observation, but GW was already out of FOV. At  $t_0+4.6$ h MAXI observed GW position, but no detection. Yet it was the **earliest** X-ray upper limit.



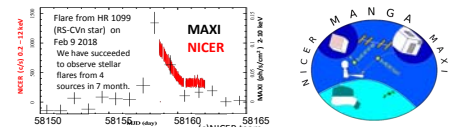
## OHMAN (On-orbit Hookup of MAXI And NICER)

- speeds up X-ray follow-up.
- NICER: Mounted in June 2017
- Look at the source in X-ray, while it is still bright in X-ray.
- Rapid follow-up from 2 minutes after discovery
- MAXI nova detection by laptop PC on ISS/JEM
- Convey information to NICER on ISS



## MANGA (MAXI And NICER Ground Alert)

Since NICER was installed on ISS in June, we have made 7 ToO observations in 6 months on MAXI alerts.



- MAXI/GSC 7-year data from 2009 August to 2016 July.
- low (214 src) and high (682 src) Galactic latitude regions.
- The two catalogs contain 896 sources in total, including a significant fraction of new unidentified objects.
- The sensitivity limit reaches  $\sim 0.4$  mCrab for half of the whole sky, which is almost the source confusion limit of MAXI/GSC.
- The deepest source catalogs covering the 4-10 keV band among all previous and on-going all-sky X-ray missions.
- The merit of 4-10 keV energy range is
  - Free from the galactic absorption.
  - Energy range where blackhole and neutron star binaries emit most of the energy.
- MAXI scans thousands of times for a catalog.
  - Correctly averages the fluxes of variable sources.
  - Also can make a variability catalog, in one-month time-bin etc.