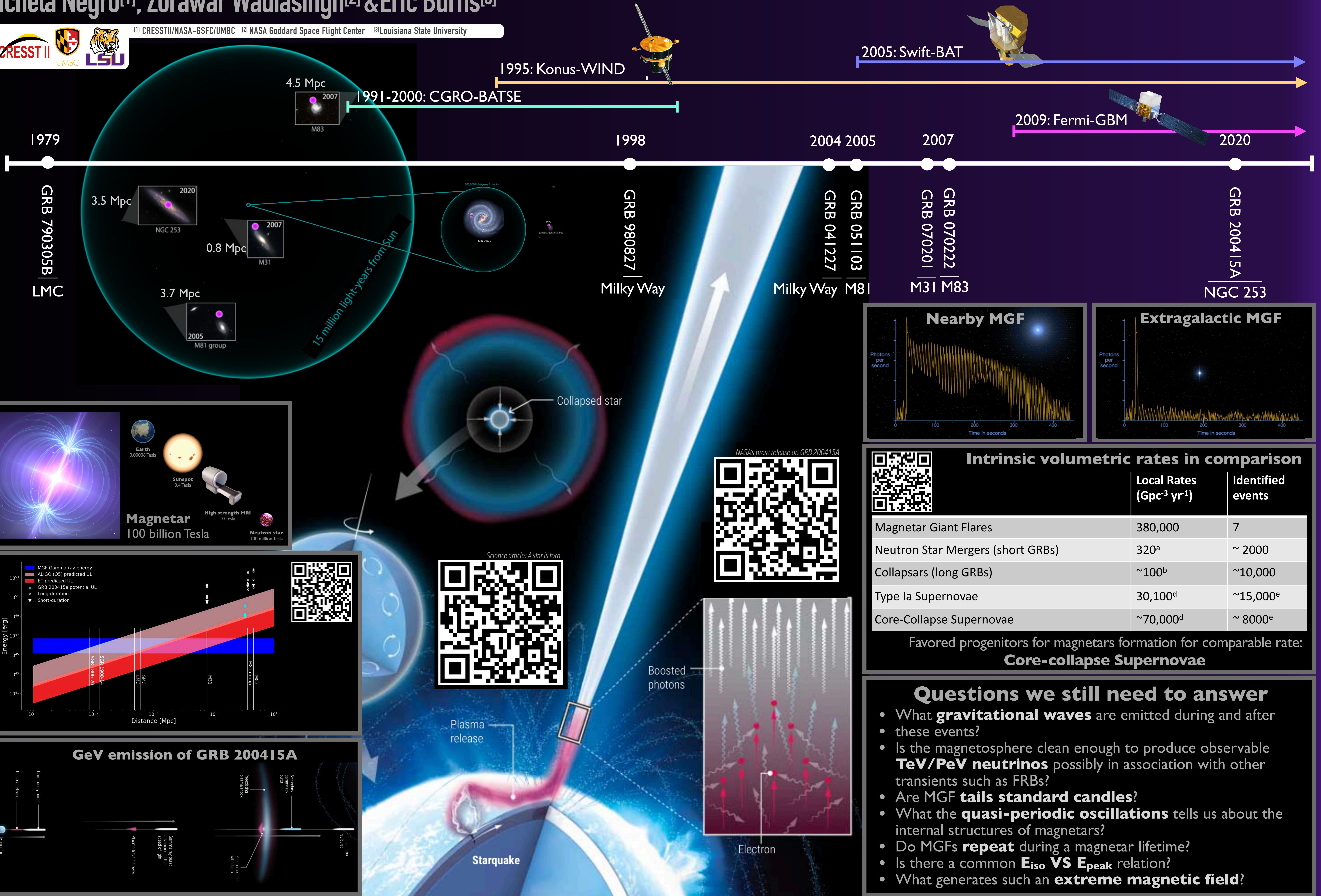


Magnetar Giant Flares

Michela Negro^[1], Zorawar Wadiasingh^[2] & Eric Burns^[3]



^[1] CRESSTII/NASA-GSFC/UMBC ^[2] NASA Goddard Space Flight Center ^[3] Louisiana State University



1979

GRB 790305B
LMC

3.5 Mpc
NGC 253

0.8 Mpc
M31

3.7 Mpc
M81 group

4.5 Mpc
M83

1991-2000: CGRO-BATSE

1995: Konus-WIND

1998

GRB 980827
Milky Way

Collapsed star

2004 2005

GRB 041227
Milky Way

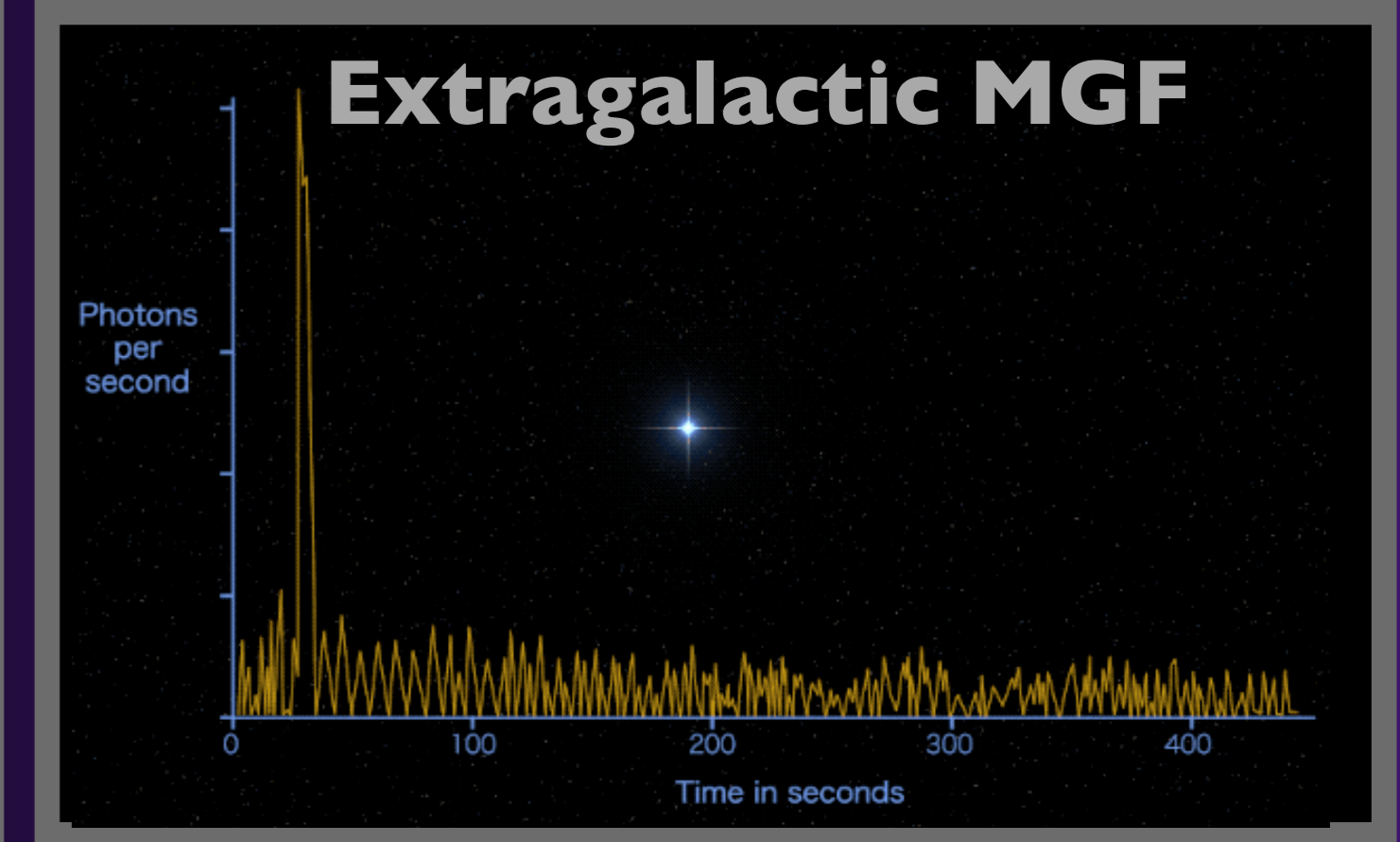
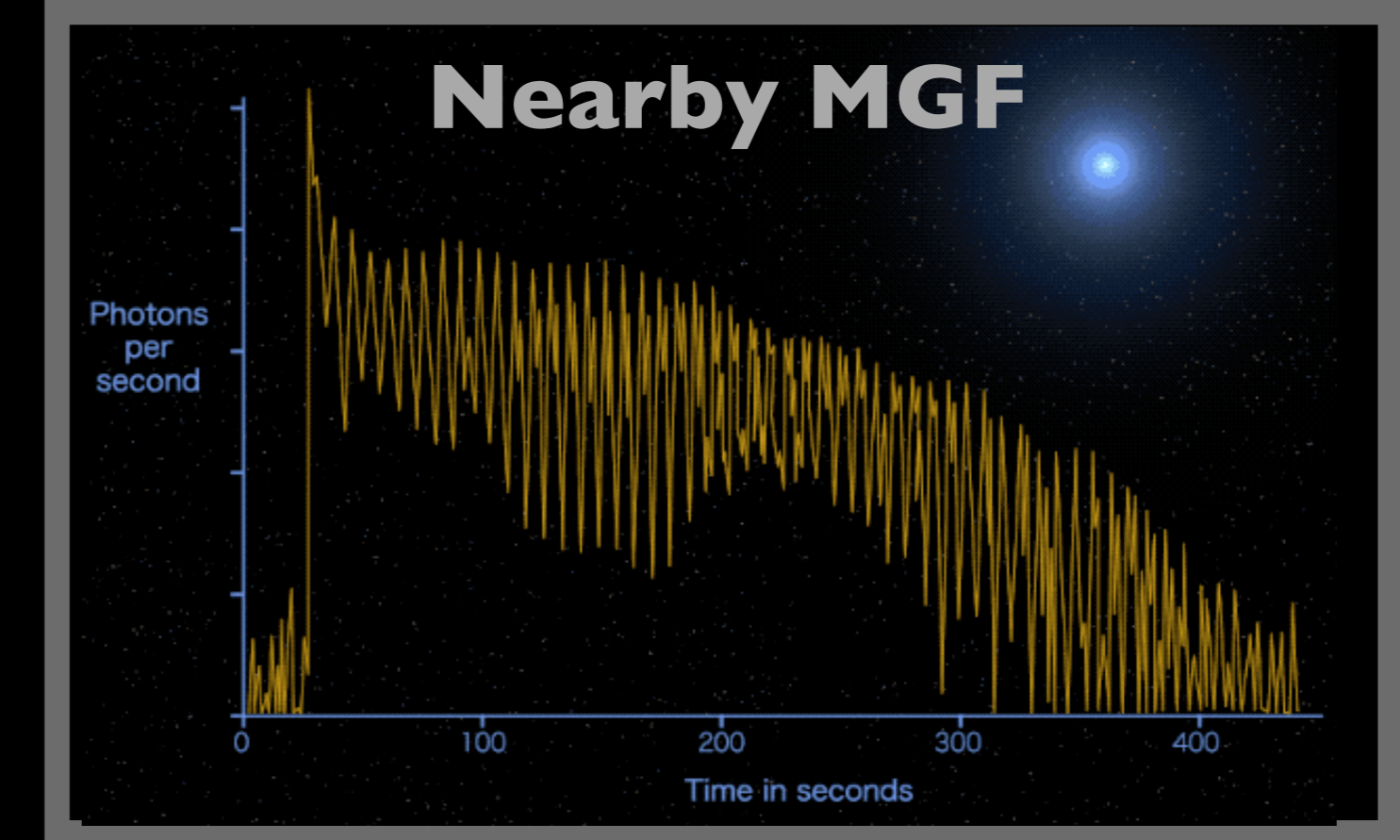
2007

GRB 070222
GRB 070201
M31 M83

2009: Fermi-GBM

2020

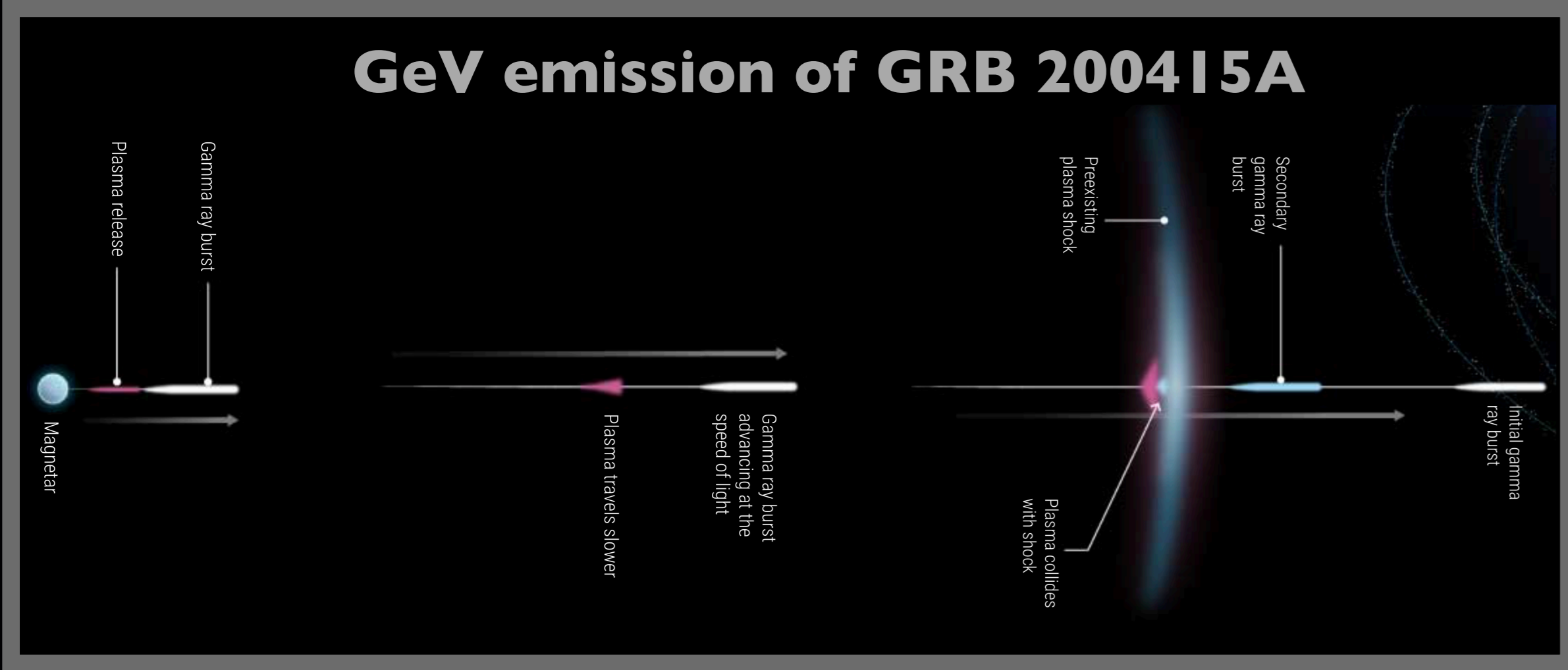
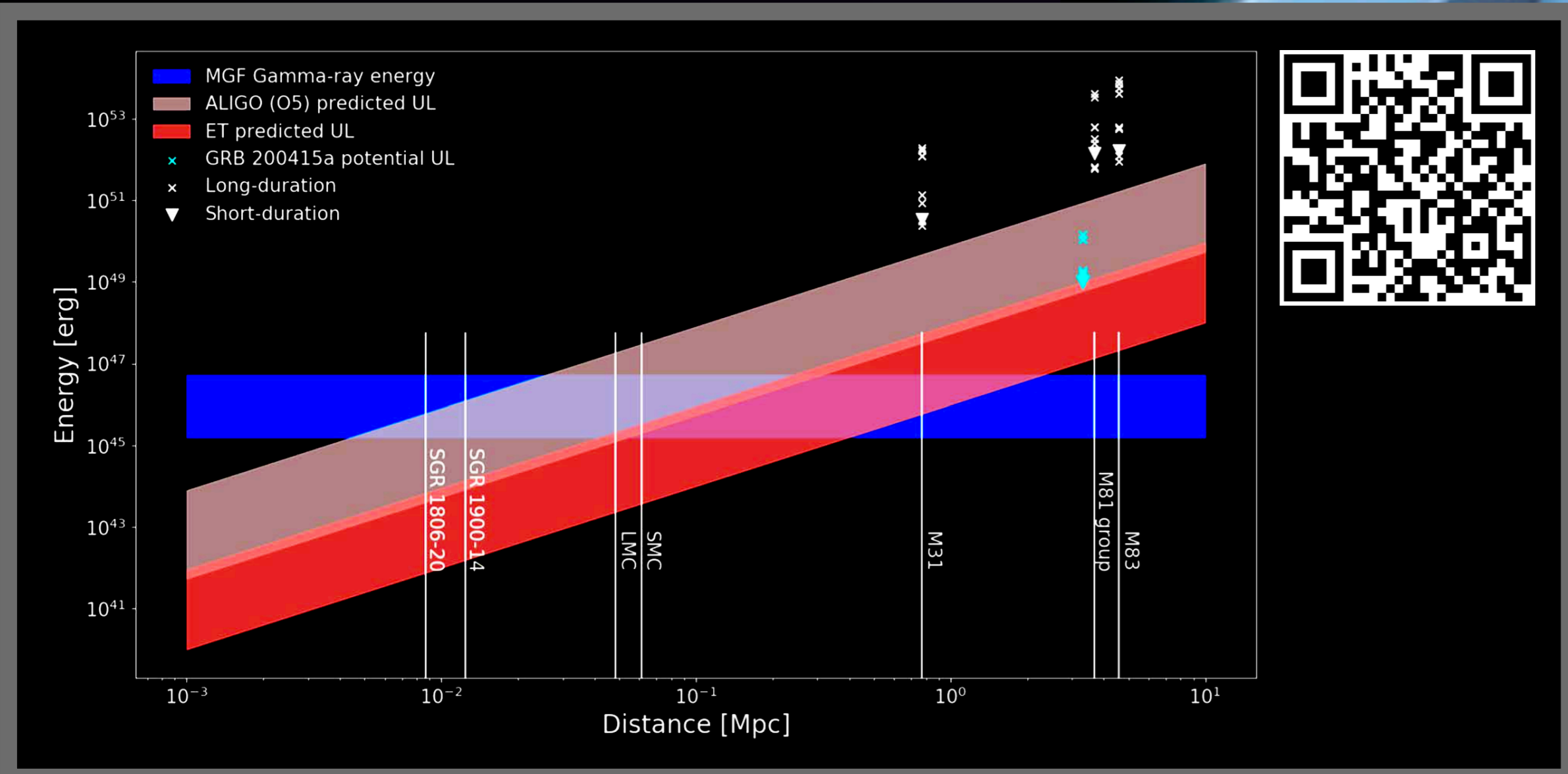
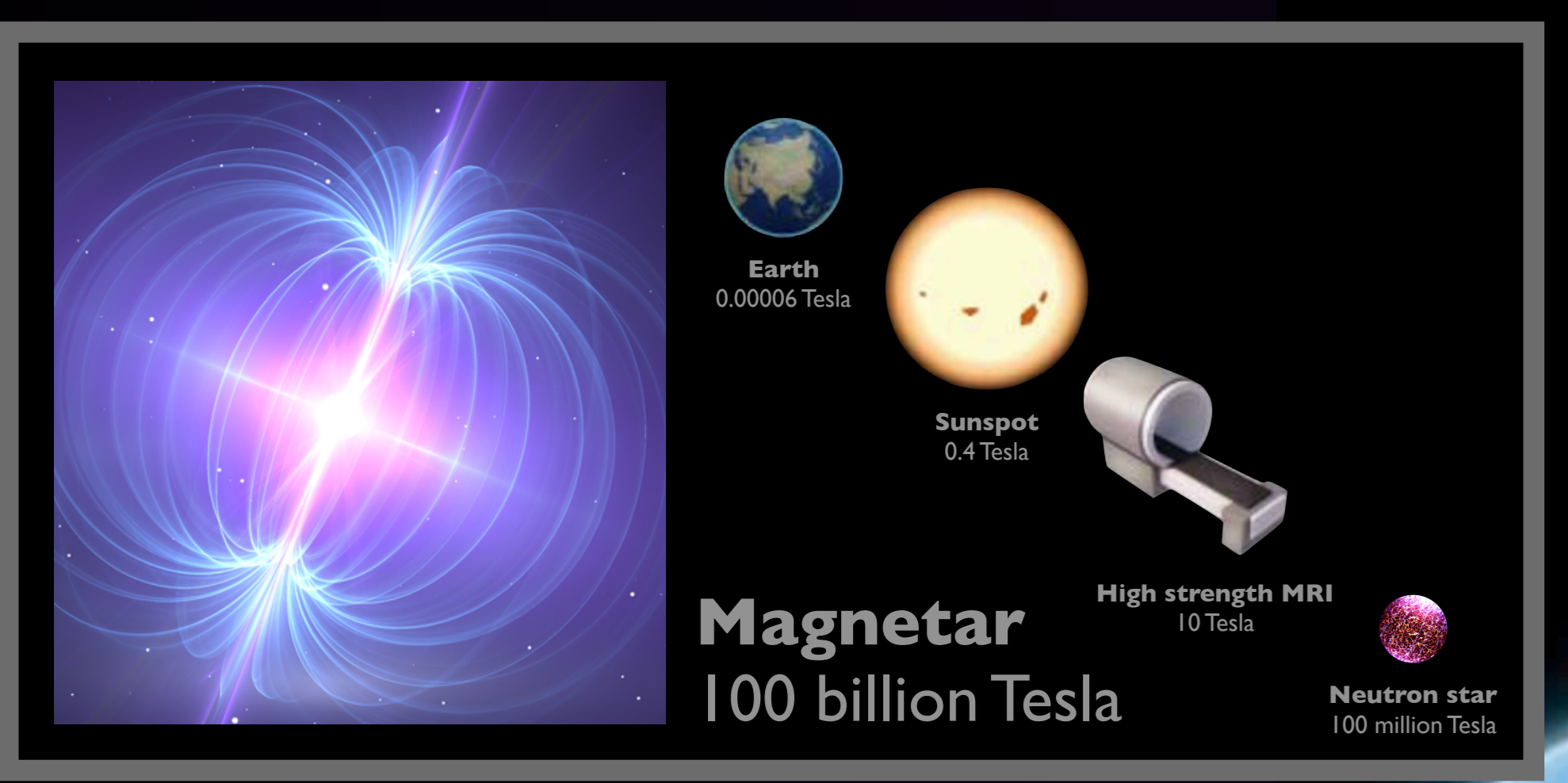
GRB 200415A
NGC 253



Intrinsic volumetric rates in comparison

	Local Rates (Gpc ⁻³ yr ⁻¹)	Identified events
Magnetar Giant Flares	380,000	7
Neutron Star Mergers (short GRBs)	320 ^a	~ 2000
Collapsars (long GRBs)	~100 ^b	~10,000
Type Ia Supernovae	30,100 ^d	~15,000 ^e
Core-Collapse Supernovae	~70,000 ^d	~ 8000 ^e

Favored progenitors for magnetars formation for comparable rate:
Core-collapse Supernovae



- Questions we still need to answer**
- What **gravitational waves** are emitted during and after these events?
 - Is the magnetosphere clean enough to produce observable **TeV/PeV neutrinos** possibly in association with other transients such as FRBs?
 - Are MGF **tails standard candles**?
 - What the **quasi-periodic oscillations** tells us about the internal structures of magnetars?
 - Do MGFs **repeat** during a magnetar lifetime?
 - Is there a common **E_{iso} VS E_{peak}** relation?
 - What generates such an **extreme magnetic field**?