

SGR 1935+2154

No pulsed radio emission during a bursting phase of
a Galactic magnetar

Kejia Lee

2020 Aug.

@ Xiamen

Based on

No pulsed radio emission during a bursting phase of a Galactic magnetar

L. Lin^{*1}, C. F. Zhang^{*2,3}, P. Wang^{*3}, H. Gao¹, X. Guan³, J. L. Han^{3,5}, J. C. Jiang^{2,3}, P. Jiang³, K. J. Lee^{4,3†}, D. Li^{3,5‡}, Y. P. Men^{2,3}, C. C. Miao³, C. H. Niu³, J. R. Niu³, C. Sun³, B. J. Wang^{2,3}, Z. L. Wang³, H. Xu^{2,3}, J. L. Xu³, J. W. Xu^{2,3}, Y. H. Yang⁶, Y. P. Yang⁷, W. Yu⁸, B. Zhang^{9§}, B.-B. Zhang^{6,10,9}, D. J. Zhou^{5,3}, W. W. Zhu³, A. J. Castro-Tirado^{11,12}, Z. G. Dai^{6,10}, M. Y. Ge¹³, Y. D. Hu^{11,14}, C. K. Li¹³, Y. Li^{4,15}, Z. Li¹, E. W. Liang¹⁶, S. M. Jia¹³, R. Querel¹⁷, L. Shao¹⁸, F. Y. Wang^{6,10}, X. G. Wang¹⁶, X. F. Wu¹⁵, S. L. Xiong¹³, R. X. Xu^{2,4}, Y.-S. Yang⁶, G. Q. Zhang⁶, S. N. Zhang^{13,3,5}, T. C. Zheng¹⁶, J.-H. Zou¹⁸

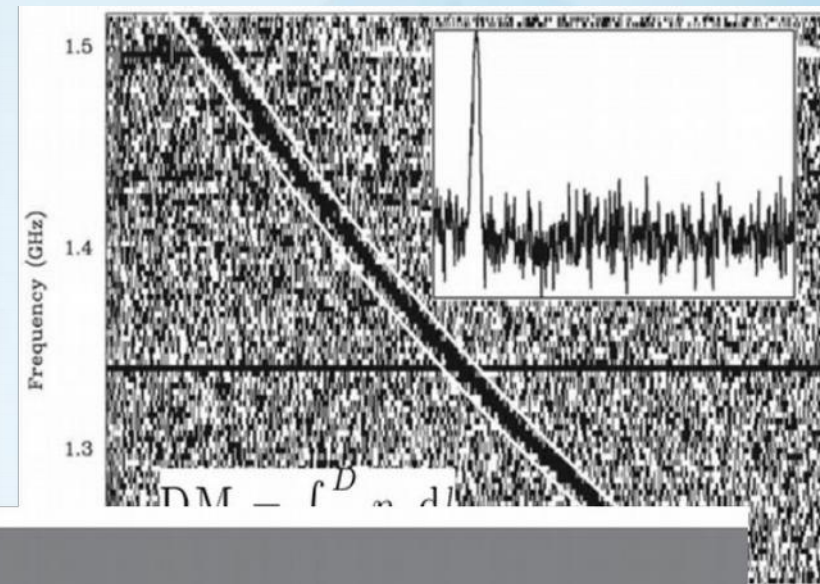
- A nice synergy between radio and high energy
- I am just presenter for the work, the work is done by many authors listed above.

Only if you want to know answers to following questions, otherwise coffee should be ready outside.

1. Does FRB come from magnetar flare?
2. Do all high energy flares associate with radio pulses?
3. Anything between pulsar and FRB?

What is FRB (in radio)?

- High DM (Greater than local Galaxy values)
- Short duration (ms) --> must be compact
- Bright --> $1E38$ erg
- Mostly found around 1GHz
- Uncertain spectral
- Maybe two types
 - repetitive vs non repetitive
- **Unknown** origins



A Bright Millisecond Radio Burst of Galactic Origin

Preliminary Statistical Analysis of Fast Radio Bursts at
3 Wavelengths Observed at Yunnan Observatory

Ma Yuan, Nie Ruixiang, Yang Kaiping

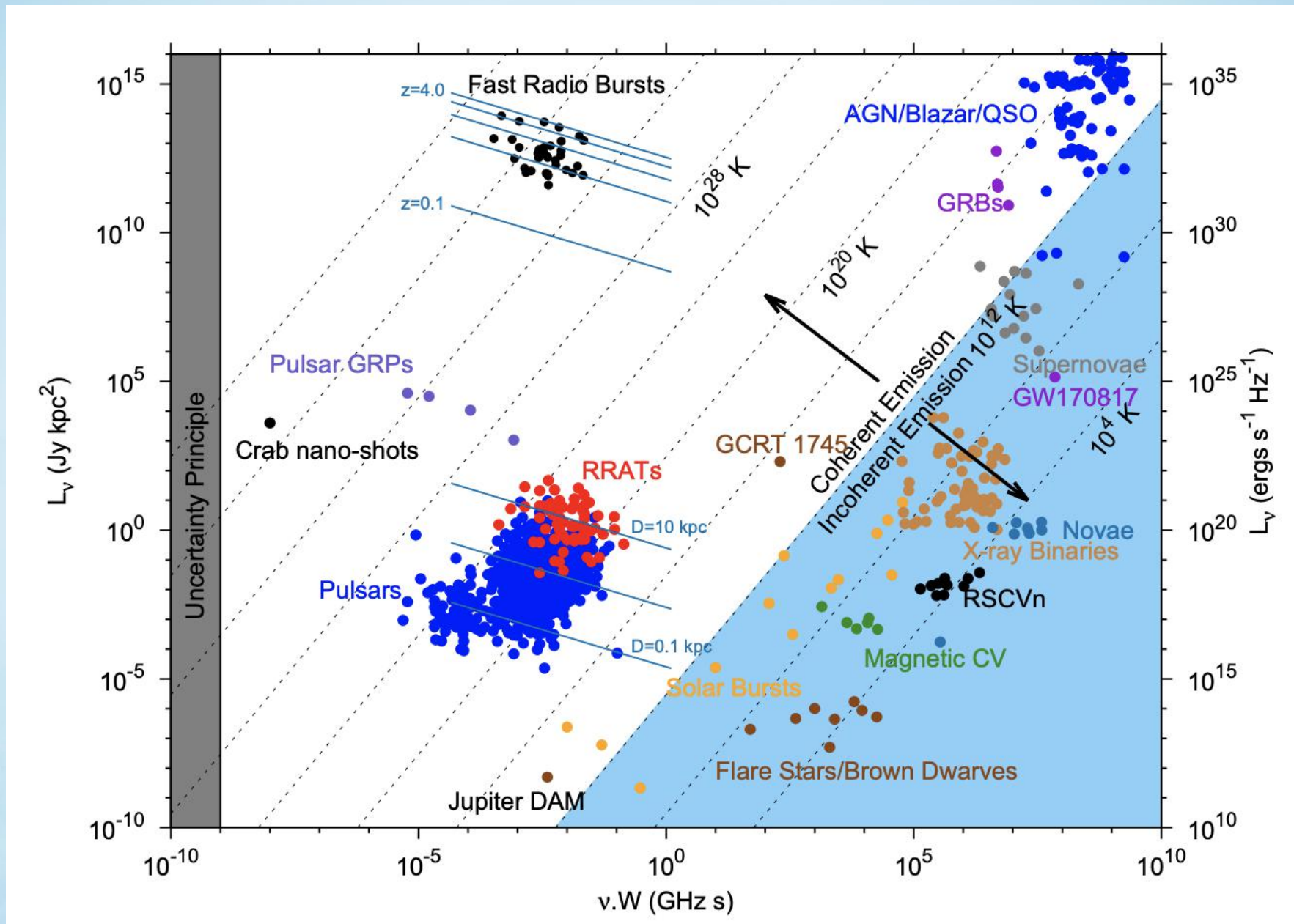
(Yunnan Observatory, Academia Sinica)

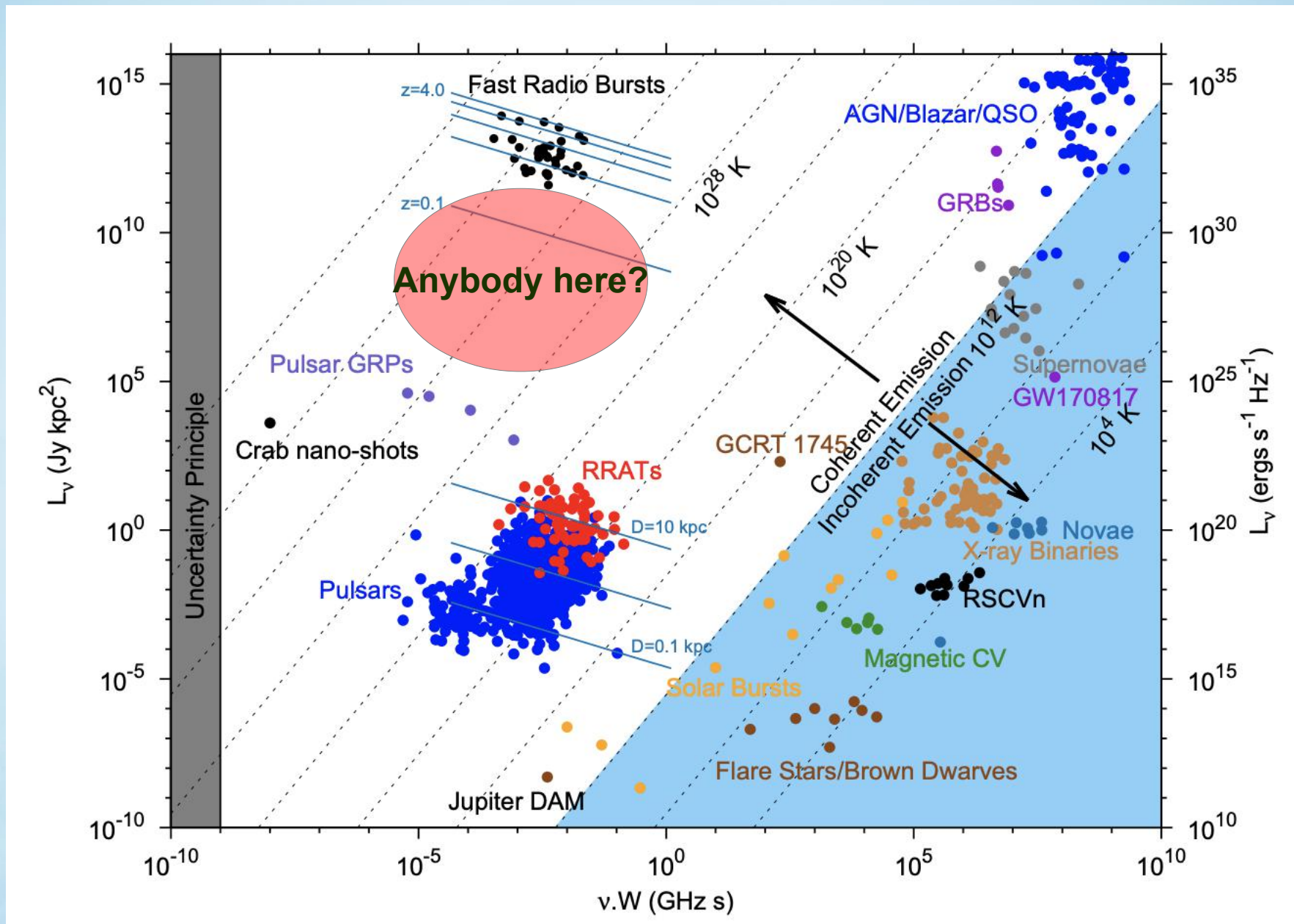
Abstract

In this paper the statistics of the fast solar radio spike events at 7.5cm, 10.6 cm and 21 cm wavelengths observed at the Yunnan Observatory from February 1987 to April 3, 1988 are presented. These events are compared with the corresponding optical observations. Two spike events obtained on March 29 and April 2, 1988, are also preliminarily analysed in this article.

M. Bailes,³ M. A. McLaughlin,^{1,2} D. J. Narkevic,¹ F. Crawford⁴

It is a rare opportunity to monitor the radio sky for impulsive burst-like events with high sensitivity. We analyzed archival survey data and found a 30-jansky dispersed burst, less than 1 ms in duration, located 3° from the Small Magellanic Cloud. The burst properties show no physical association with our Galaxy or the Small Magellanic Cloud. Current models for the origin of FRBs in the universe imply that the burst is less than 1 gigaparsec distant. No FRB was seen in 90 hours of additional observations, which implies that it was a singular event, such as a supernova or coalescence of relativistic objects. Hundreds of similar events could occur undetected, could serve as cosmological probes.



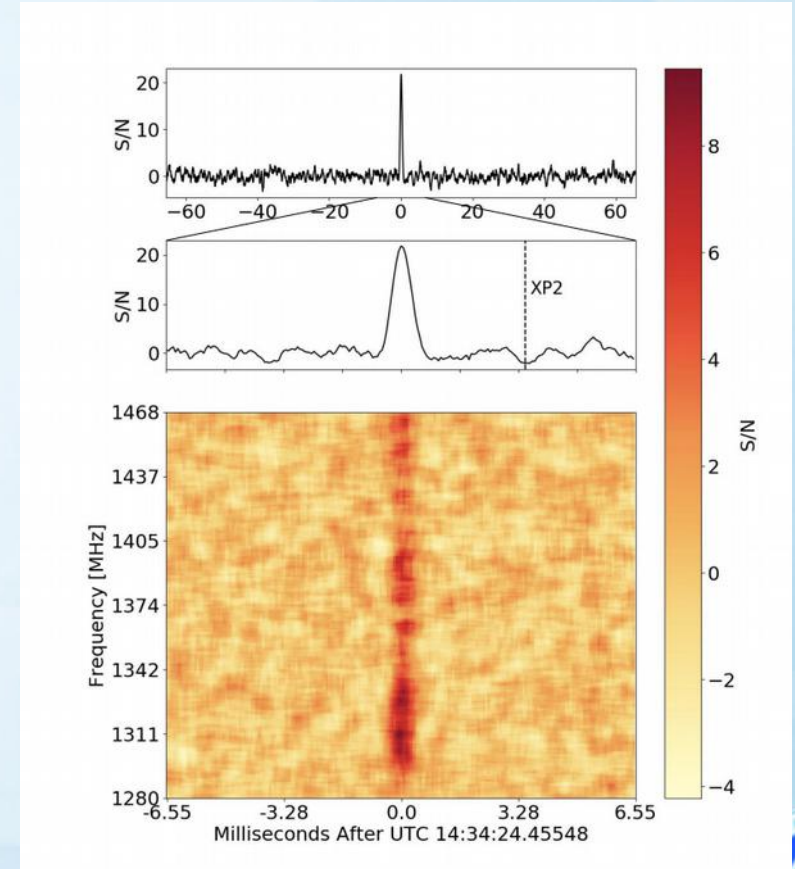
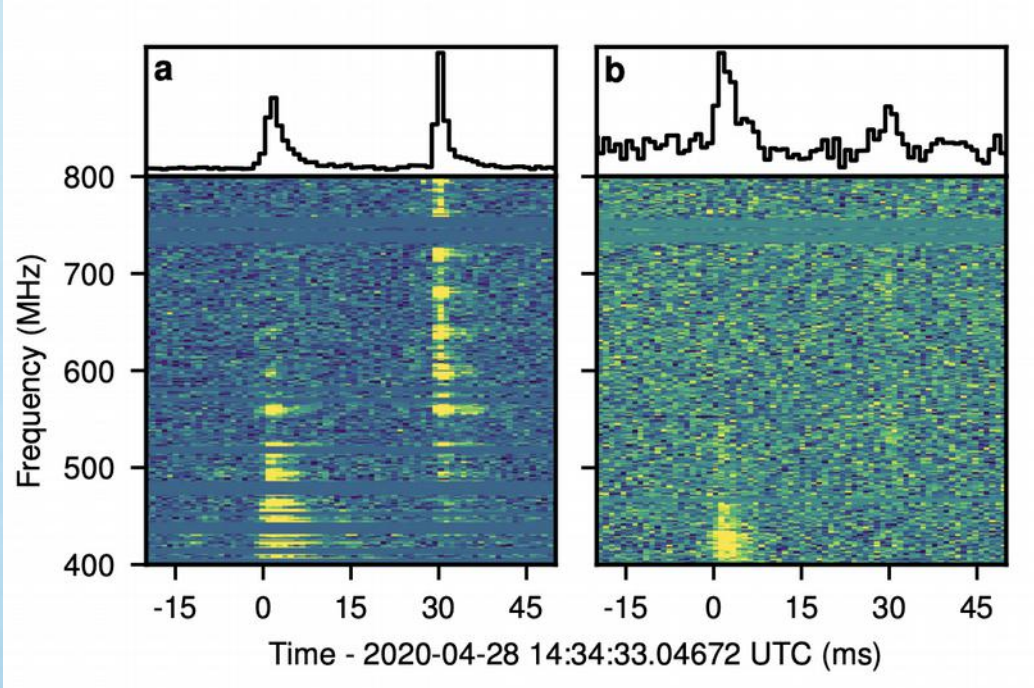
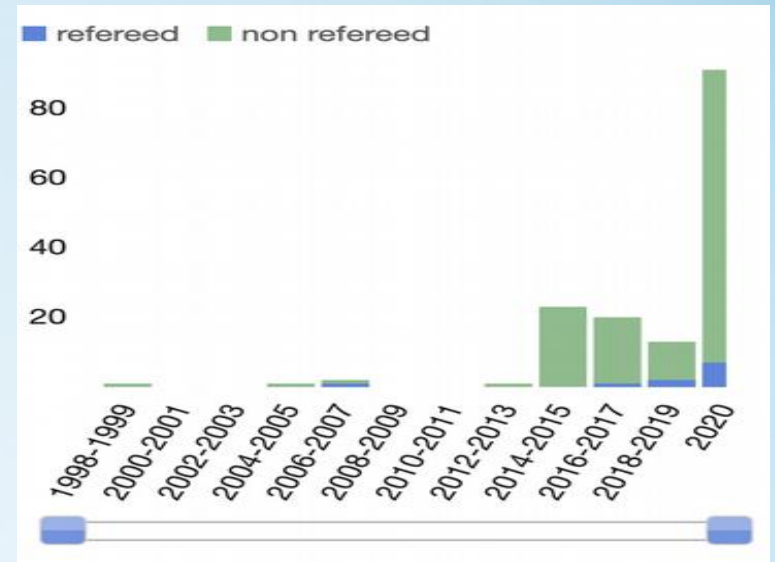


SGR 1935+2154

Known SGR since 70s.

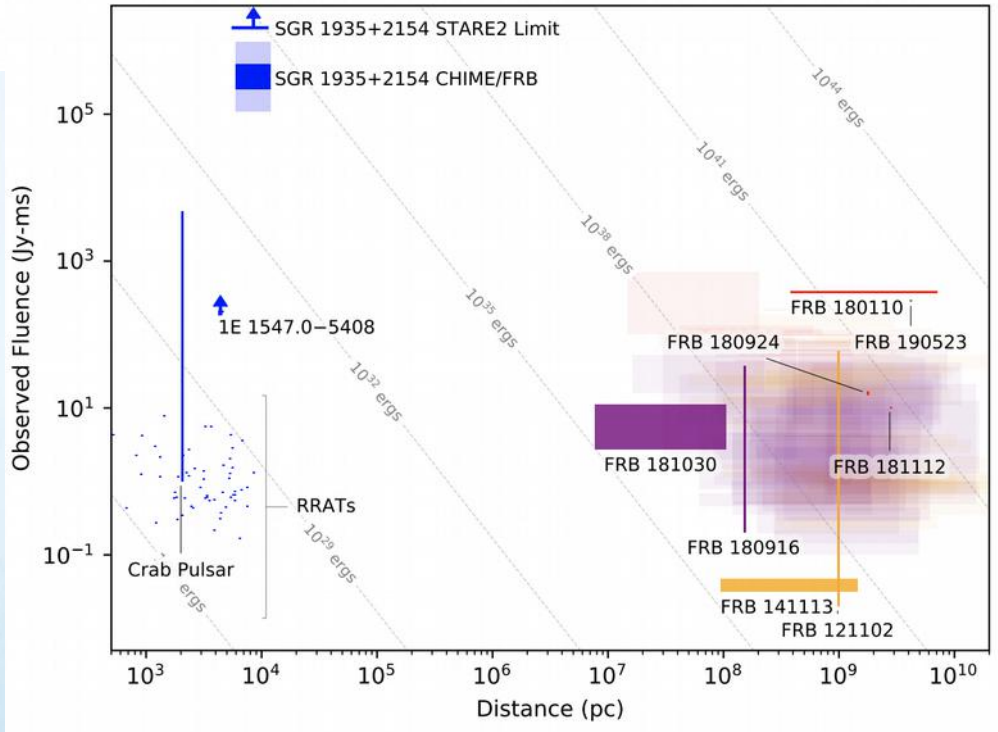
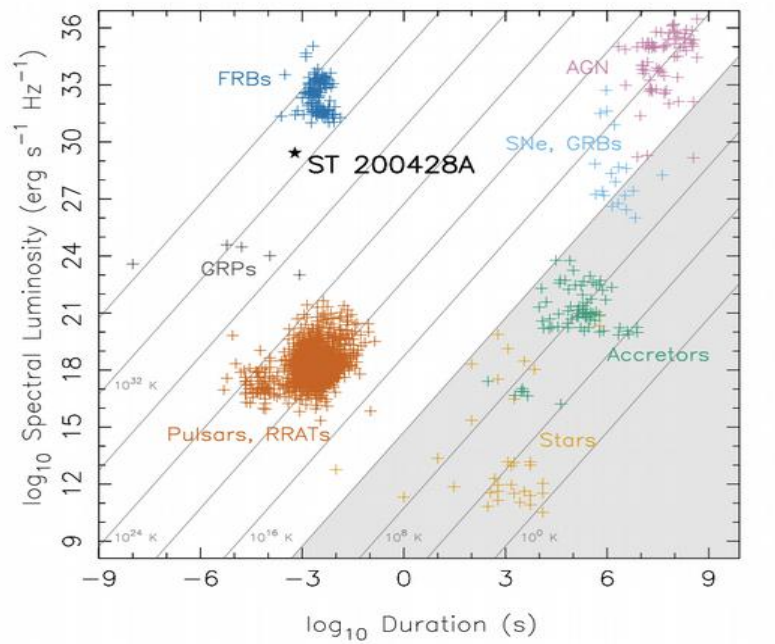
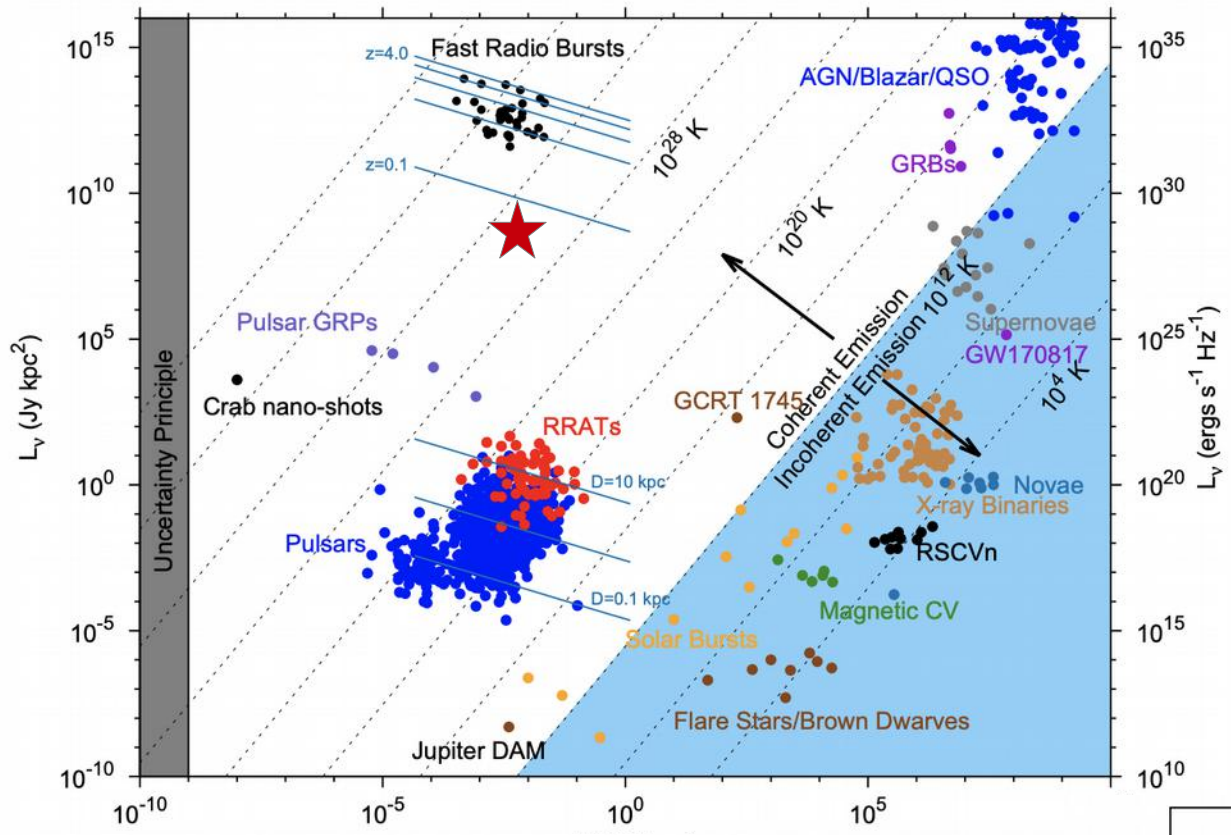
April 2020, Swift/BAT team noticed forest of bursts from SGR 1935+2154, then high-energy band coverage stated.

FAST also monitored the source. The stories explode, after CHIME discovery.



CHIME/FRB coll. 2020

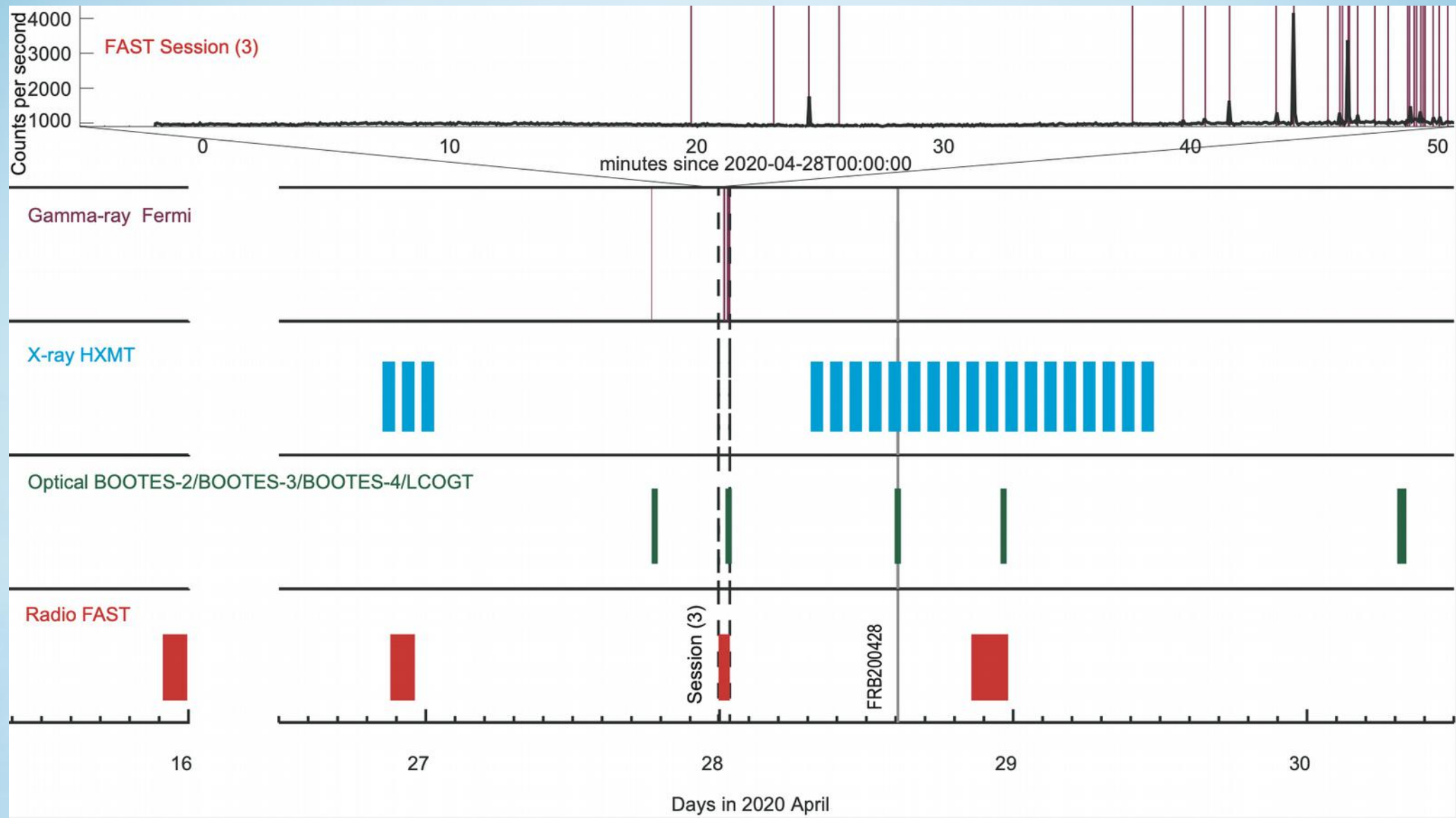
Bochenek et al., 2020 STARE2



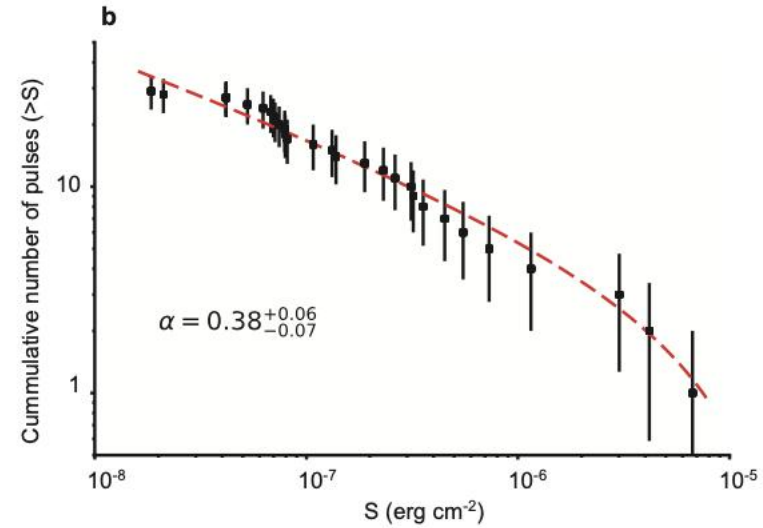
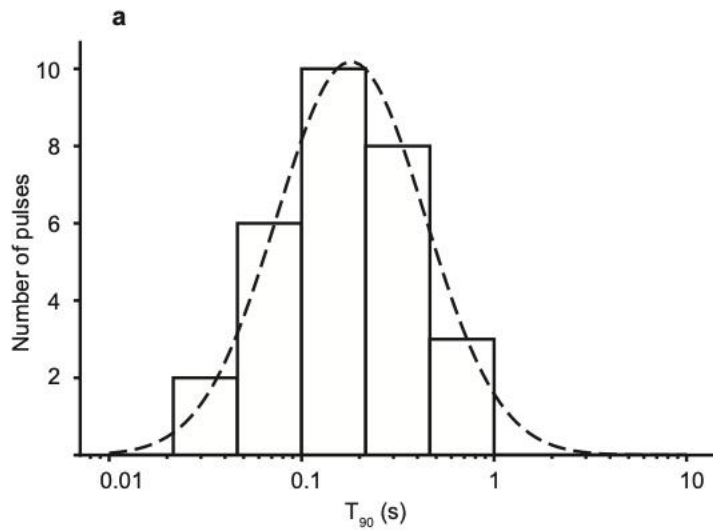
1. Does FRB come from magnetar flare?
Probably, if SGR is really identified as magnetar.

2. Do all high energy flares associate with radio pulses?

3. Anything between pulsar and FRB?
Ans: Yes



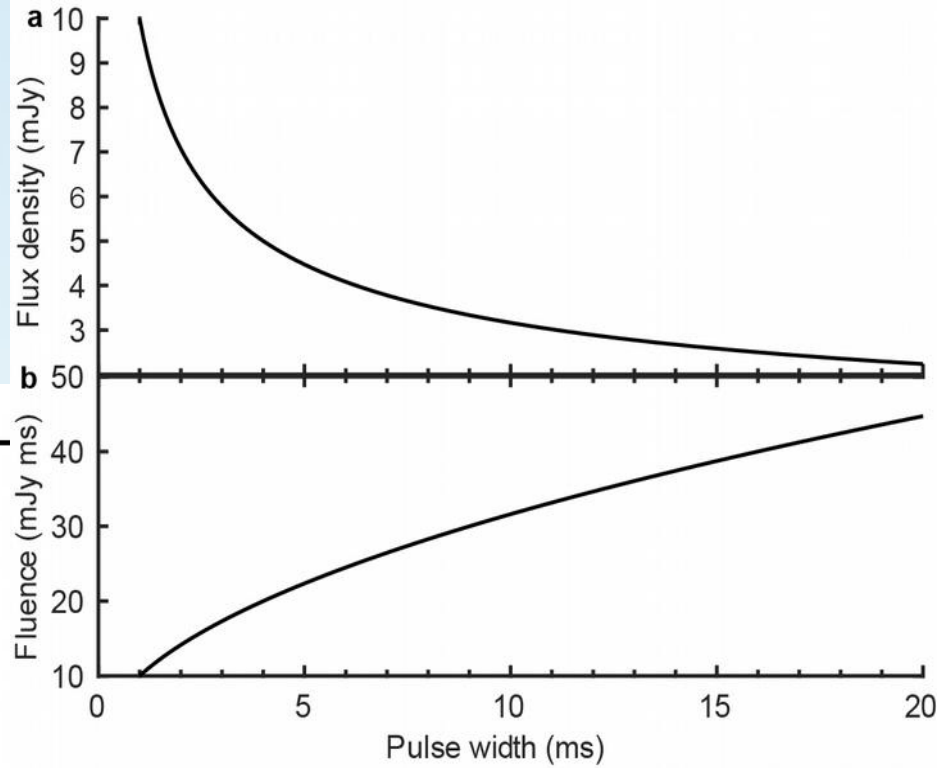
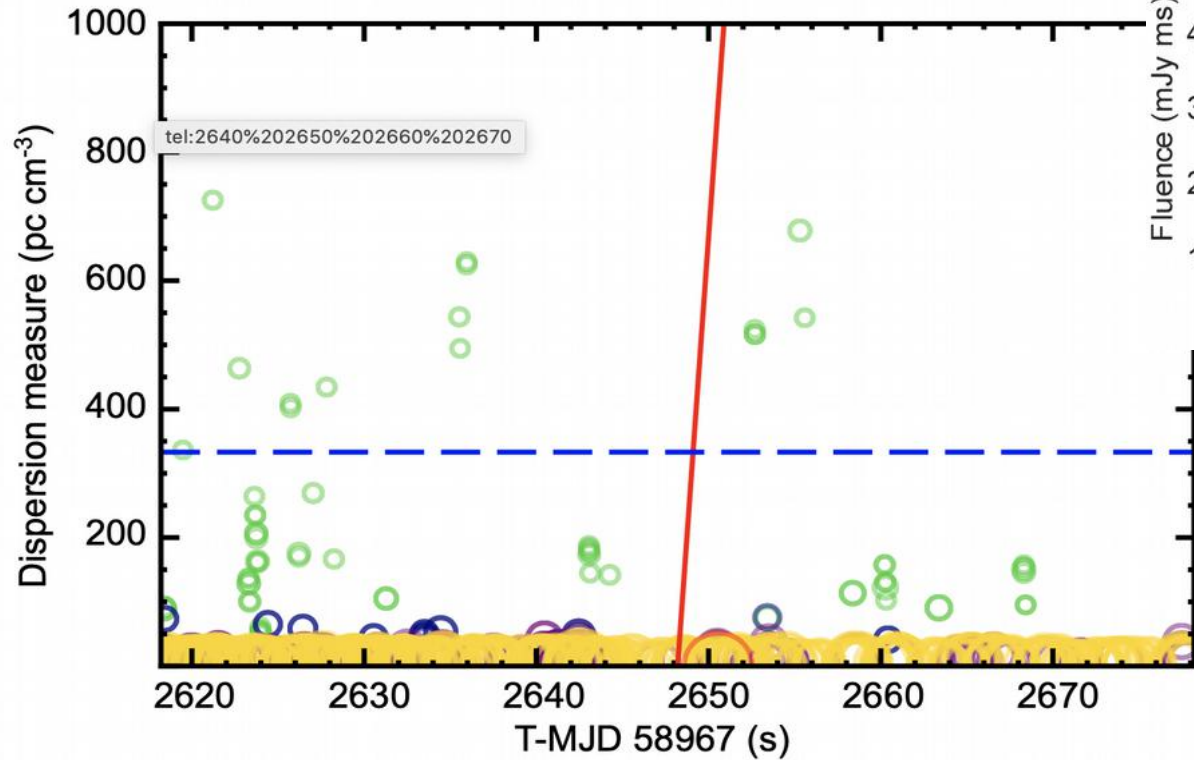
FAST observation coverage



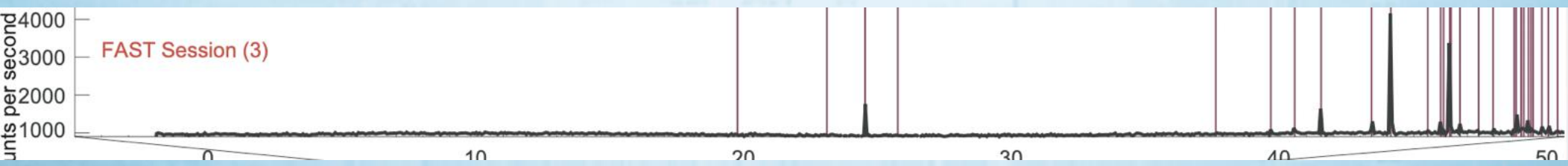
Extended Data Figure 3: T_{90} and fluence distribution of 29 *Fermi*/GBM bursts with best fitting lines. a the duration T_{90} distribution, and b the fluence distribution.

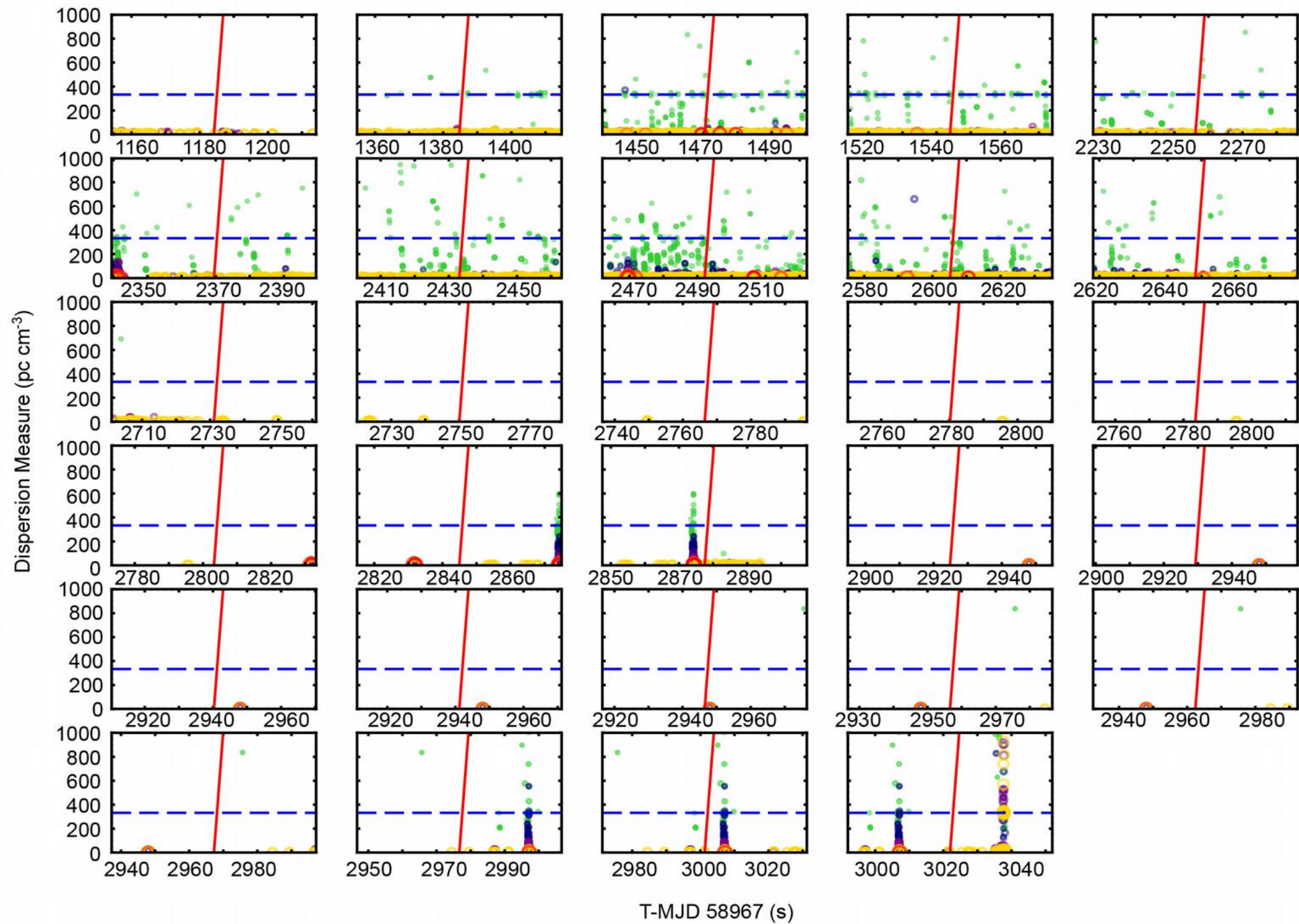
Properties of those Fermi bursts

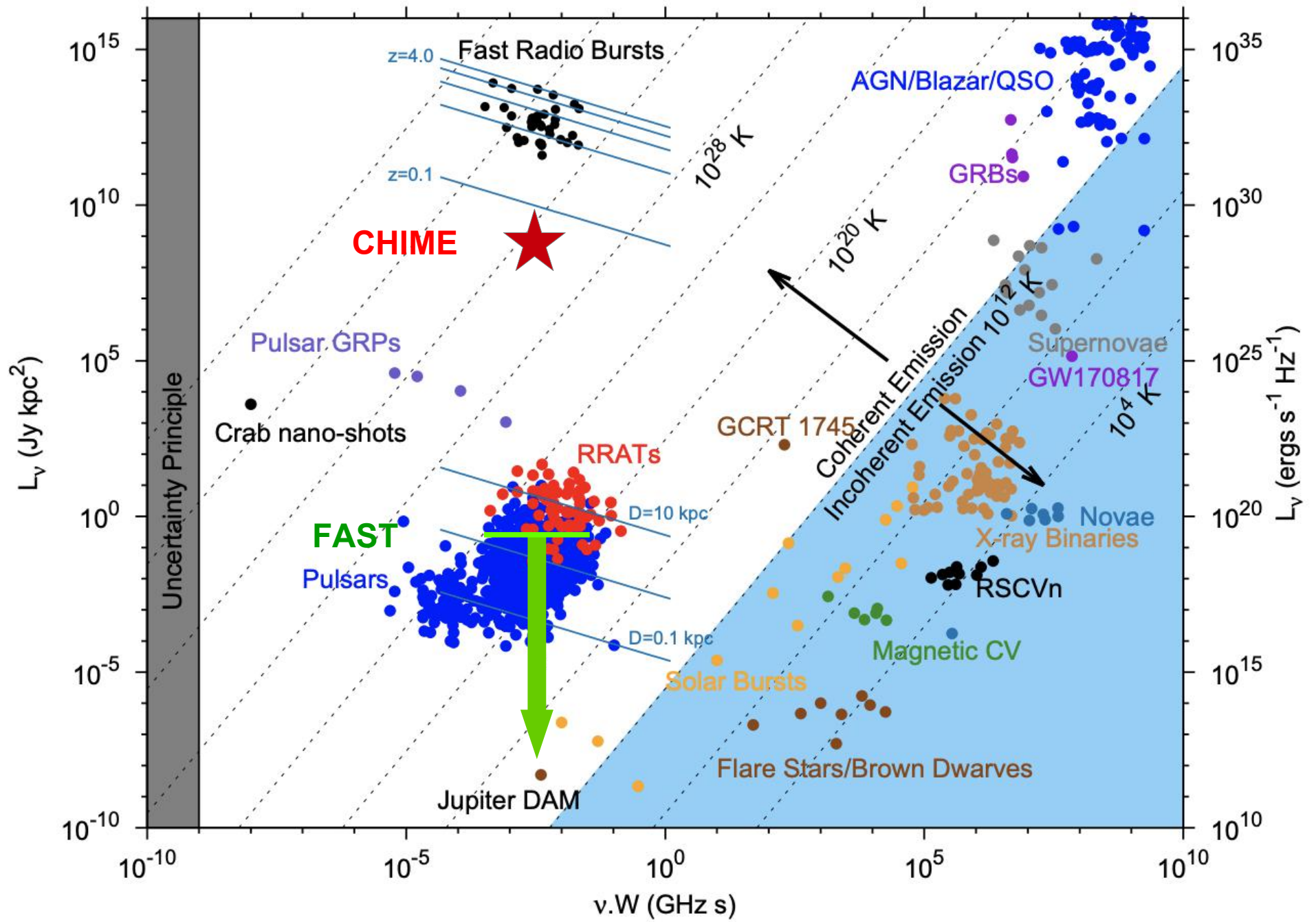
However in FAST...



FAST does not detect pulse or saturation at the time Fermi had bursts.







1. Does FRB come from magnetar flare?
Probably, if SGR is really identified as magnetar.

2. Do all high energy flares associate with radio pulses?

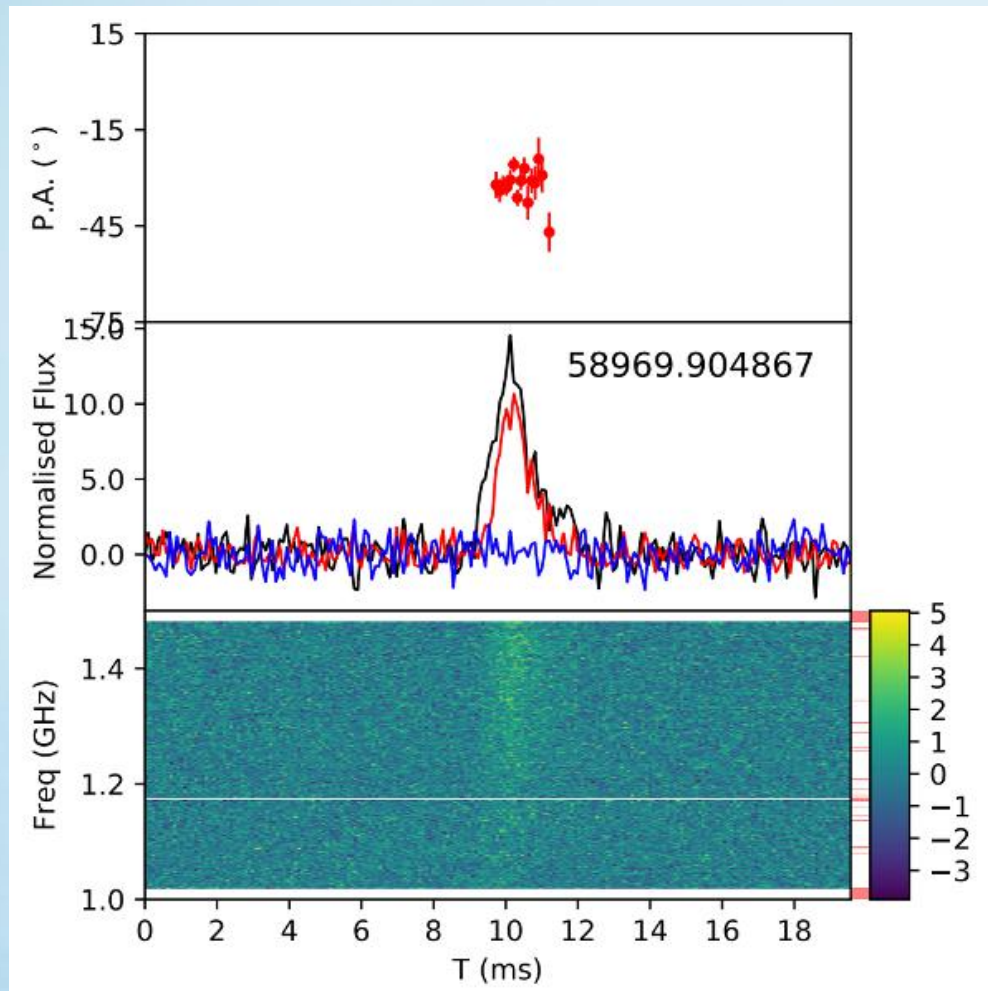
Ans: No, unless the pulse is really weak.

3. Anything between pulsar and FRB?

Ans: Yes

Has the SGR really the same radio properties compare to AXPs?

At the time without high energy burst, FAST see one weak normal radio pulse



$RM=112.3 \text{ rad /cm}^2$

We tried the pulsar searching, but no discovery.

Probably the first SGR normal radio pulse detected, the properties are very similar to AXP radio emissions.

1. Does FRB come from magnetar flare?

Probably.

2. Do all high energy flares associate with radio pulses?

Ans:No

3. Anything between pulsar and FRB?

Ans: Yes

1+2+3=It is good educated guess that FRB may be generated from magnetar, however some really **special conditions** are required. The next nature step is to understand what the conditions really is.



Thanks!