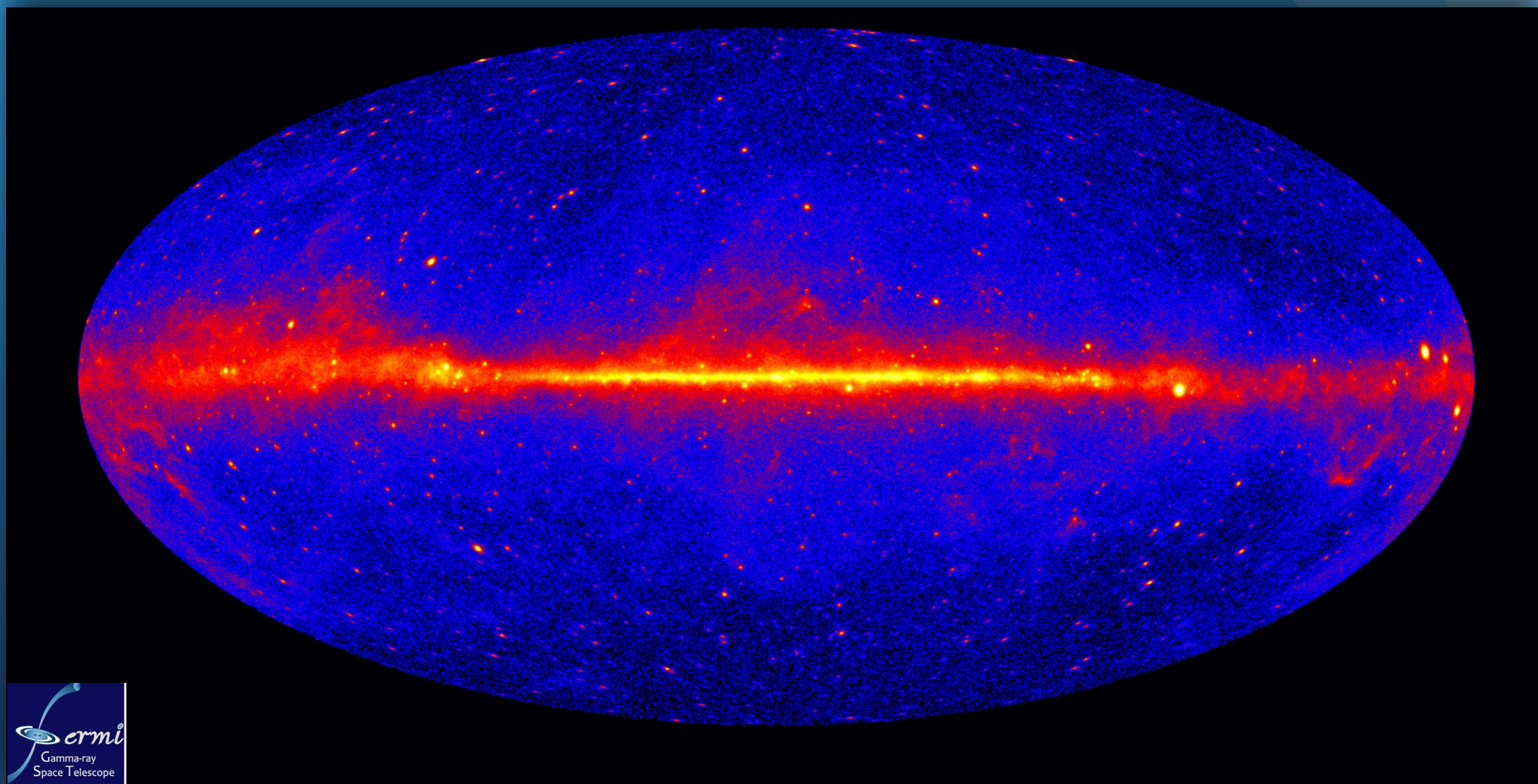
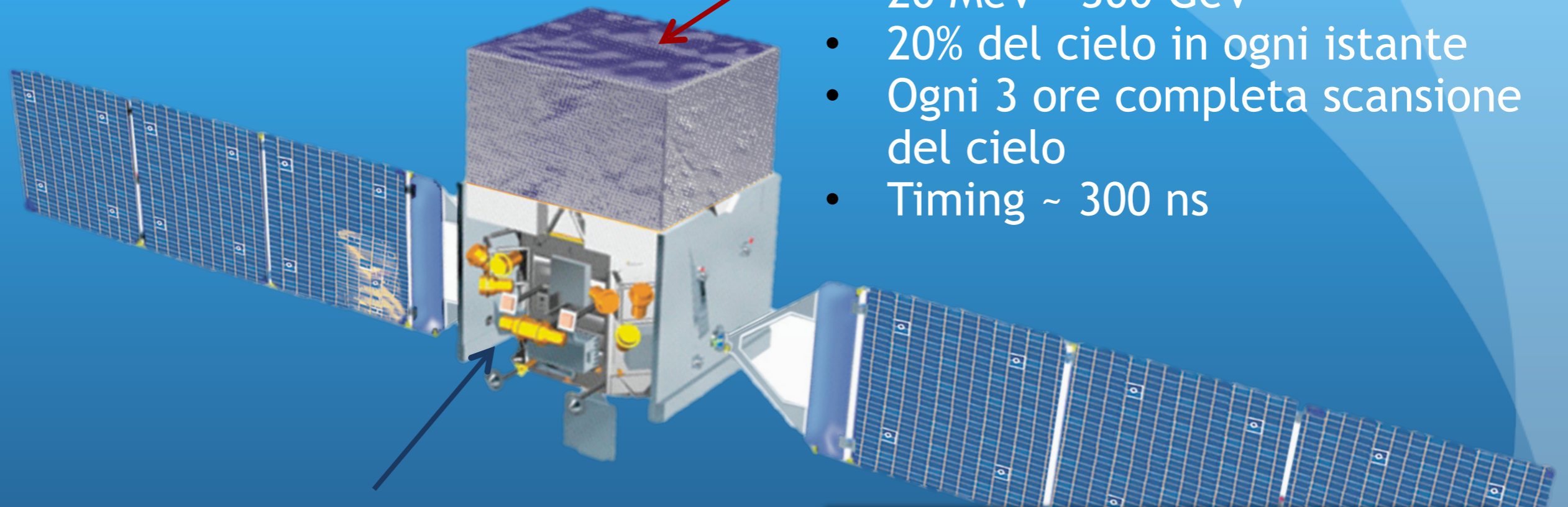


Fermi Gamma-ray Science Telescope

Sara Cutini (INFN) on behalf of the Fermi group



The Fermi observatory



Large Area Telescope (LAT):

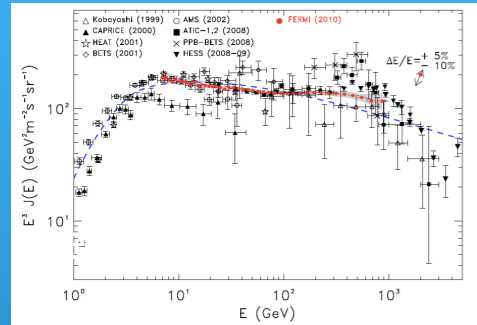
- 20 MeV - 300 GeV
- 20% del cielo in ogni istante
- Ogni 3 ore completa scansione del cielo
- Timing ~ 300 ns

Gamma-ray Burst Monitor (GBM):

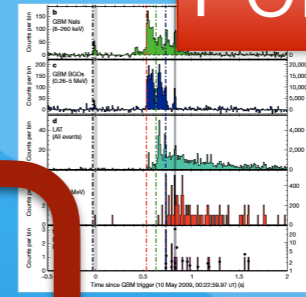
- 8 keV - 40 MeV
- Intero cielo non occultato
- Timing ~ 2 μ s
- Algoritmo di localizzazione onboard per il pointing del LAT

**NASA ha esteso la missione fino al 2024
~ 15 anni di dati**

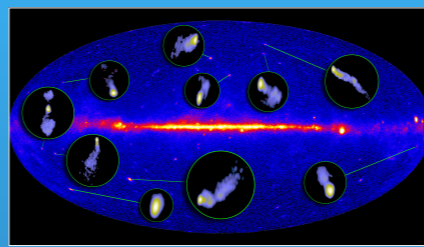
Gamma-ray emitters



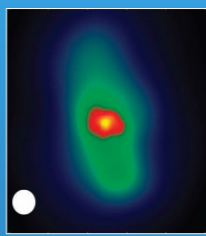
Follow-up di GW



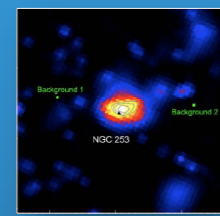
GRBs



Blazars

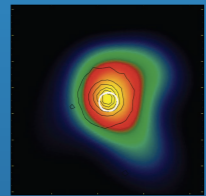
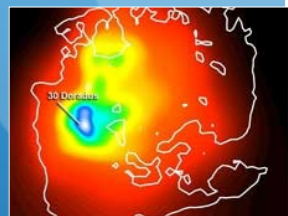


Radio Galaxies



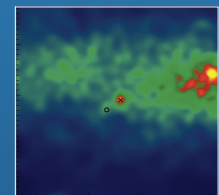
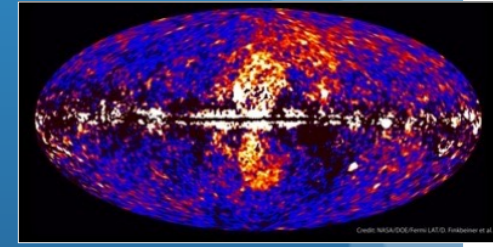
Starburst Galaxies

LMC & SMC



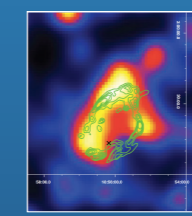
Globular Clusters

Fermi Bubbles



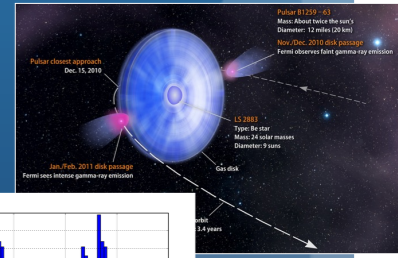
Novae

SNRs & PWN

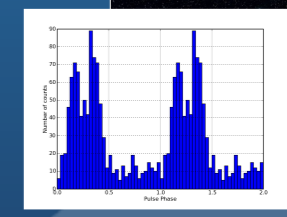
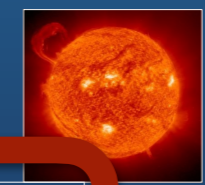


Galactic

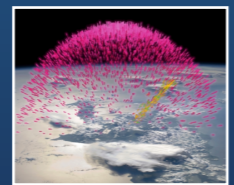
Pulsars: isolated, binaries, & MSPs



Sun: flares & CR interactions



TGFs



Unidentified Sources

Weekly Duties

- **1 turni di Data Quality Monitoring**

- Controllo della qualità dei dati, verifica degli alert dovuti a malfunzionamenti e valutazione dei Bad Time Interval — Lubrano, Cutini, Germani

- **3 turni di Burst advocate**

- Analisi dei dati per verificare la presenza della controparte gamma-ray di eventuali oggetti transienti (GRB, SGR, GW) — Berretta, Cutini

- **5 turni di Flare Advocate**

- Analisi dati del cielo nella scala temporale del giorno e 6h per verificare la presenza dell'aumento dell'emissione gamma-ray associata a sorgenti puntiformi — Mereu, Cutini

Pubblicazioni 2022/2023:

23 pubblicazioni all'interno della collaborazione Fermi-LAT

- 5 Articoli su rivista internazionale
- 18 non referati (proceeding, ATel & GCN)

Fermi-GBM Discovery of GRB 221009A: An Extraordinarily Bright GRB from Onset to Afterglow

Fermi collaboration 2023: Accepted to APJS

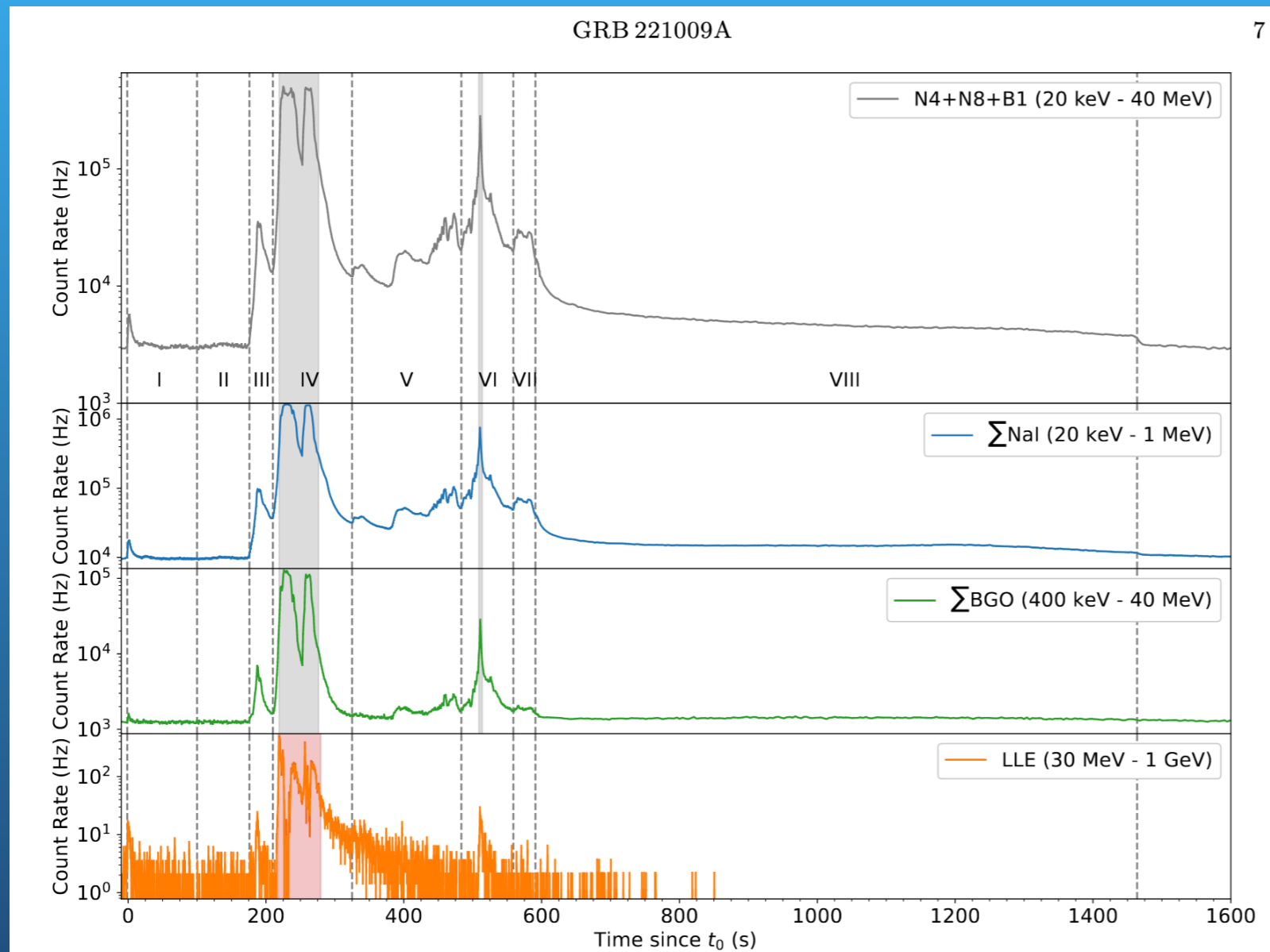
GRB 221009A: the B.O.A.T Burst that Shines in Gamma-rays

Fermi Collaboration 2023: Submitted to APJS

A gamma-ray pulsar timing array constrains the nanohertz gravitational wave background

Fermi-LAT collaboration 2022: Science

GRB 221009A: the B.O.A.T Burst that Shines in Gamma-rays



7

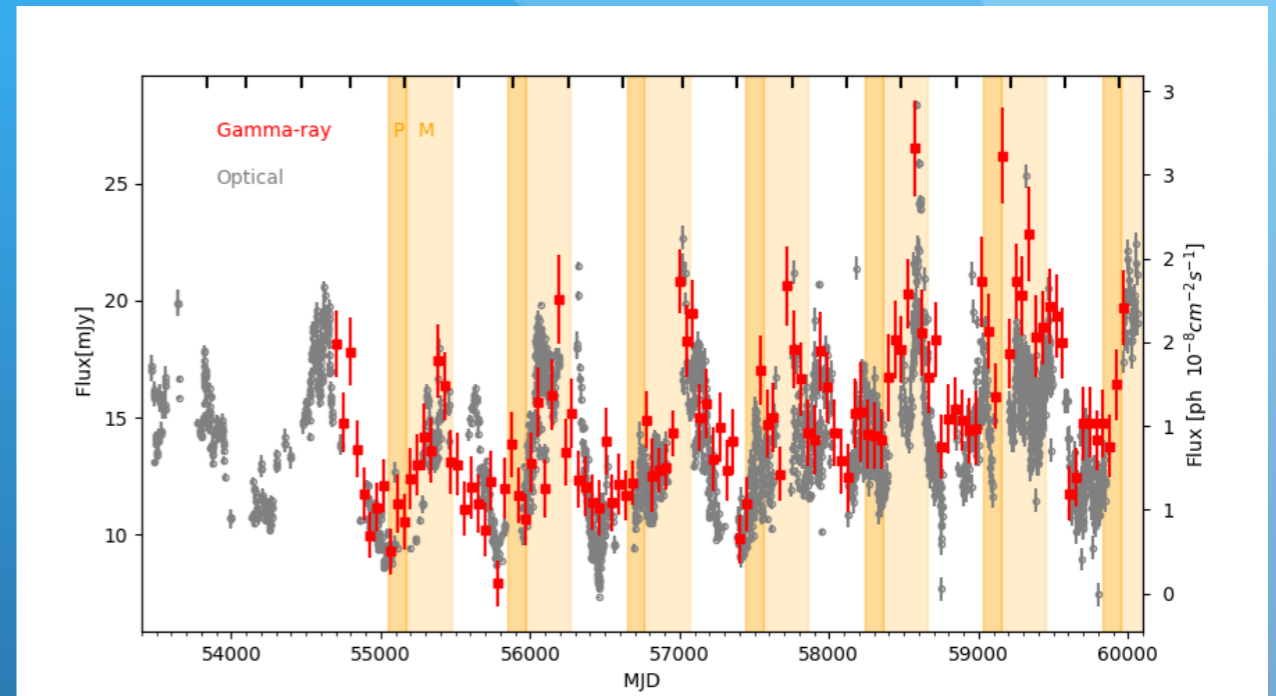
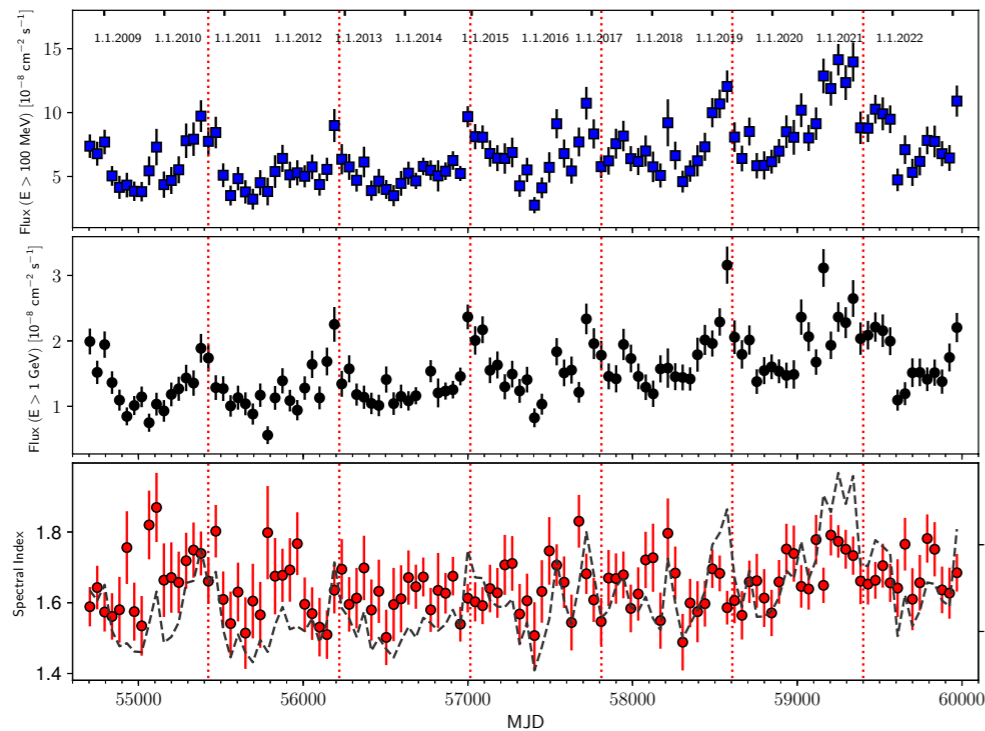
The first detection of TeV energy photons during the prompt emission by LHAASO

The identification of rings from dust echoes from the Swift-XRT

Polarization observations from IXPE

Measurable disturbances in Earth's ionosphere

PG 1553+113 Periodicity studies



Studi di periodicità sul BL Lac PG 1553+113

Conferma del massimo previsto per Febbraio 2021 e 2023

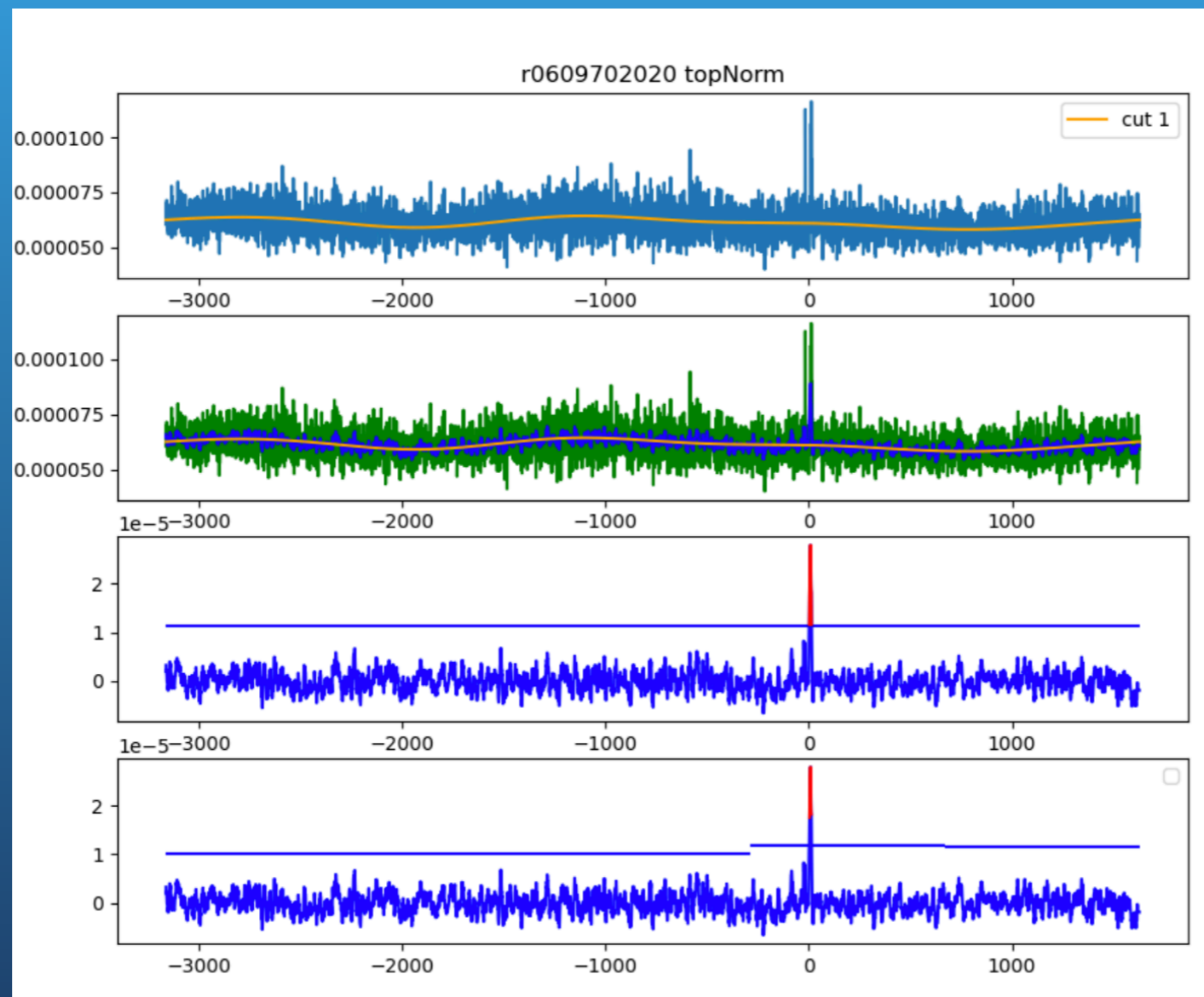
Aggiornato con quasi 15 anni dati

Interpretazione teorica: SMBH binary system \rightarrow modello interpretativo corroborato dai recenti risultati di EPTA

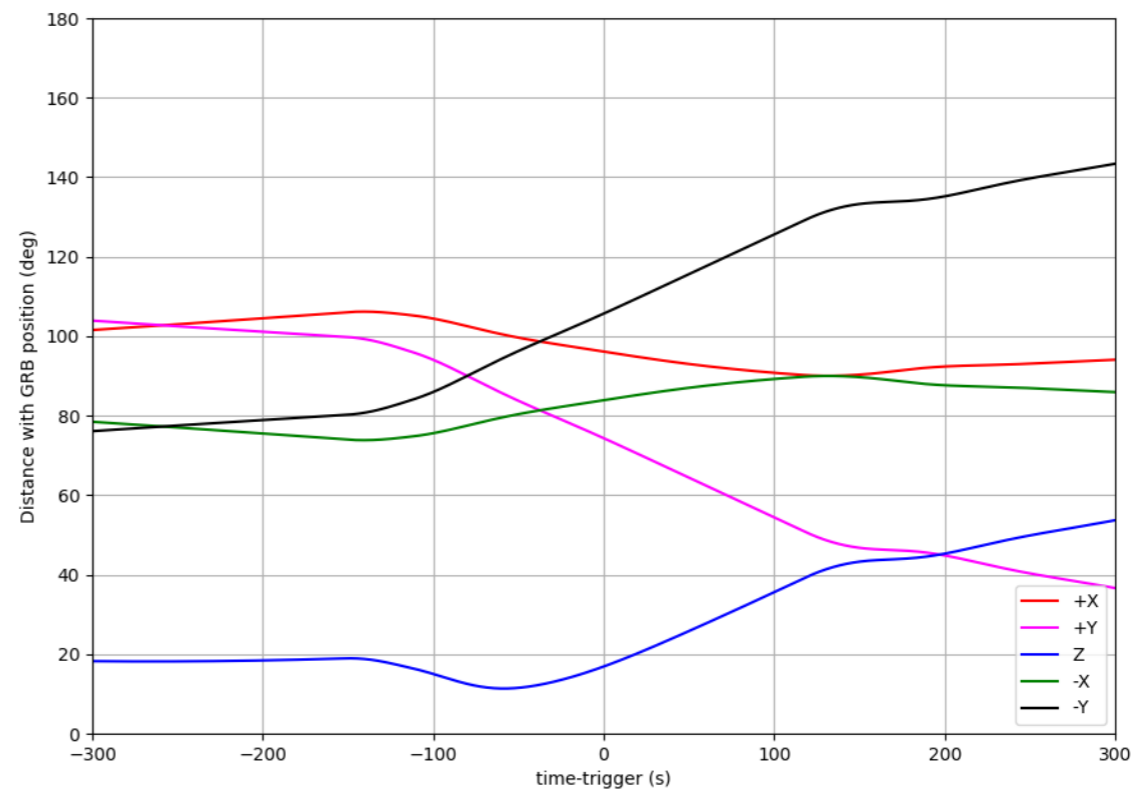
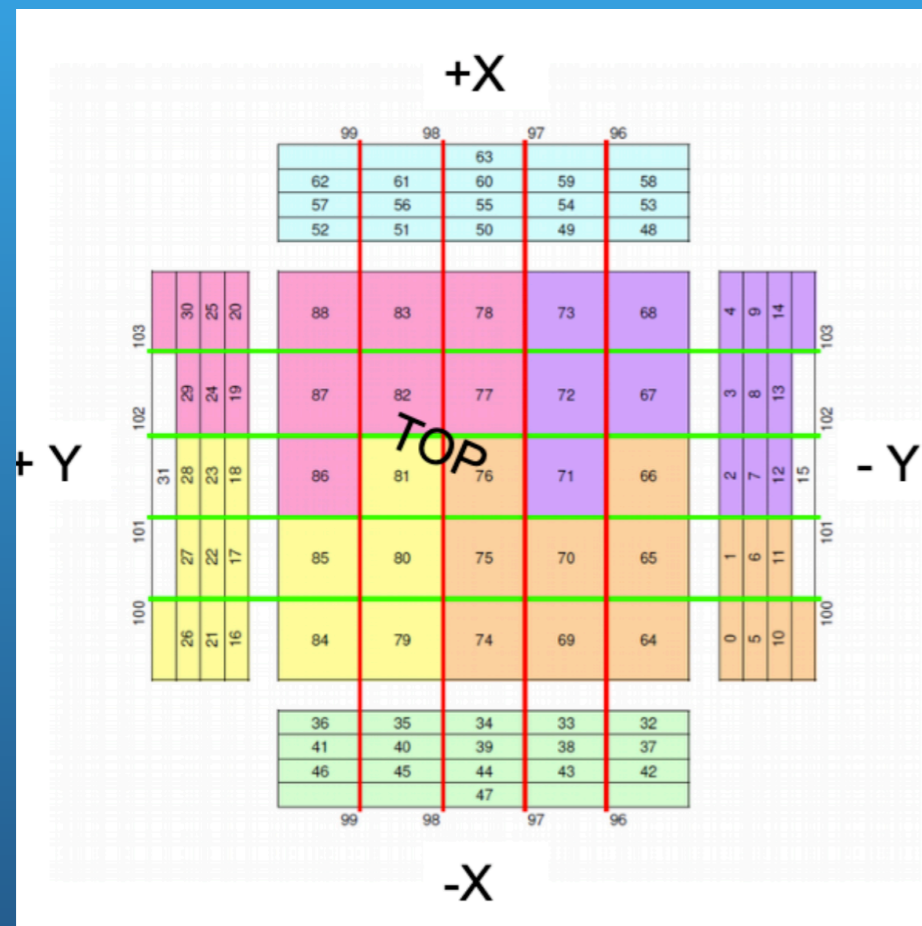
Articolo CAT1 in fase di referaggio interno alla collaborazione Fermi-LAT

Follow-up di eventi di GW con Fermi ACD

- L'idea è quella di cercare il segnale di soft-gamma-ray events con il sistema di anticoincidenza di Fermi
- Rivelato con l'ACD il segnale da SGR 1935+2154 (simultaneo con AGILE e BAT) il 27 Aprile 2020 18:32 UT evento che poi è stato seguito dal FRB

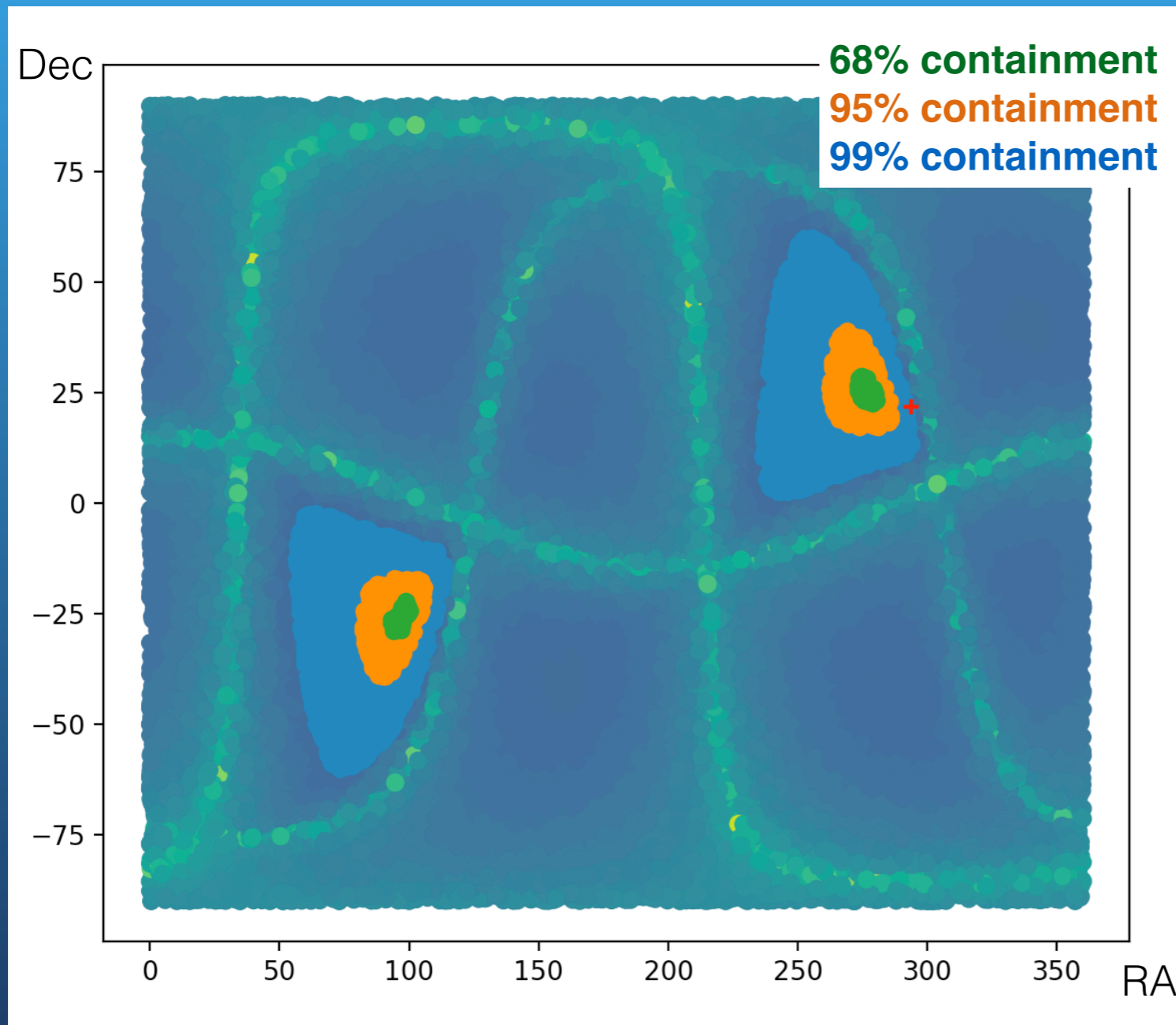


Follow-up of GW events using Fermi ACD



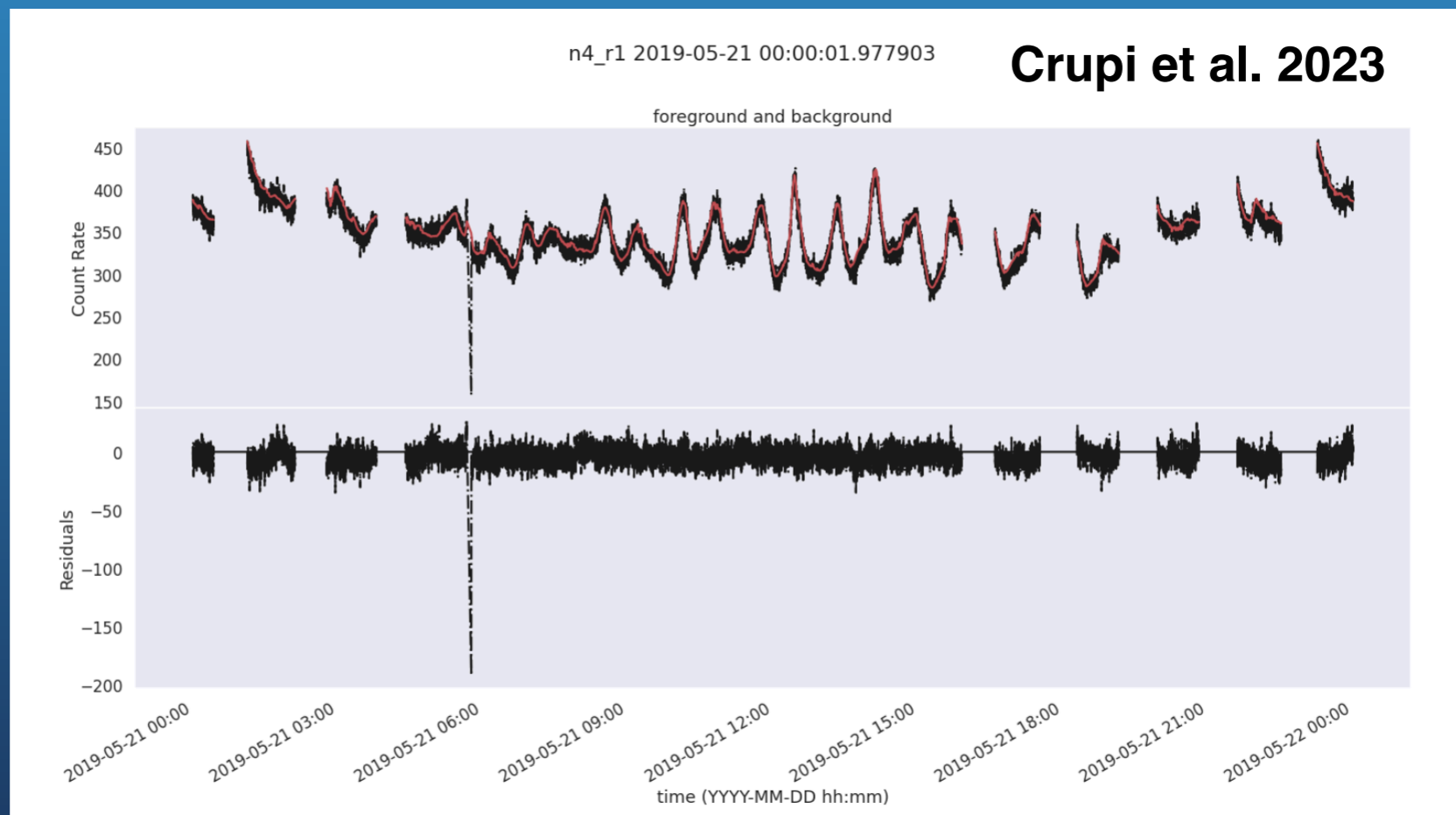
Follow-up of GW events using Fermi ACD

Possiamo localizzare il segnale utilizzando l'ampiezza del segnale rivelato nelle varie facce

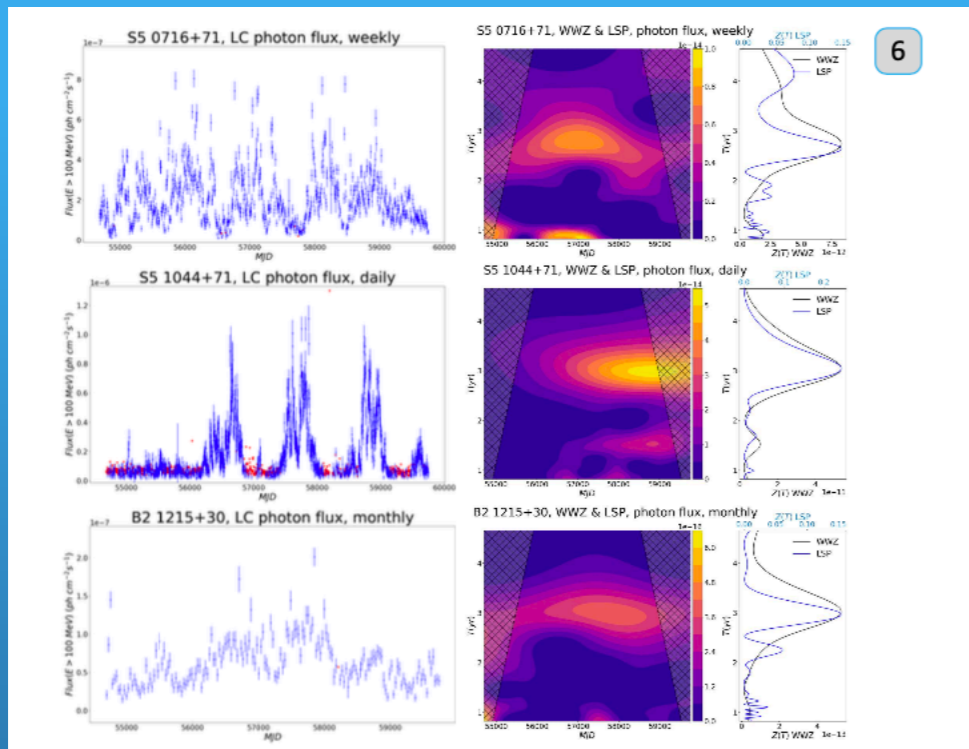


Follow-up of GW events using Fermi ACD

- Utilizzo di metodi di Machine Learning supervised per la stima del background sull'ACD
 - in funzione dell'orbita
 - campo geomagnetico
 - attività solare
 - flusso di raggi cosmici
- —> Borsa Tecnologica PNRR Spoke3 in collaborazione con Intesa San Paolo su tecniche di anomaly detection su serie temporali

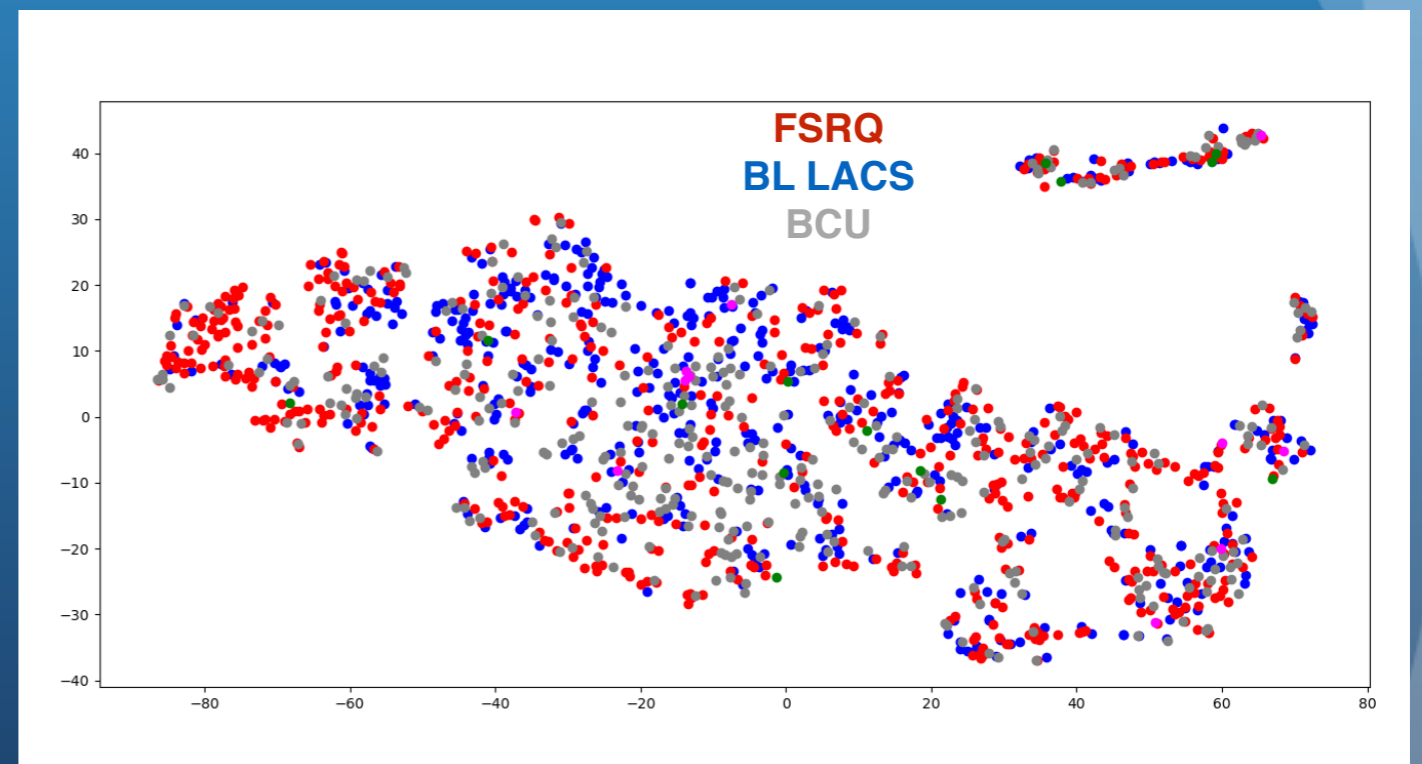


Articoli in preparazione (categoria 3):



“Study of periodicity in Blazar light curves observed by Fermi-LAT”
Cristarella Orestano et al. 2023 In prep.

“T-distributed neighbor embedding (t-SNE) method applied to 4th Fermi-LAT catalogue light curves”
Cutini et al. In prep.



Anagrafica sigla Fermi

Ricercatore III Livello - Sara Cutini - 77%

Dirigente di Ricerca - Pasquale Lubrano -27%

Professore associato UniPG - Gino Tosti 50%

Ricercatore UniPG - Stefano Germani 50%

Studente Dottorato - Paolo Cristarella Orestano: 100%

Associato - Isabella Mereu 100%

Totale FTE: 4.04