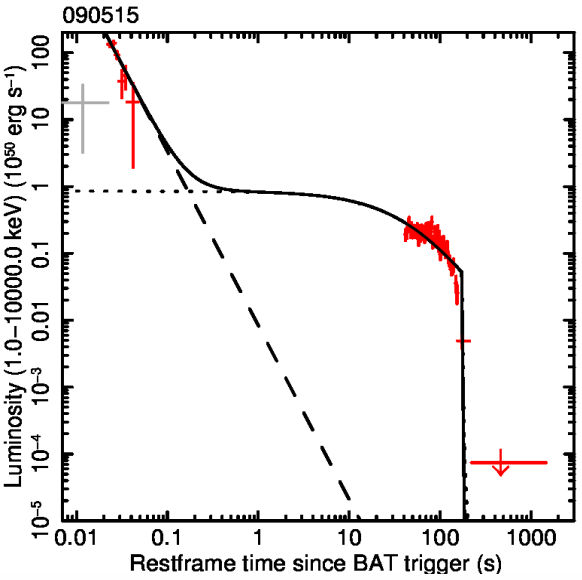
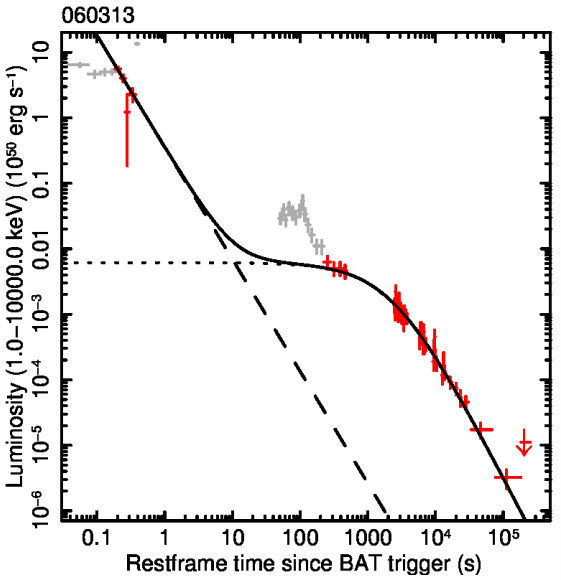
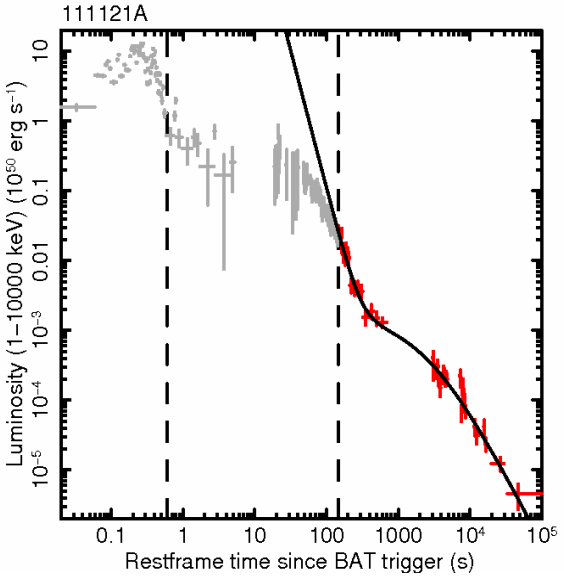
Why use magnetars?

- Magnetic dipole spin-down profile provides a good fit to SGRB X-ray afterglows

Rowlinson et al. (2013)

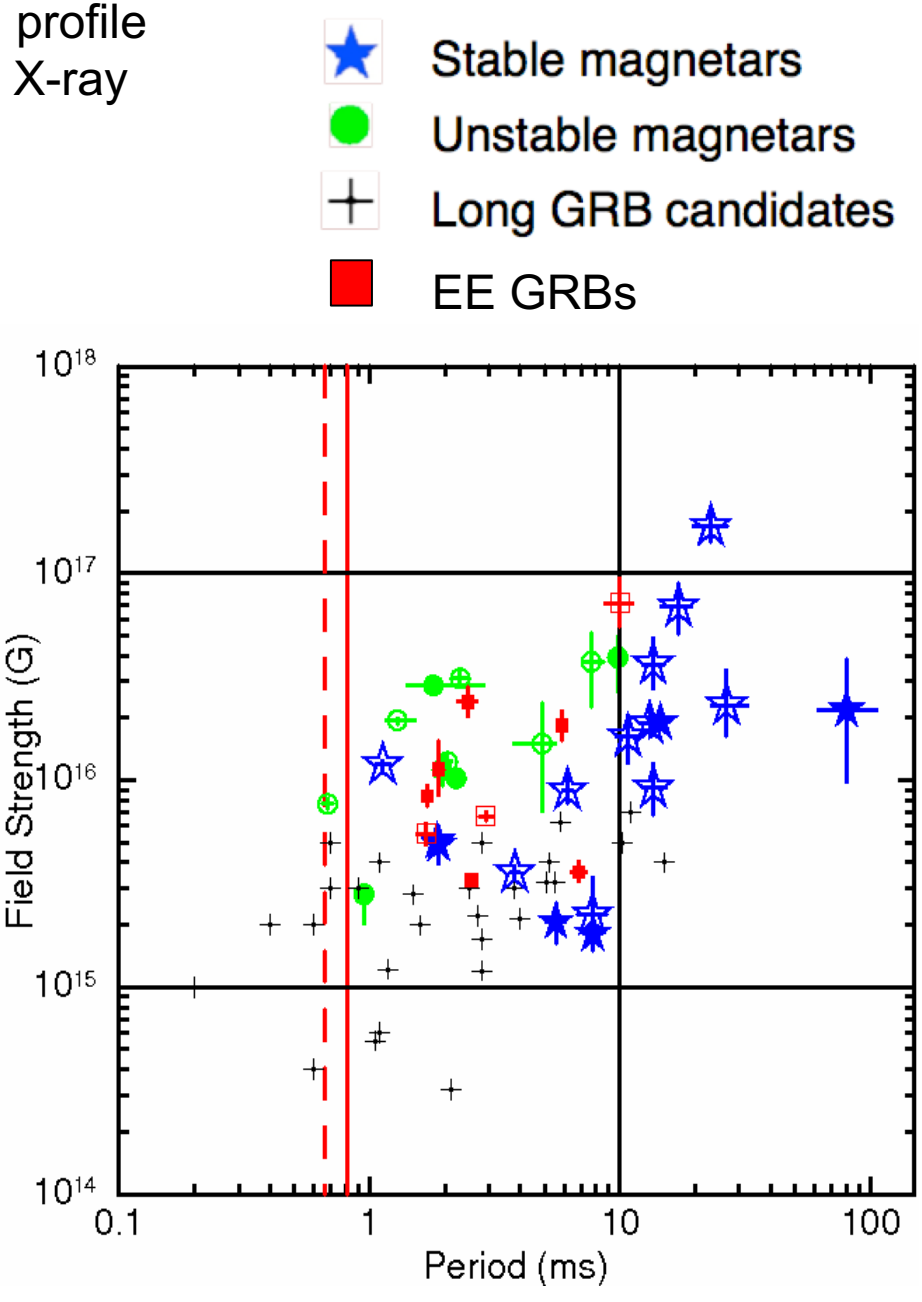






- Short and EE GRB X-ray light curves are energetically compatible with a magnetar central engine

- Viscous time for black hole accretion disk is too short to provide these plateaux



Gompertz et al. (2013)

The magnetar model in SGRBs

+ Naturally long-lived central engine
+ Energetically consistent with magnetar limitations
+ Produces afterglow fits with good fit statistics
+ Fits fall within allowed B and P parameter space
+ Can account for bursts with/without late plateaux and EE GRBs within a single model
+ Only model currently capable of explaining sudden & severe drops in flux (e.g. Troja et al. 2007)

- Too simplistic; energy reprocessed in shock with assumed efficiency
- No spectral information
- Serious concerns over whether a jet with requisite Lorentz factor can be launched (e.g. Drenkhahn & Spruit, 2002; Dessart et al. 2007)
- Can a magnetar be formed through merger? (Massive NSs e.g. 2.01 Msol, Antoniadis et al. 2013, suggest yes)
- Where is the radio emission? (Metzger & Bower, 2014; Horesh et al. 2016; Fong et al. 2016)

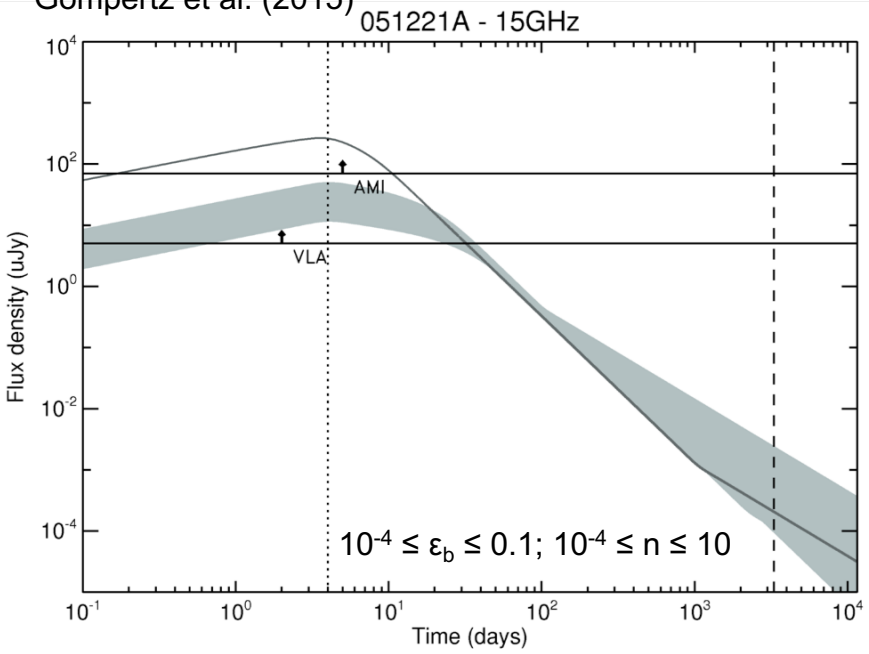
Other models for late plateaux:

- Fallback accretion (e.g. Rosswog 2007)
- Top heavy jet with prolonged coasting phase (Duffell & MacFadyen, 2015)
- Interactions with walls of a pulsar-excavated cavity (Holcomb et al. 2014)
- Shells of ejecta with stratified Lorentz factors

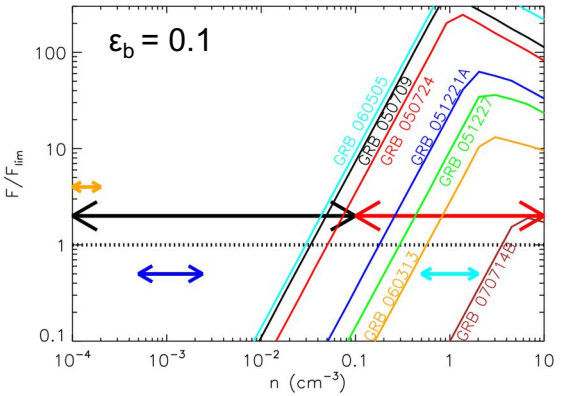
Detectability

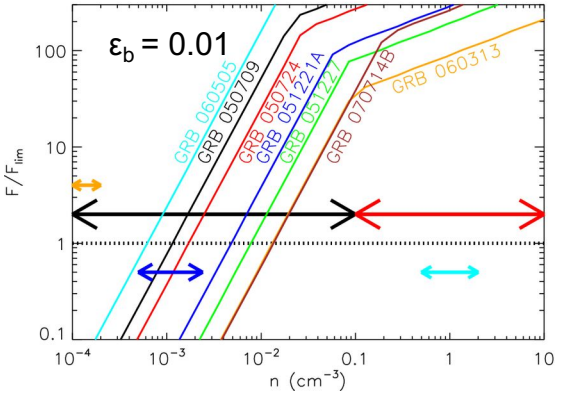
- Magnetar injection should provide an enhanced radio signal
- Finding this signal (the earlier the better), or providing upper limits that rule it out, can potentially resolve the magnetar issue

Gompertz et al. (2015)

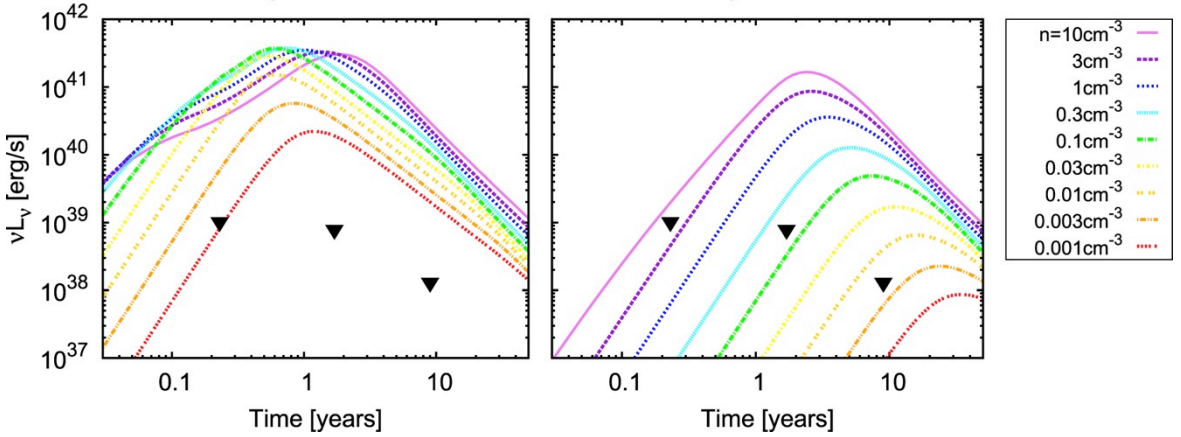


Metzger & Bower (2014)





M_{ej}=0.01M_{sun} Horesh et al. (2016) M_{ej}=0.1M_{sun}



Assumes E_k = 3E52 erg. Includes macronovae.

Fong et al. (2016)