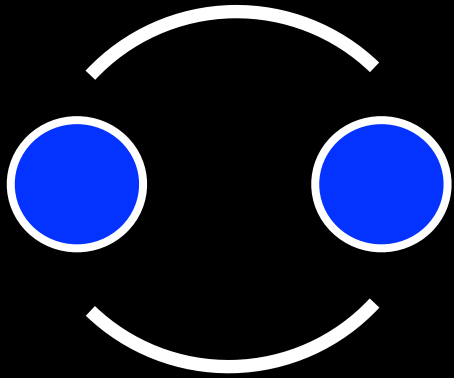


Identifying the Remnants of Neutron Star Mergers

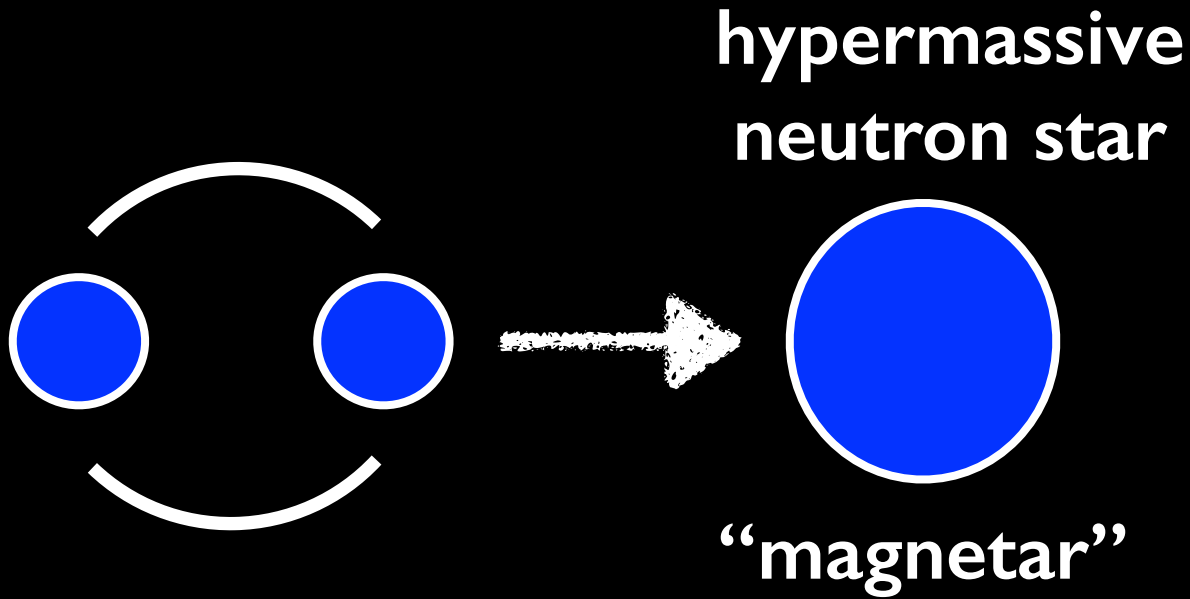


Wen-fai Fong
University of Arizona

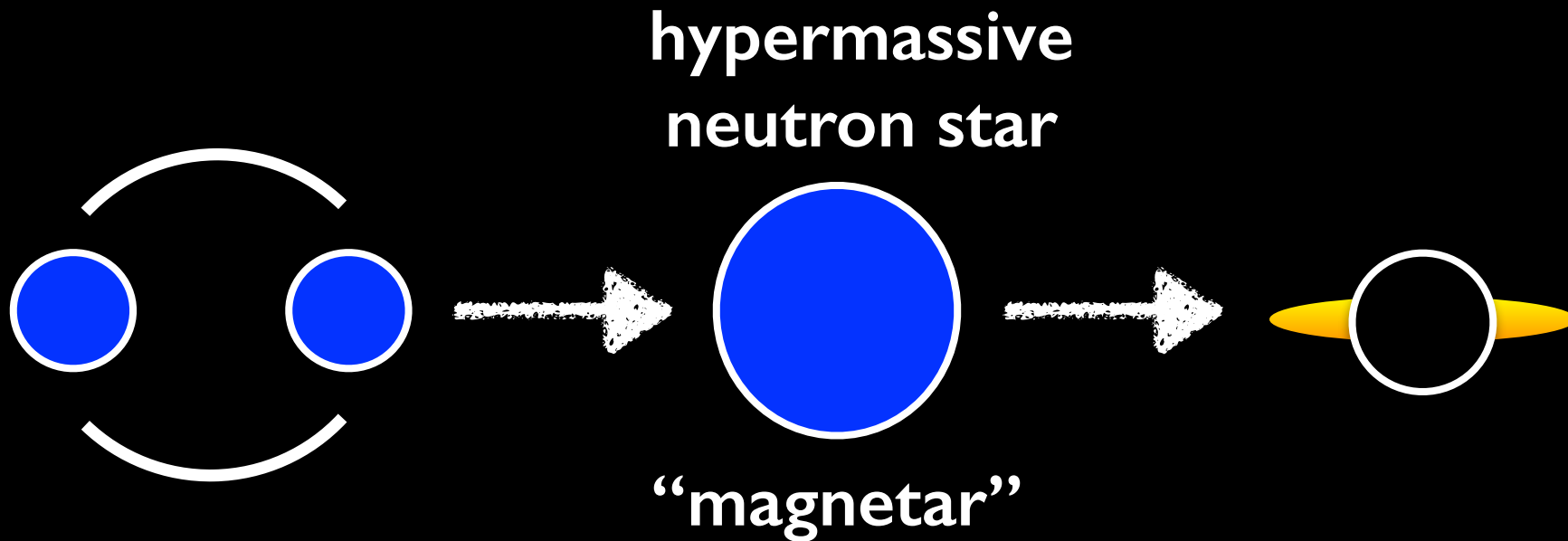
**What's left after two
neutron stars merge?**



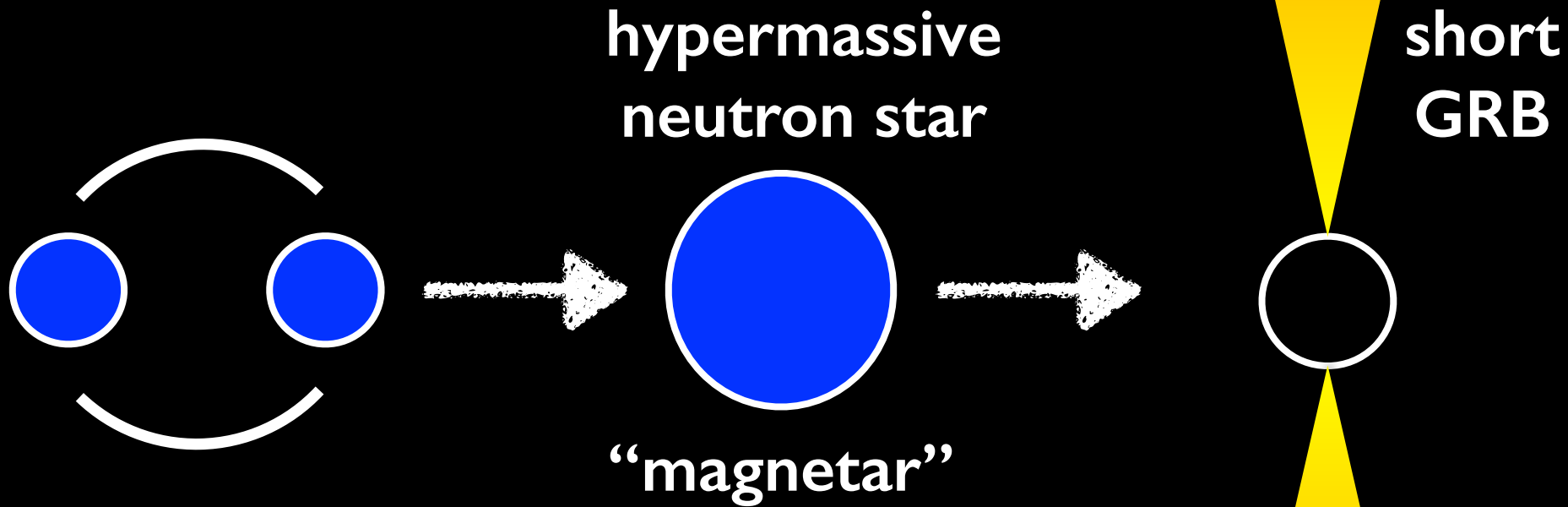
What's left after two neutron stars merge?



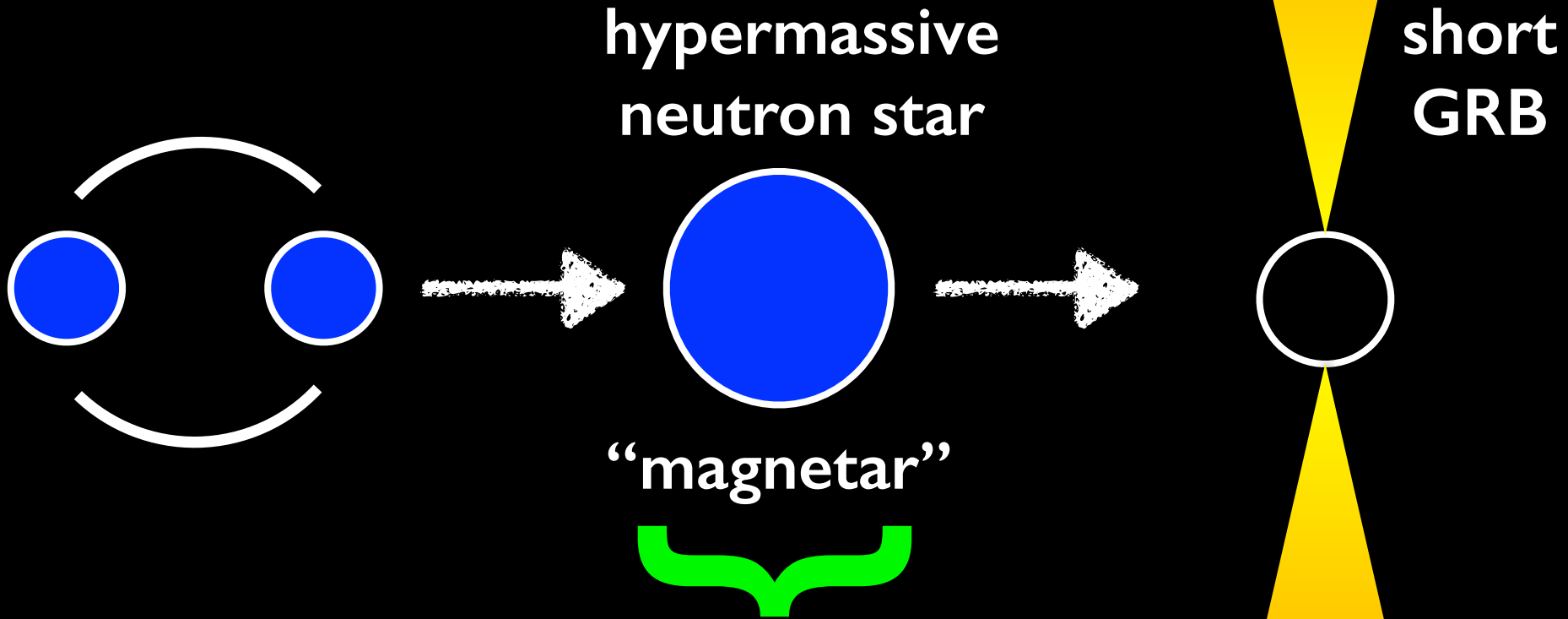
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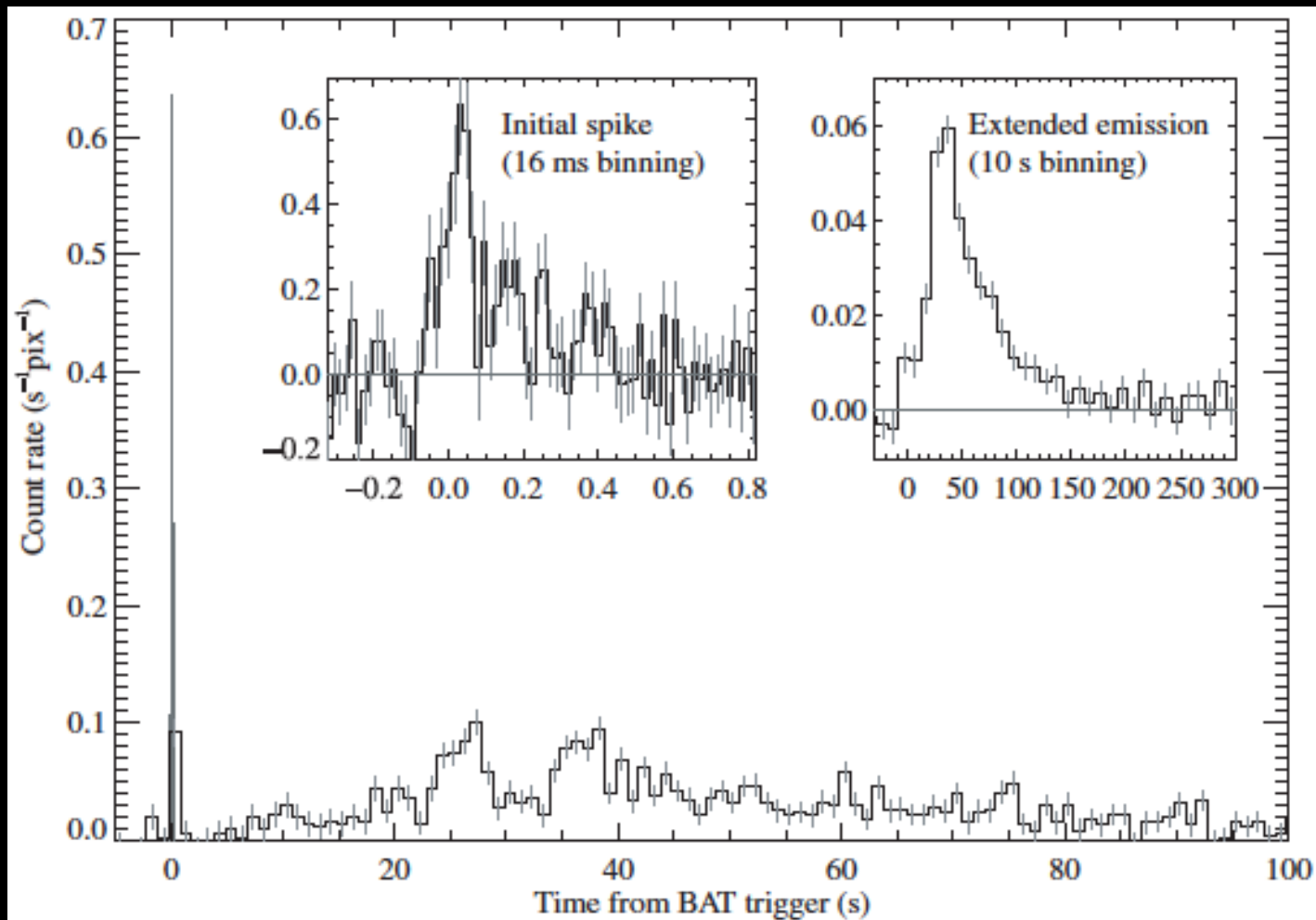


What's left after two neutron stars merge?

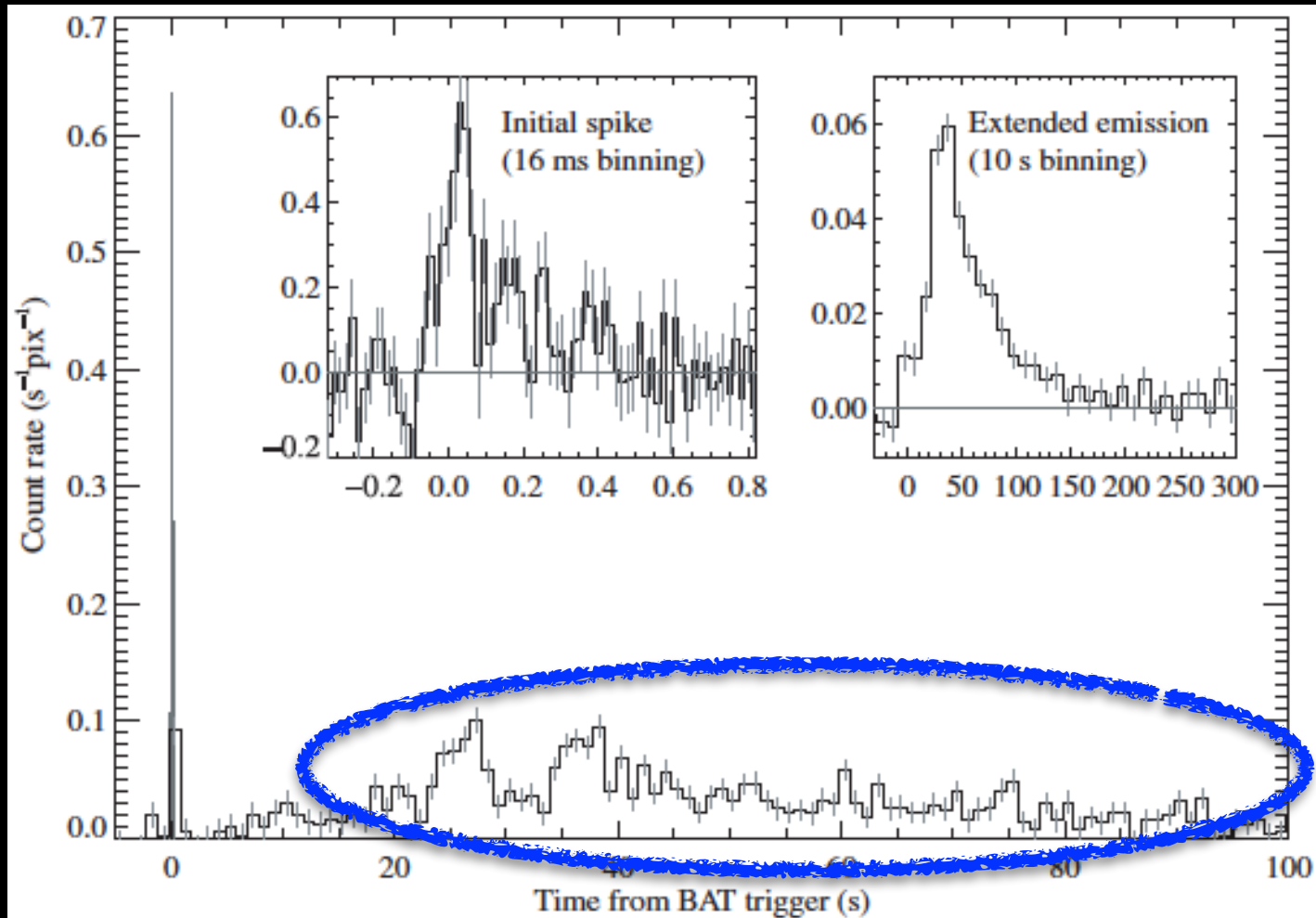


How long is this stage?

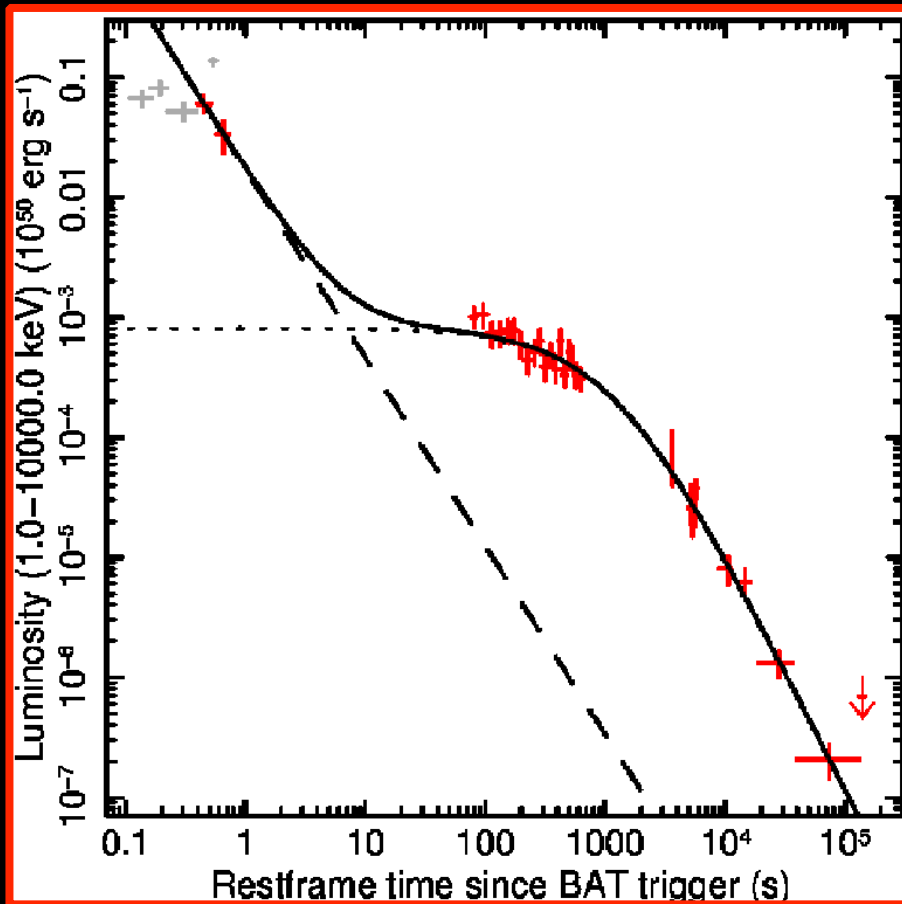
Long-lived magnetars in short GRBs: Extended emission



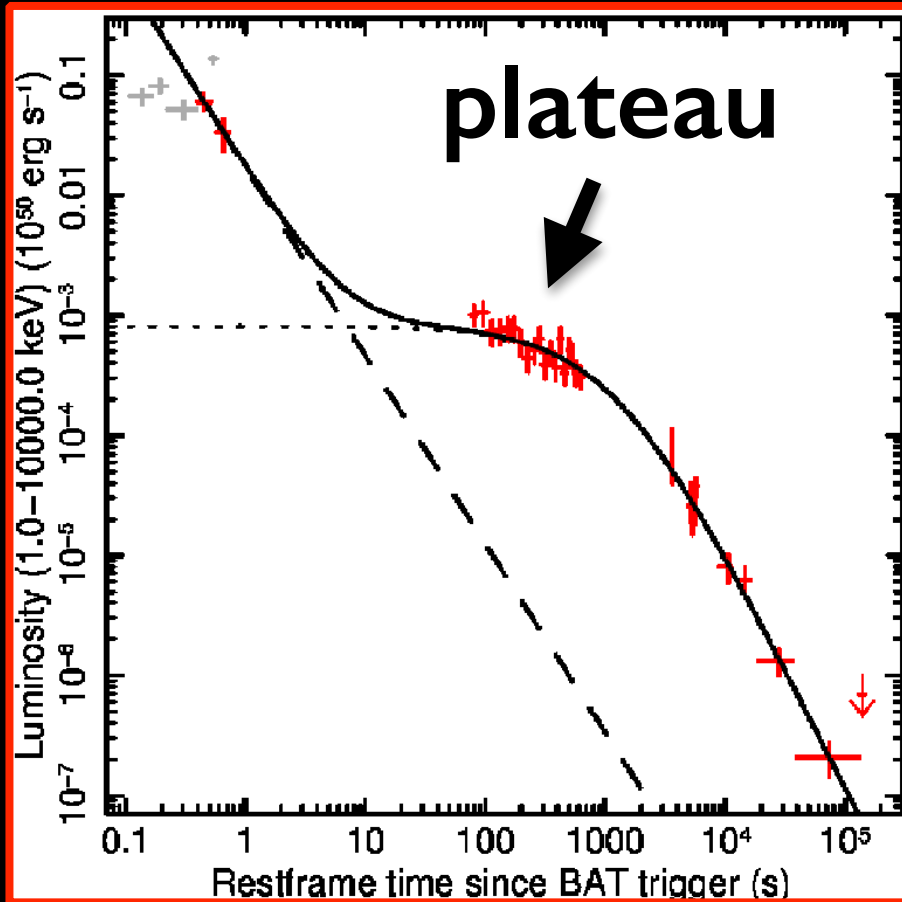
Long-lived magnetars in short GRBs: Extended emission



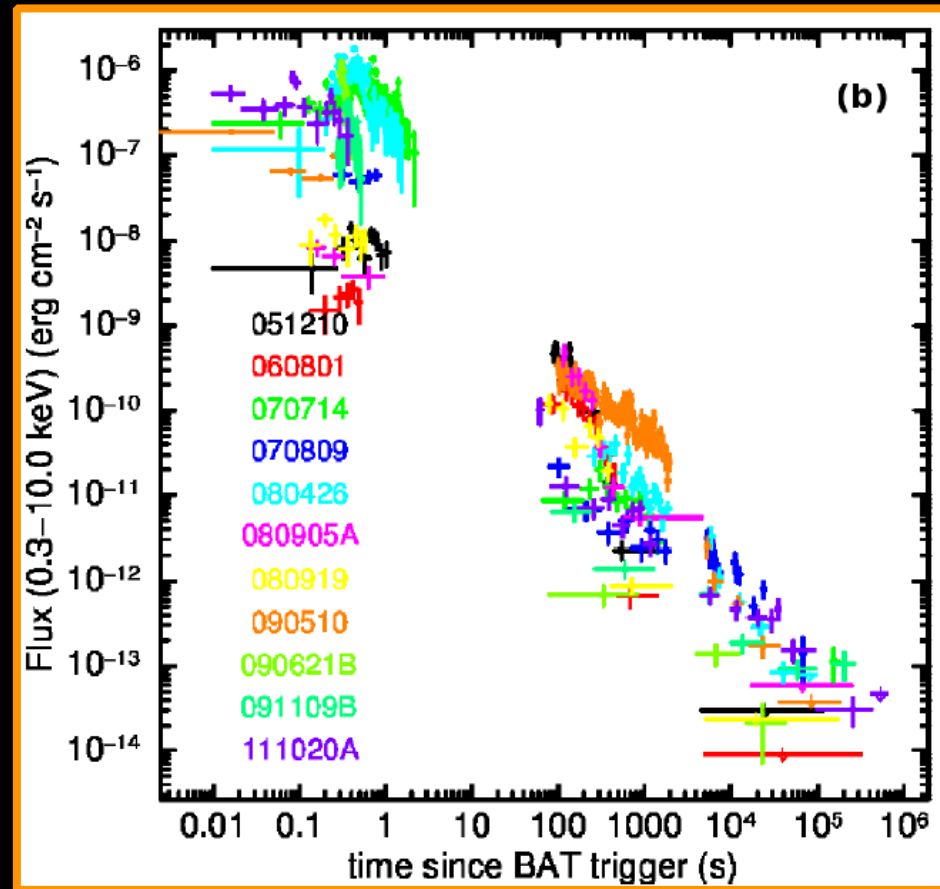
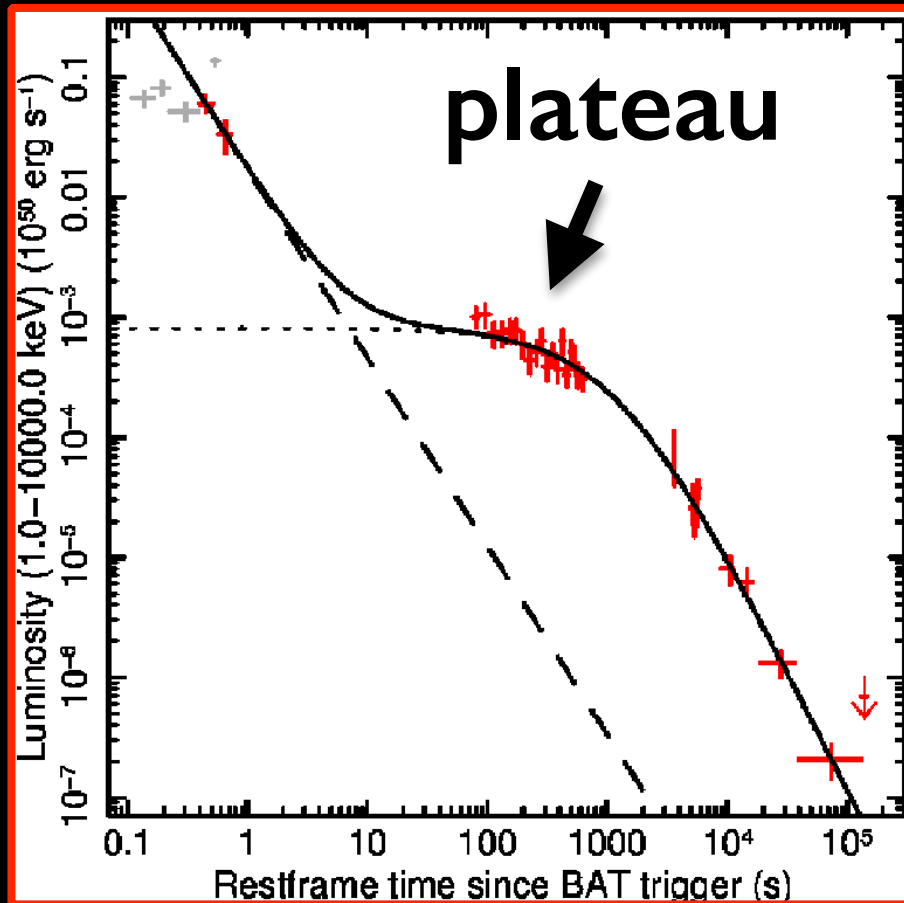
Long-lived magnetars in short GRBs: X-ray plateaus



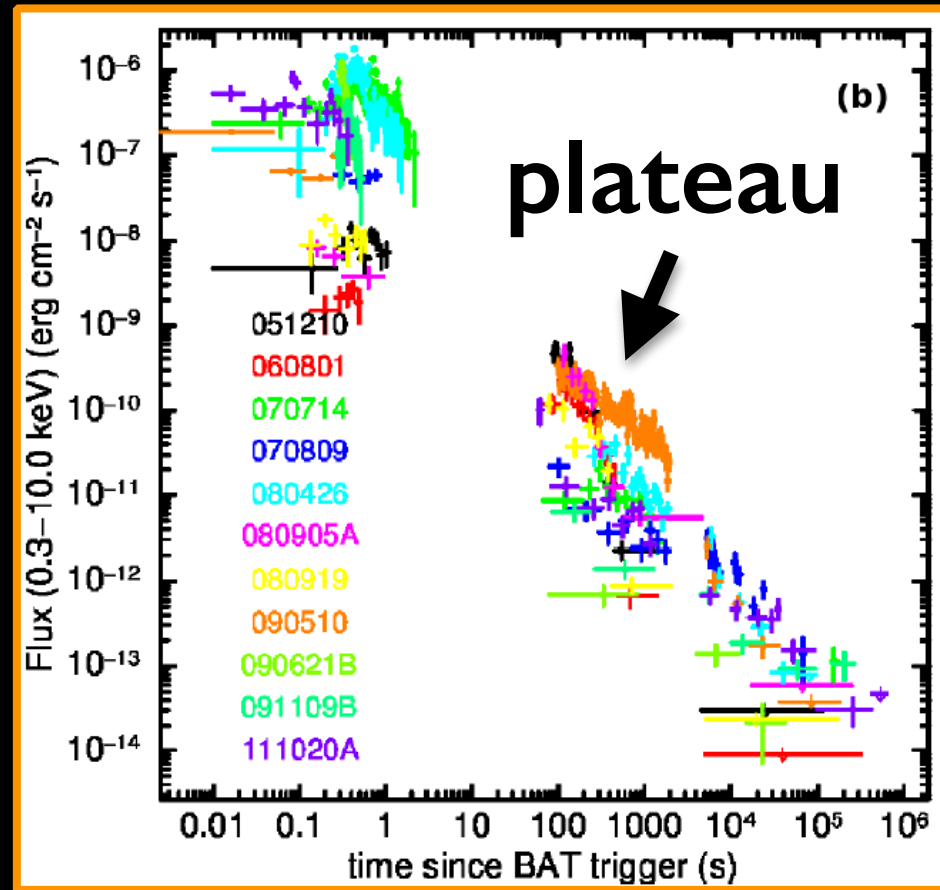
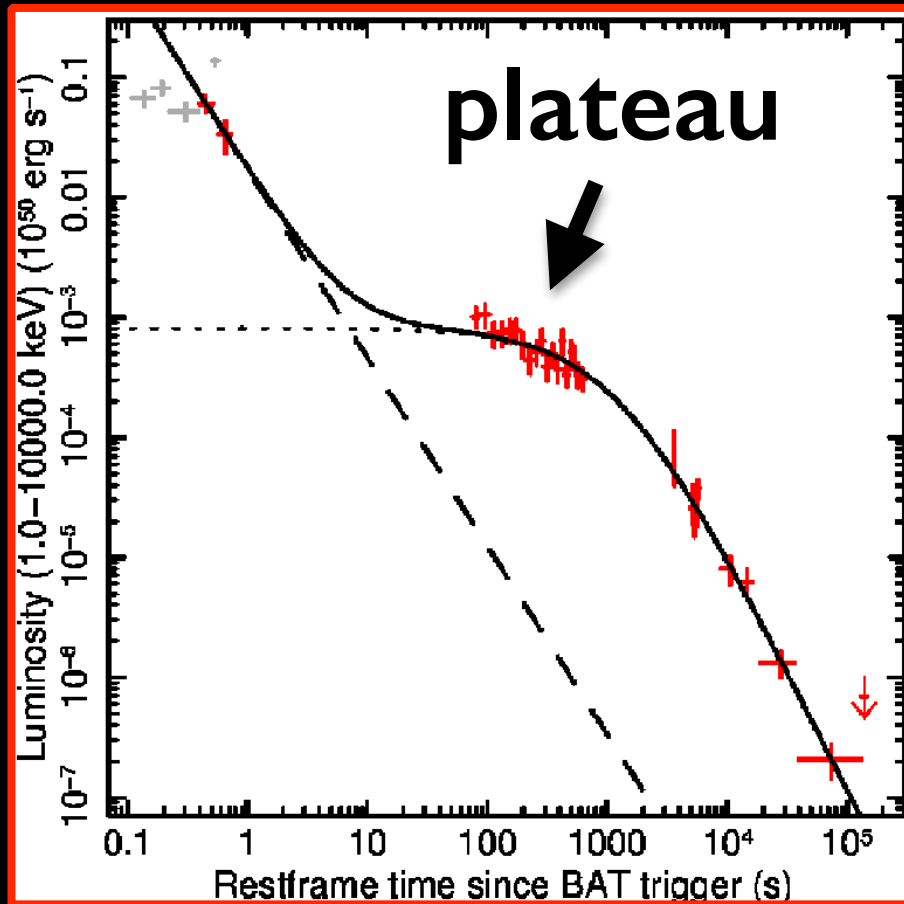
Long-lived magnetars in short GRBs: X-ray plateaus



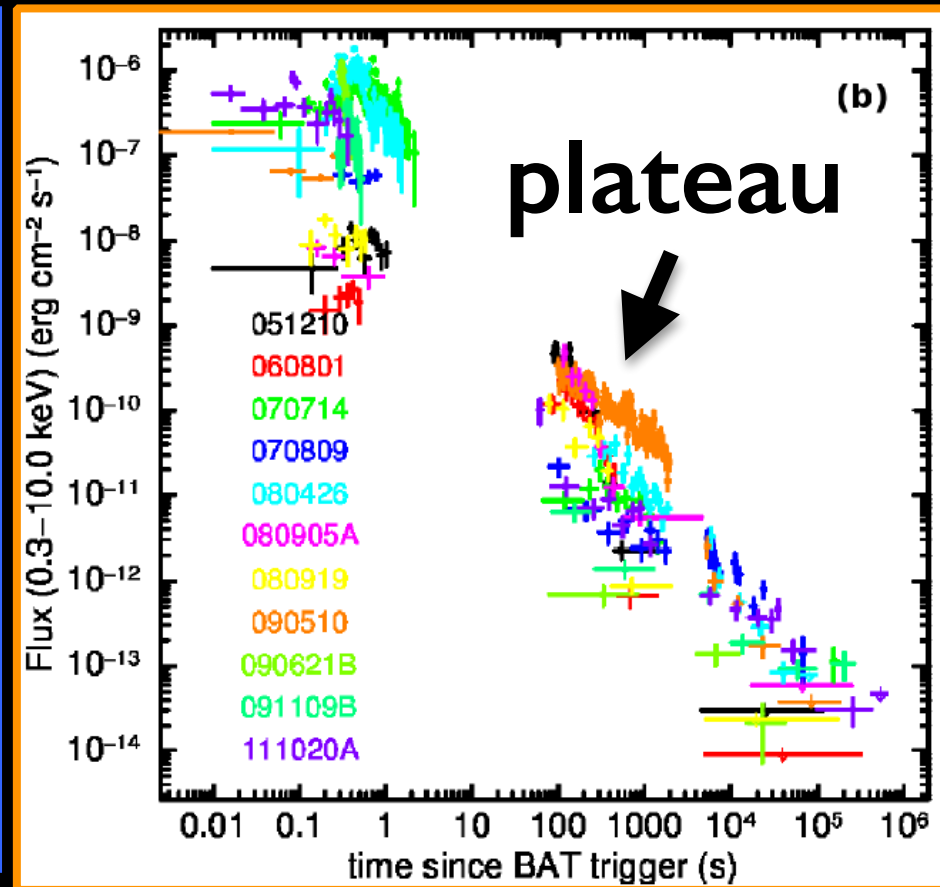
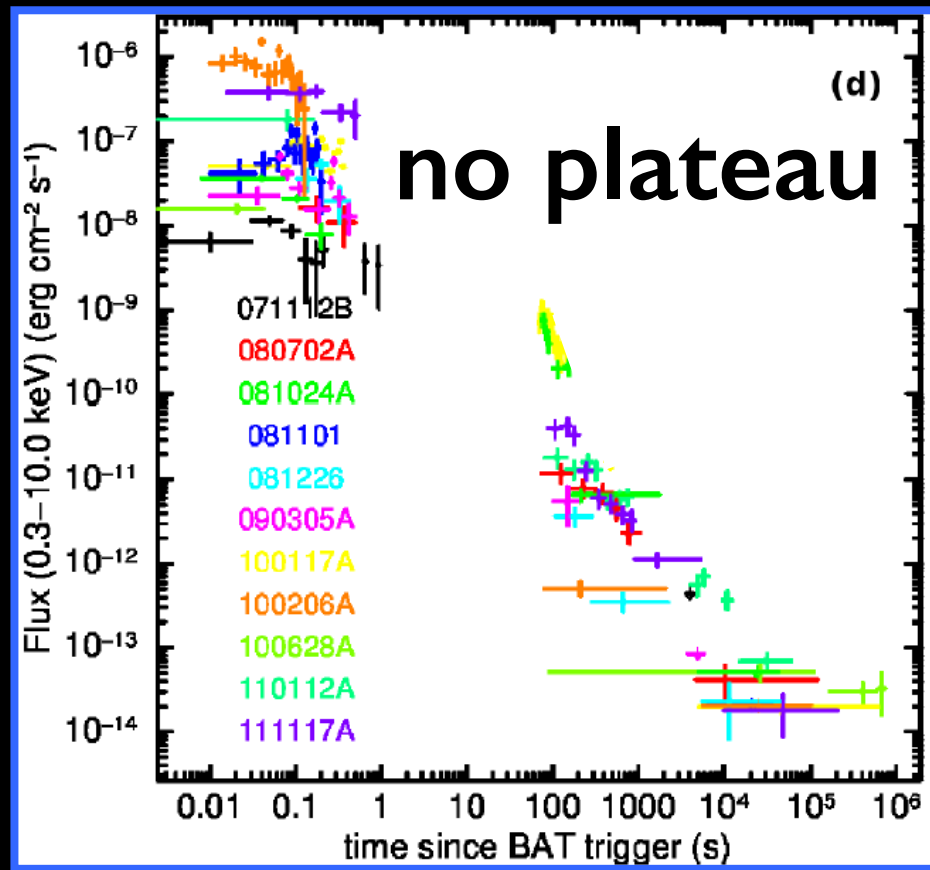
Long-lived magnetars in short GRBs: X-ray plateaus



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Long-lived magnetars in short GRBs: X-ray plateaus



Magnetar spin-down energy powers a radio transient?

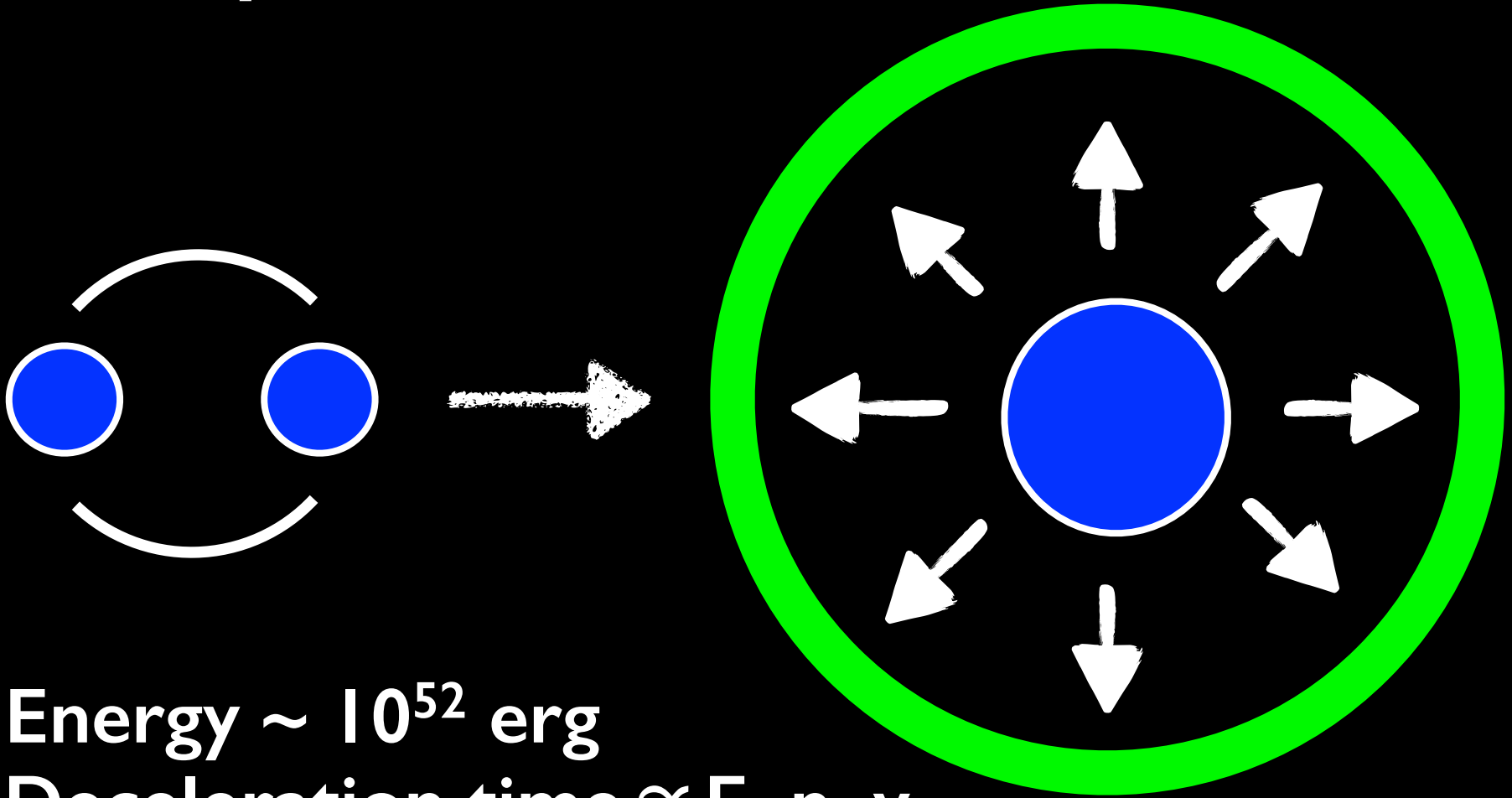


Magnetar spin-down energy powers a radio transient?



Energy $\sim 10^{52}$ erg

Magnetar spin-down energy powers a radio transient?

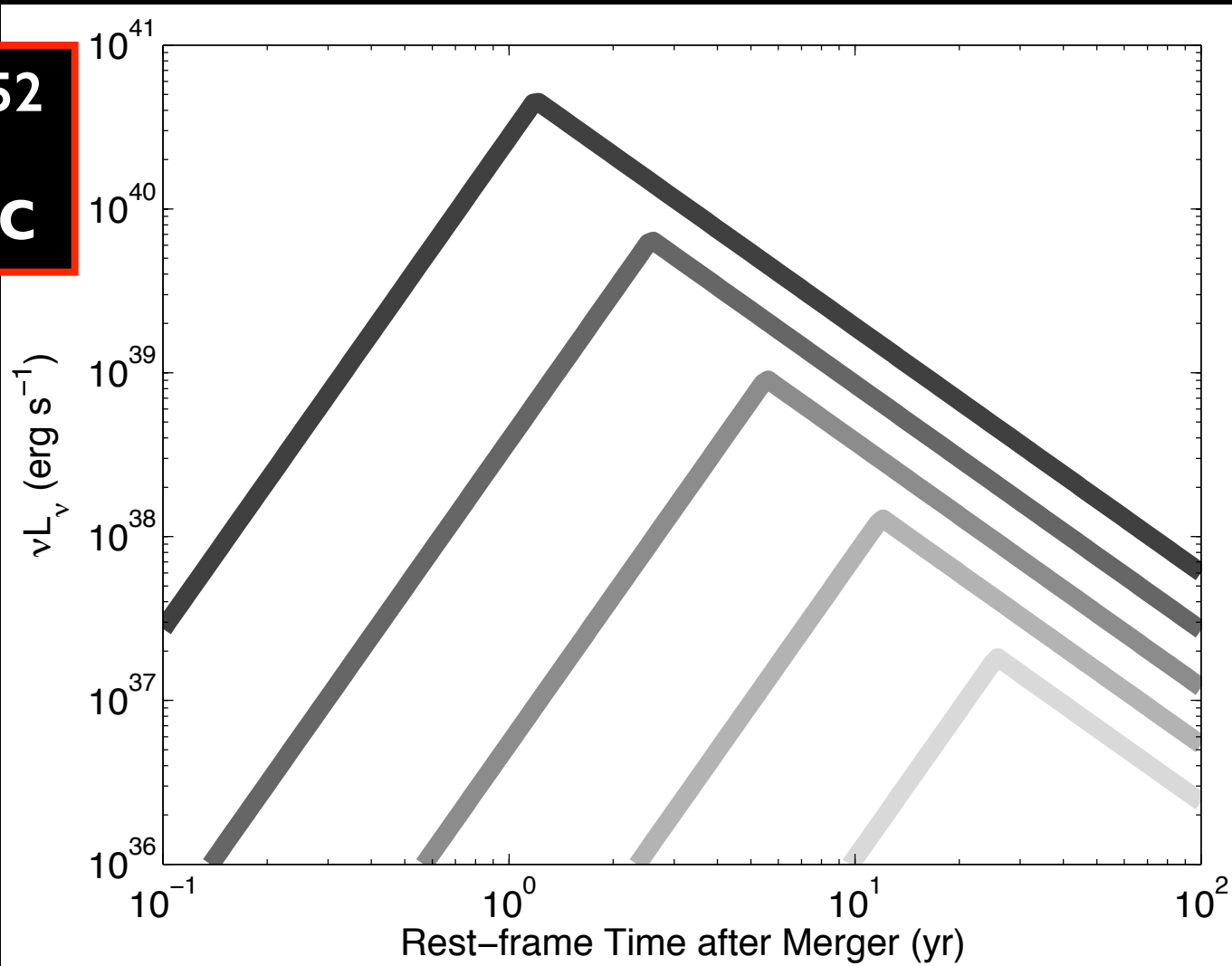


Energy $\sim 10^{52}$ erg

Deceleration time $\propto E, n, v$

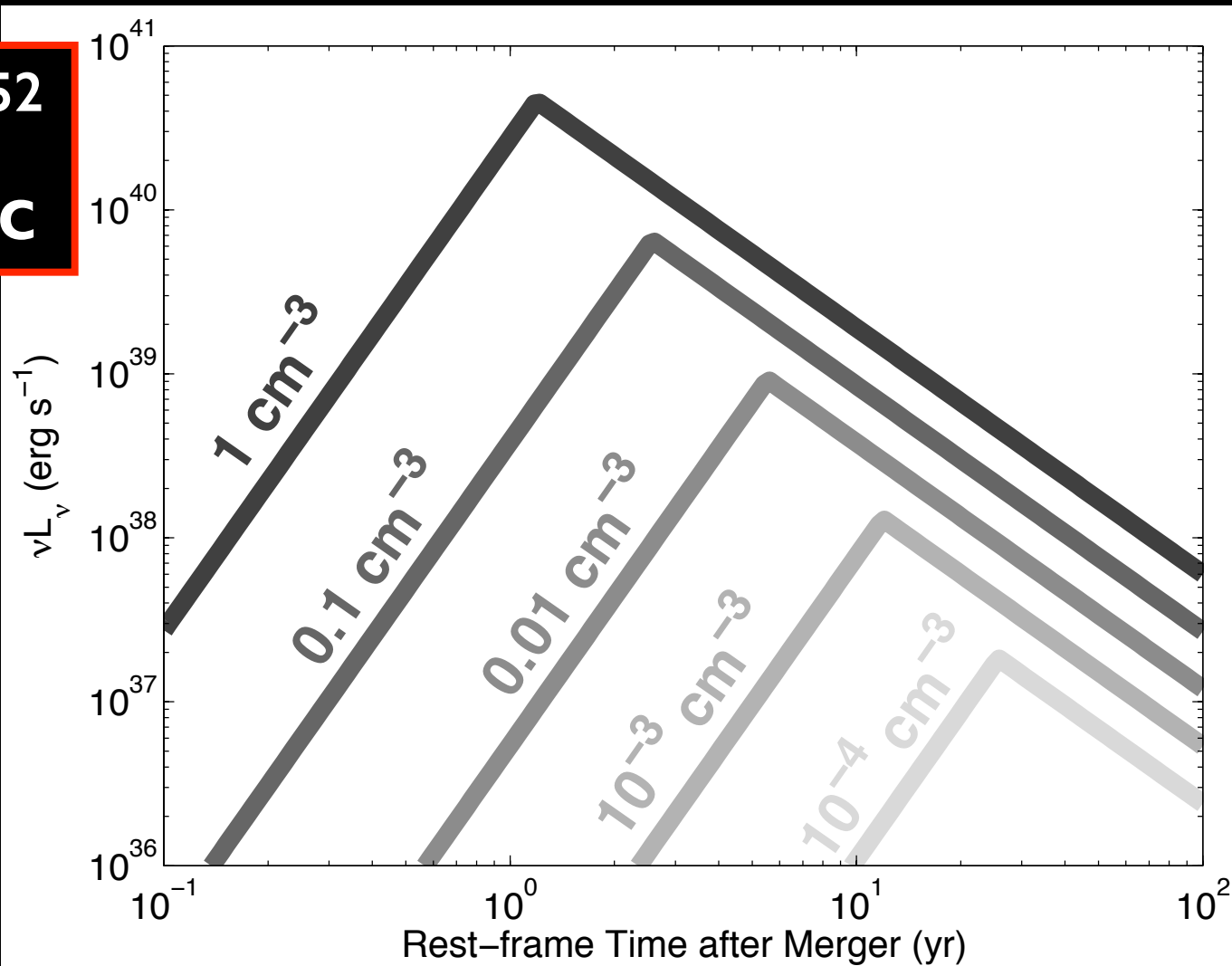
Model light curves for varying densities

$E \sim 10^{52}$
 $v = 0.8c$



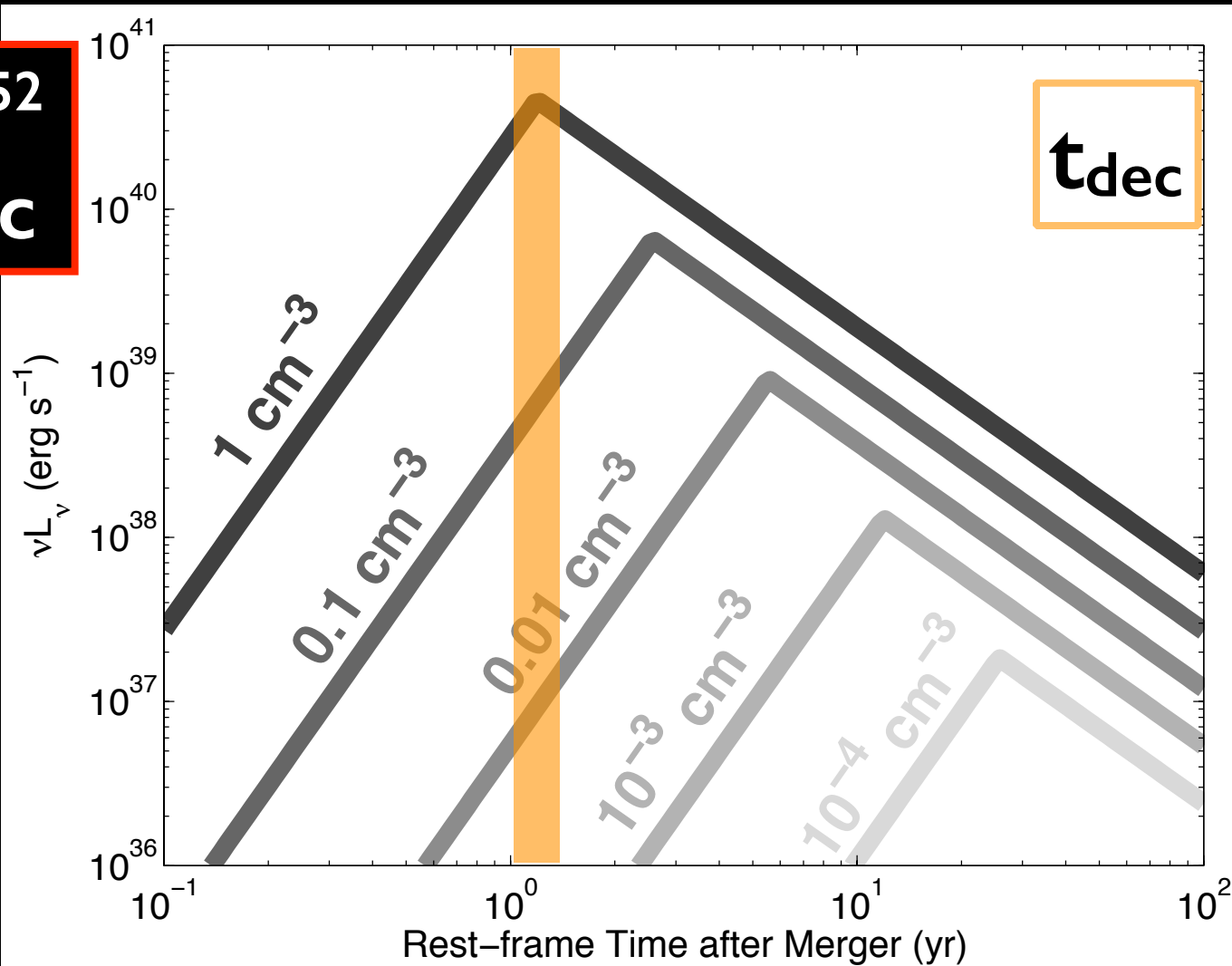
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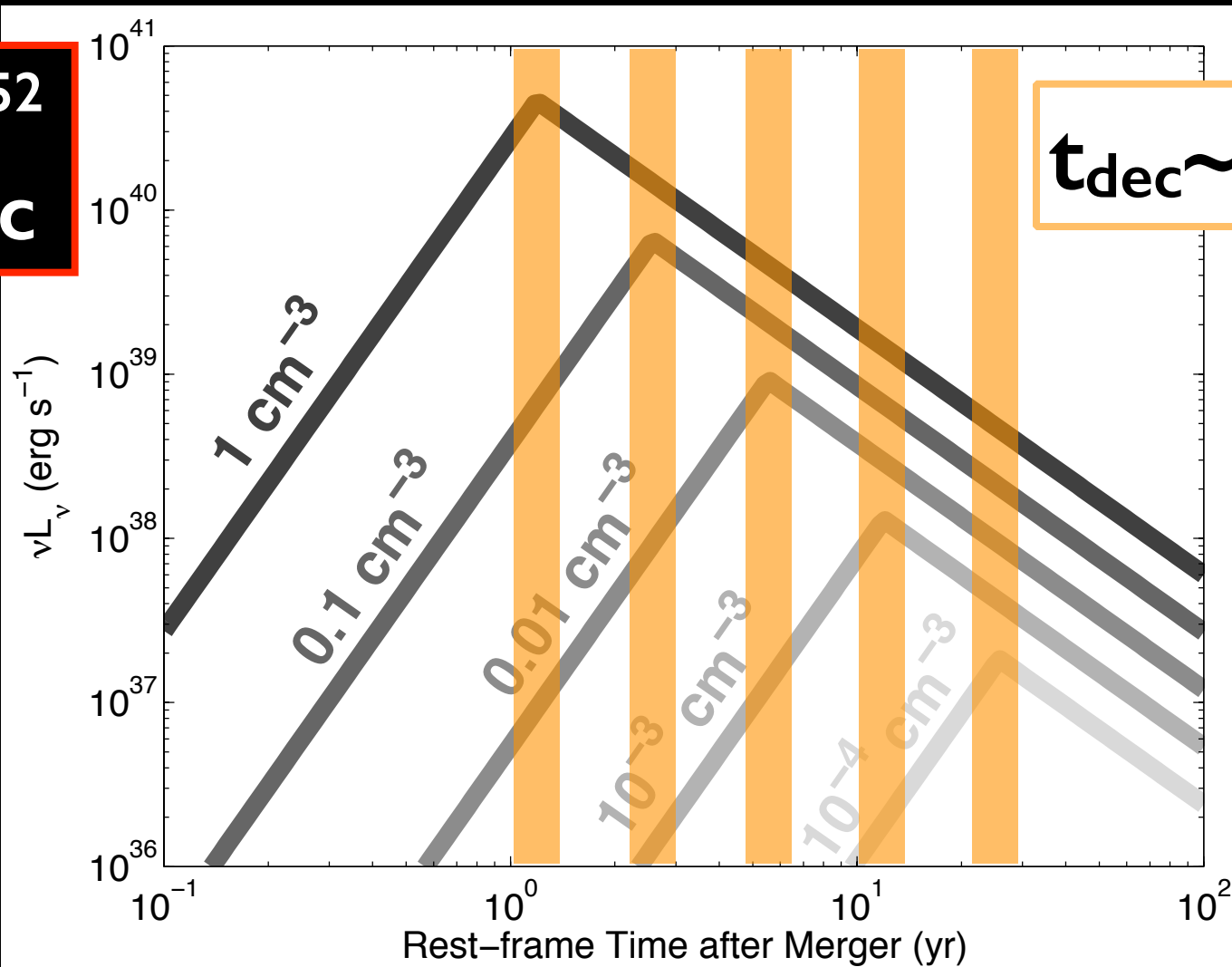
Model light curves: Density is a key parameter

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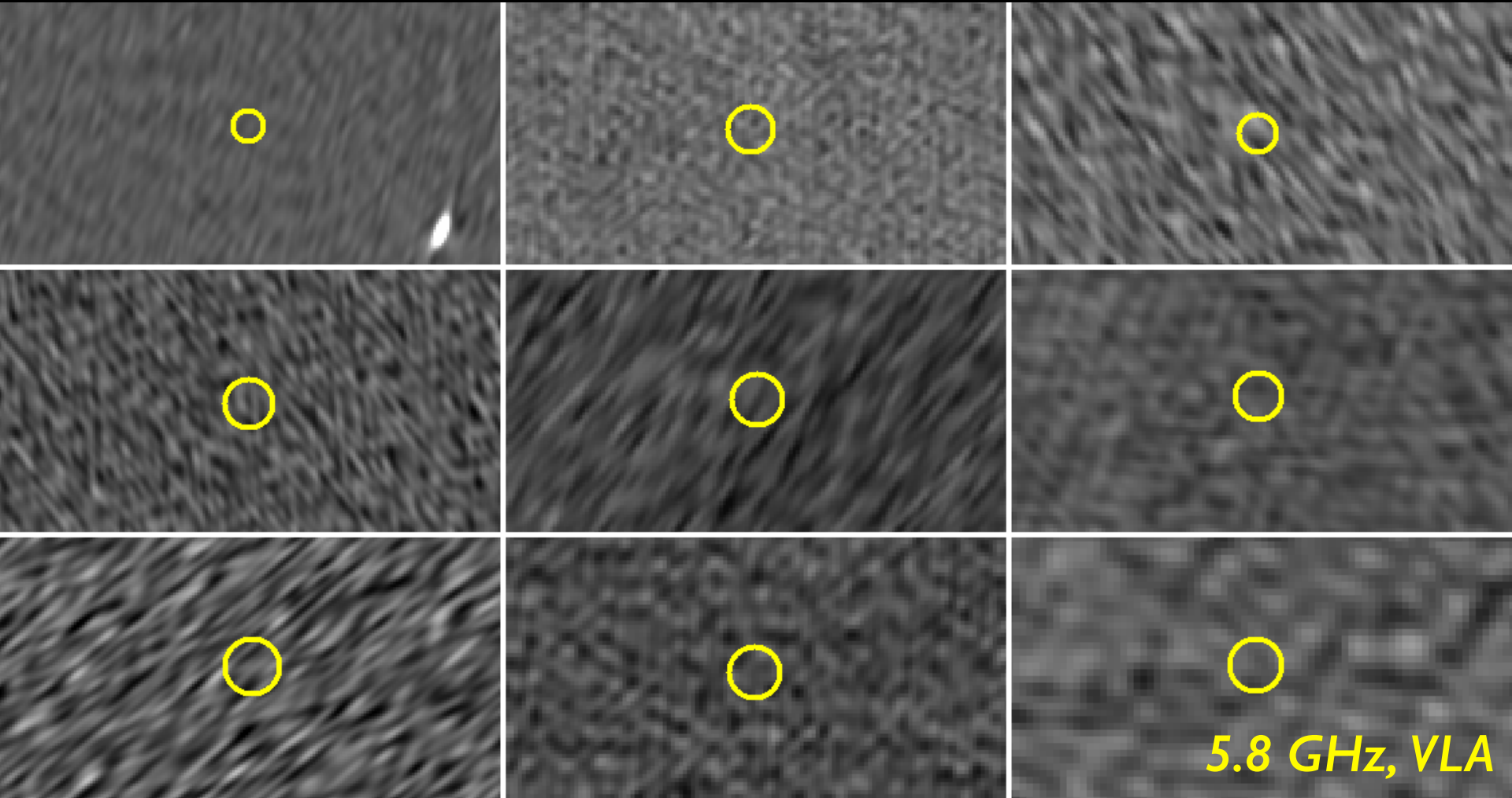
$t_{\text{dec}} \sim \text{years}$

Radio observations as a test of the magnetar model

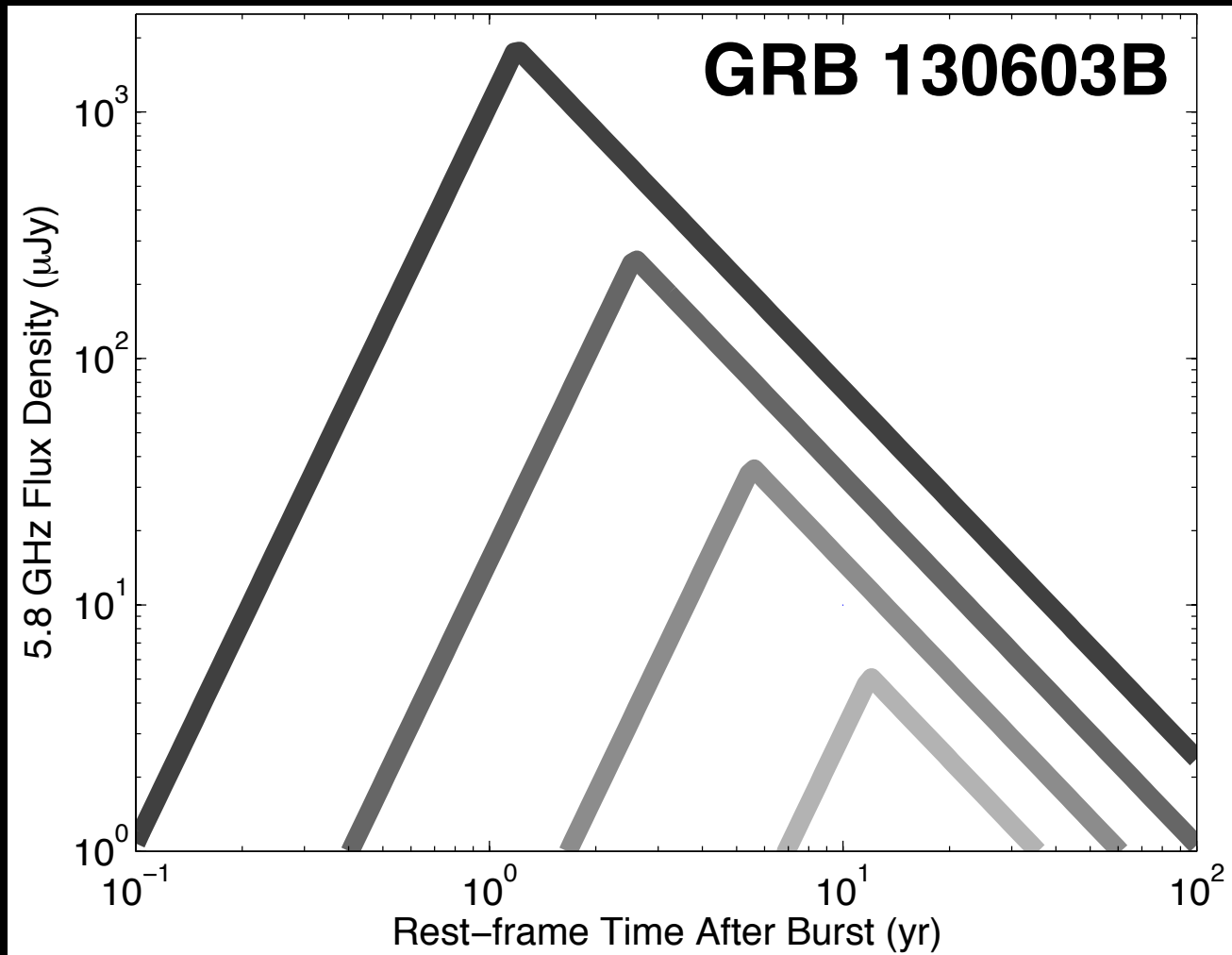
9 events with previous “signature” of a magnetar

Radio observations as a test of the magnetar model

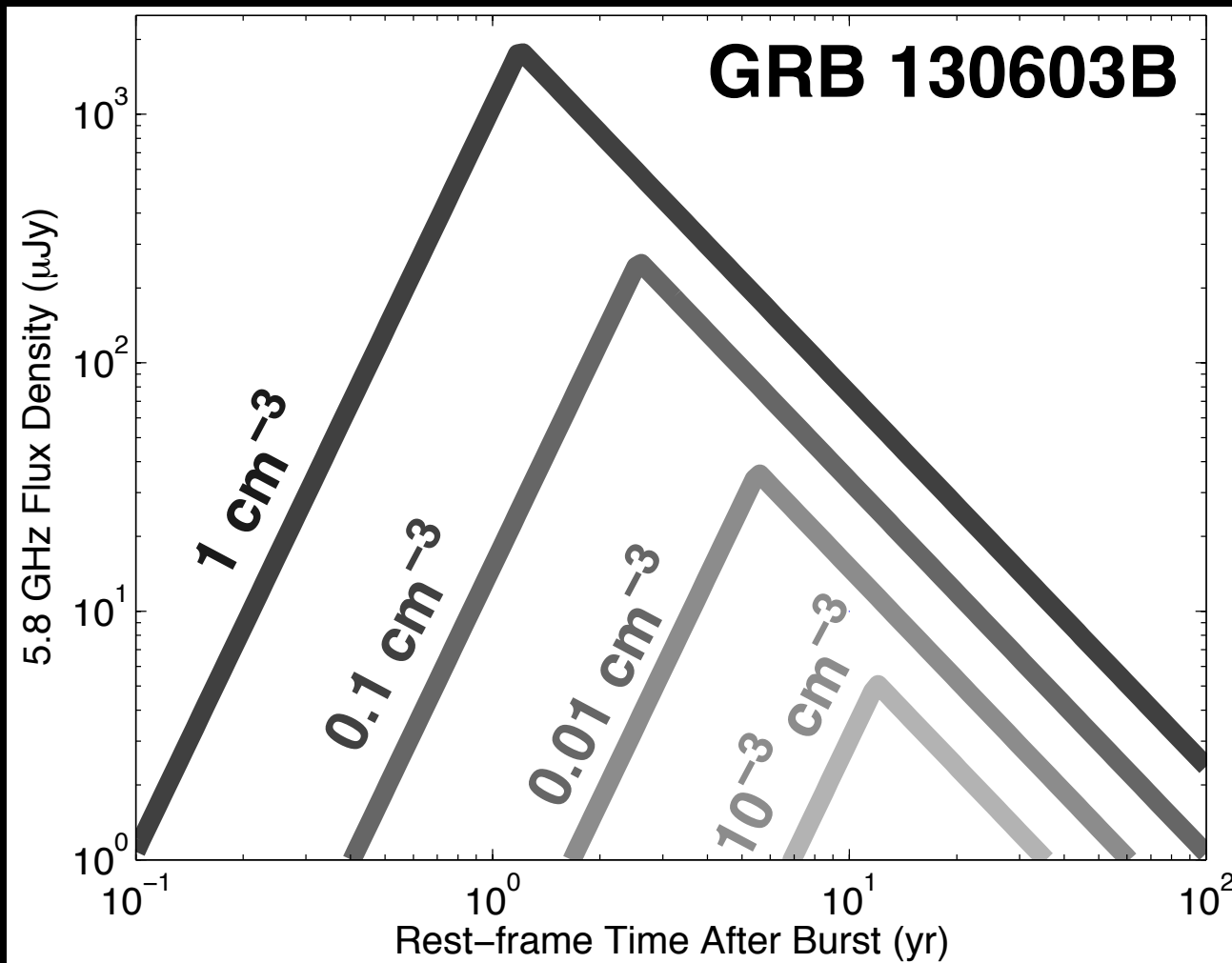
9 events with previous “signature” of a magnetar



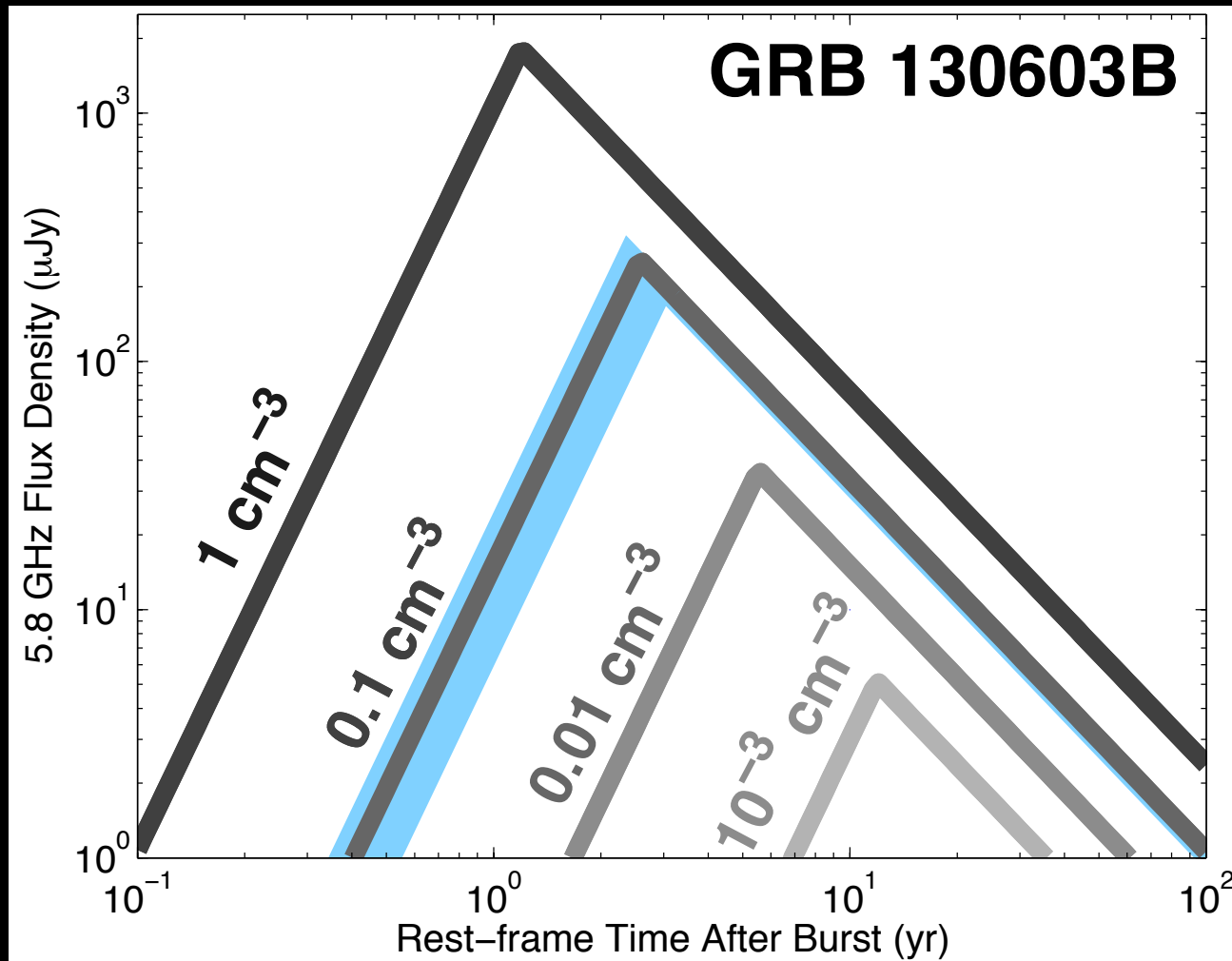
What constraints can the upper limits place on the magnetar model?



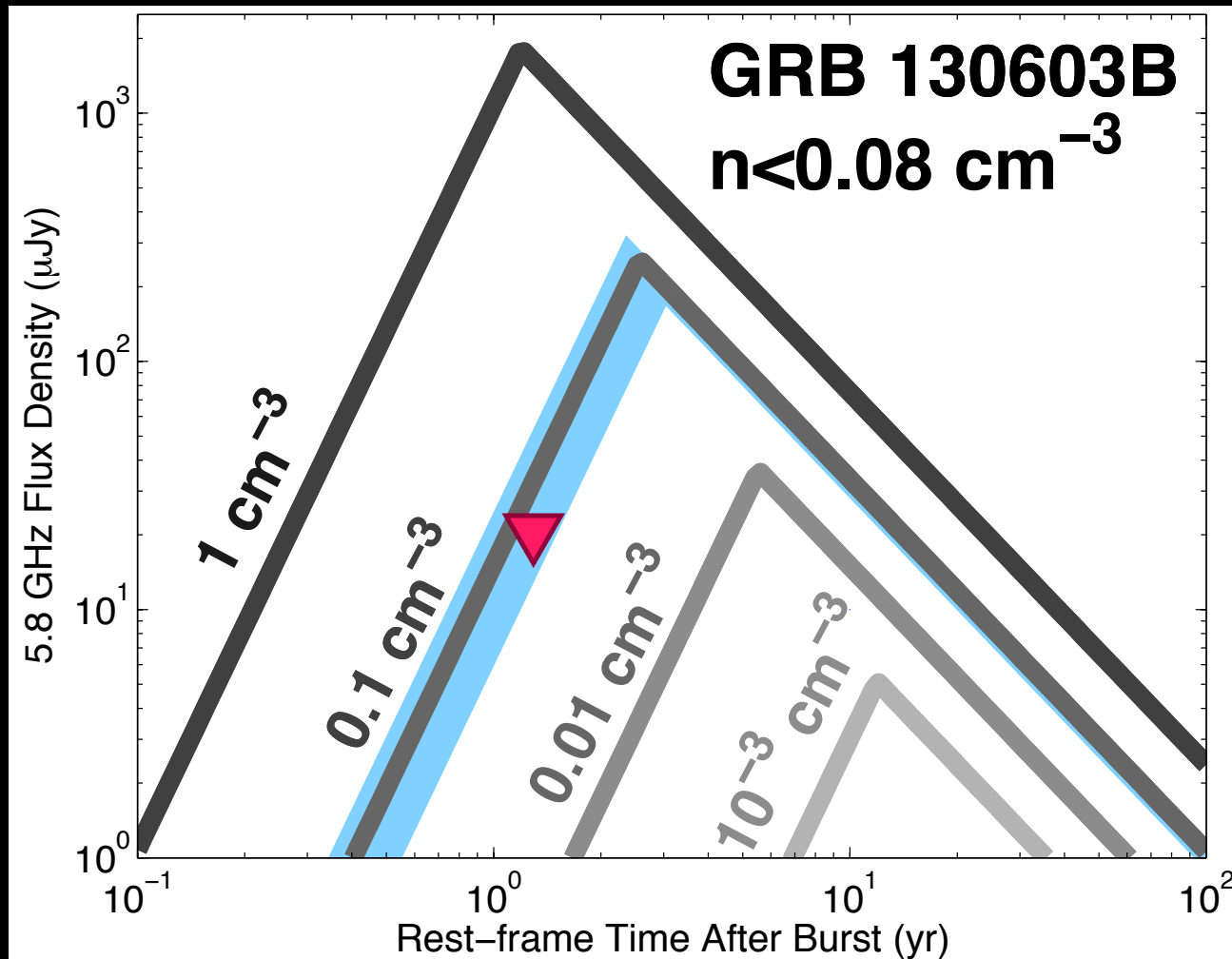
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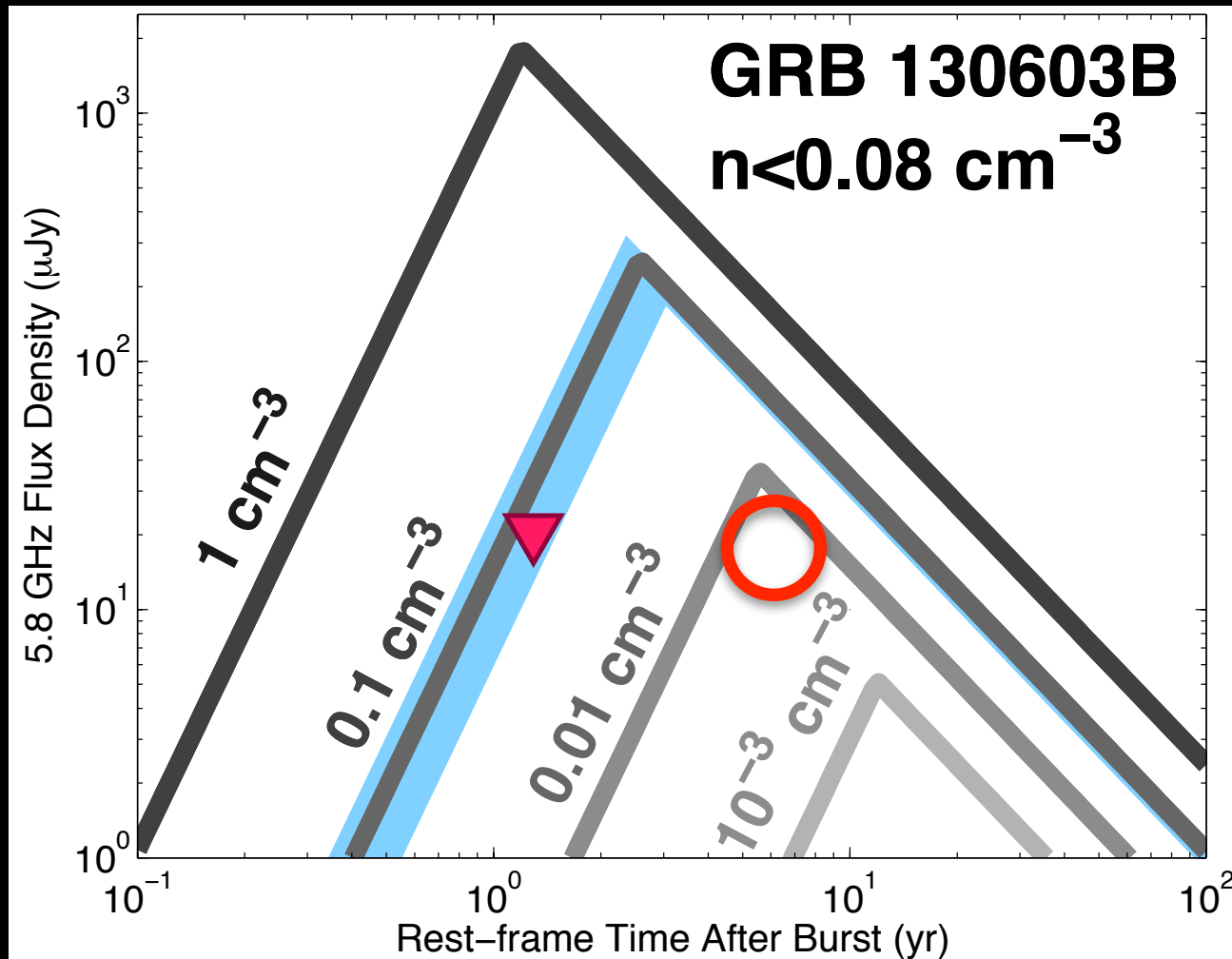
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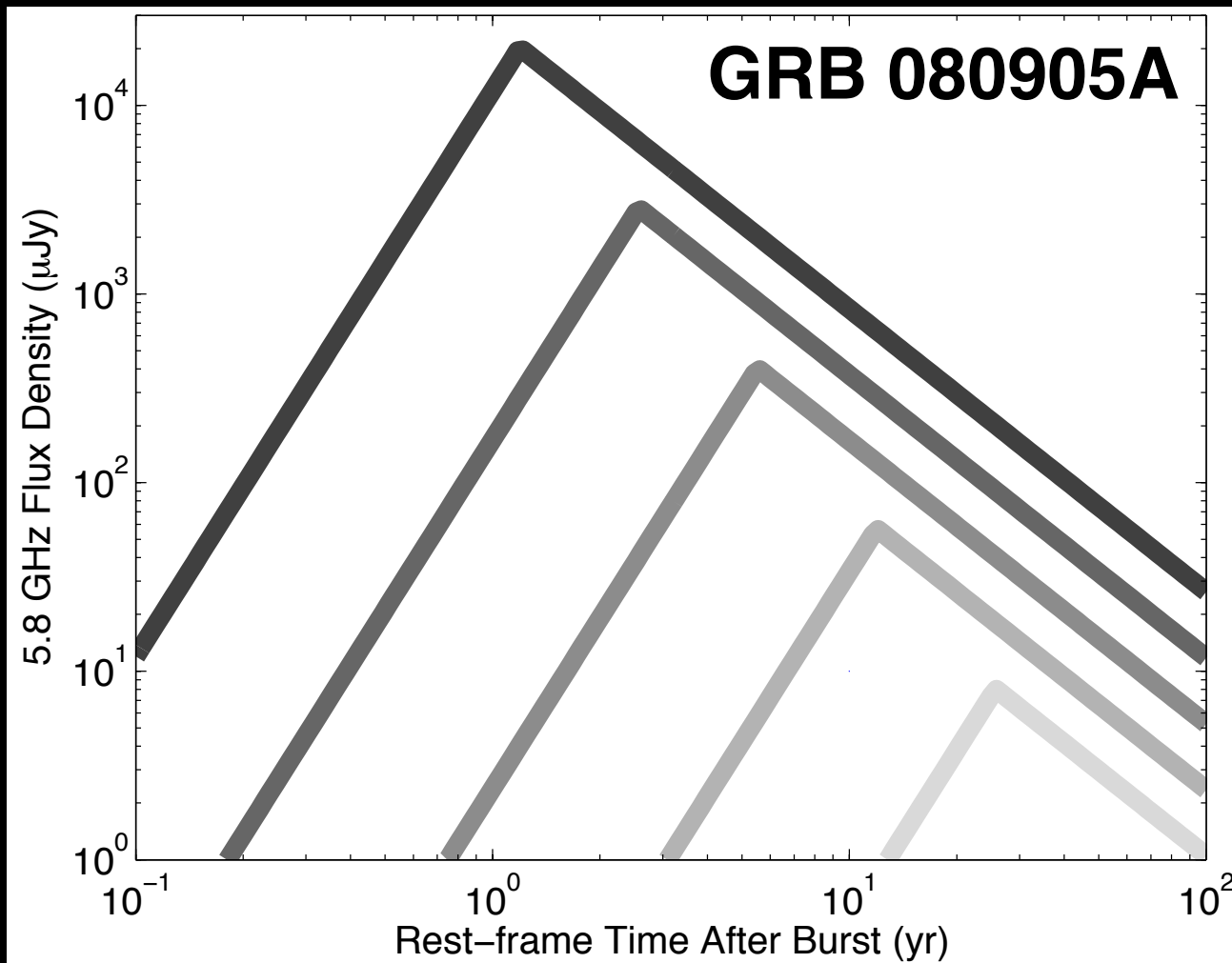
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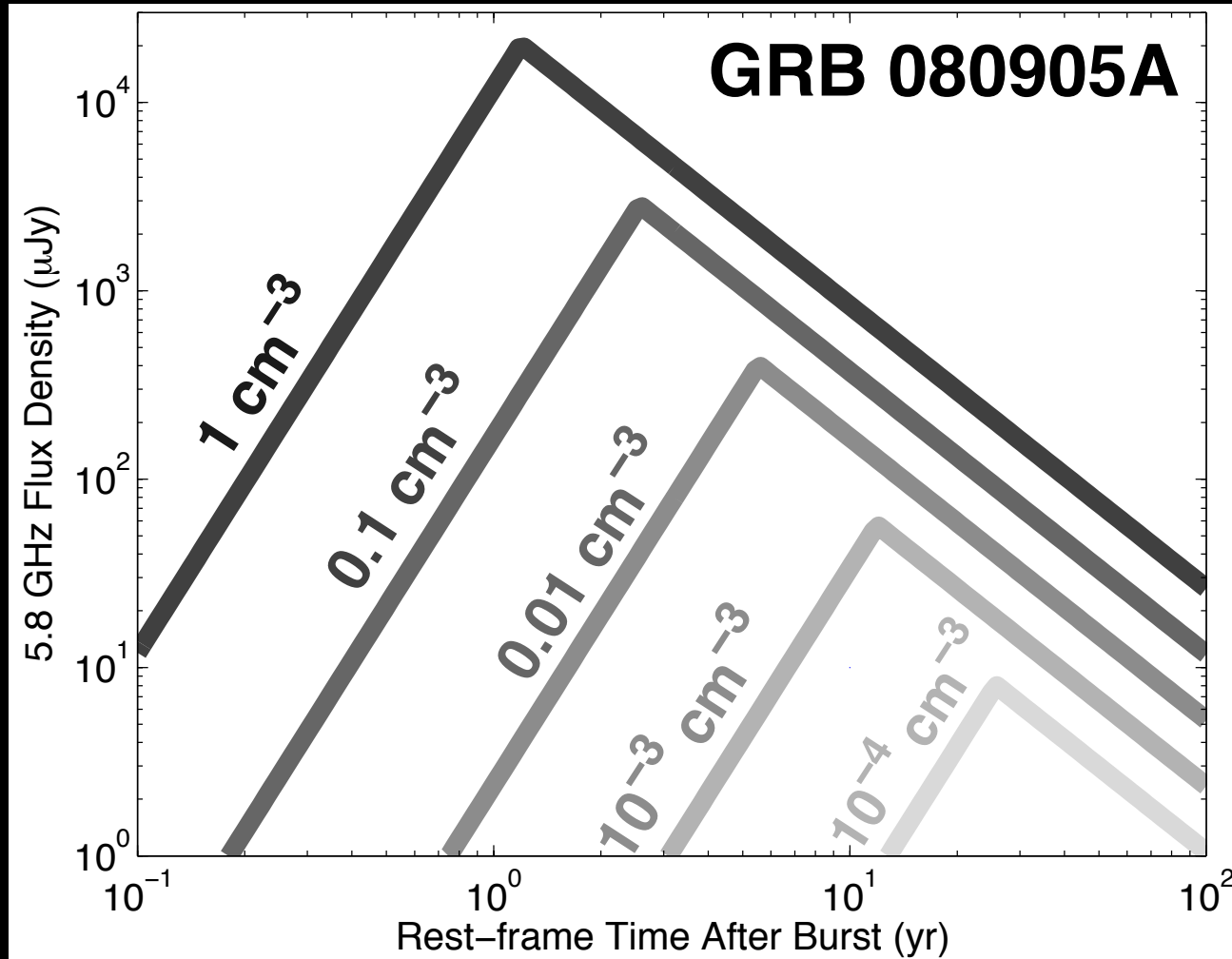
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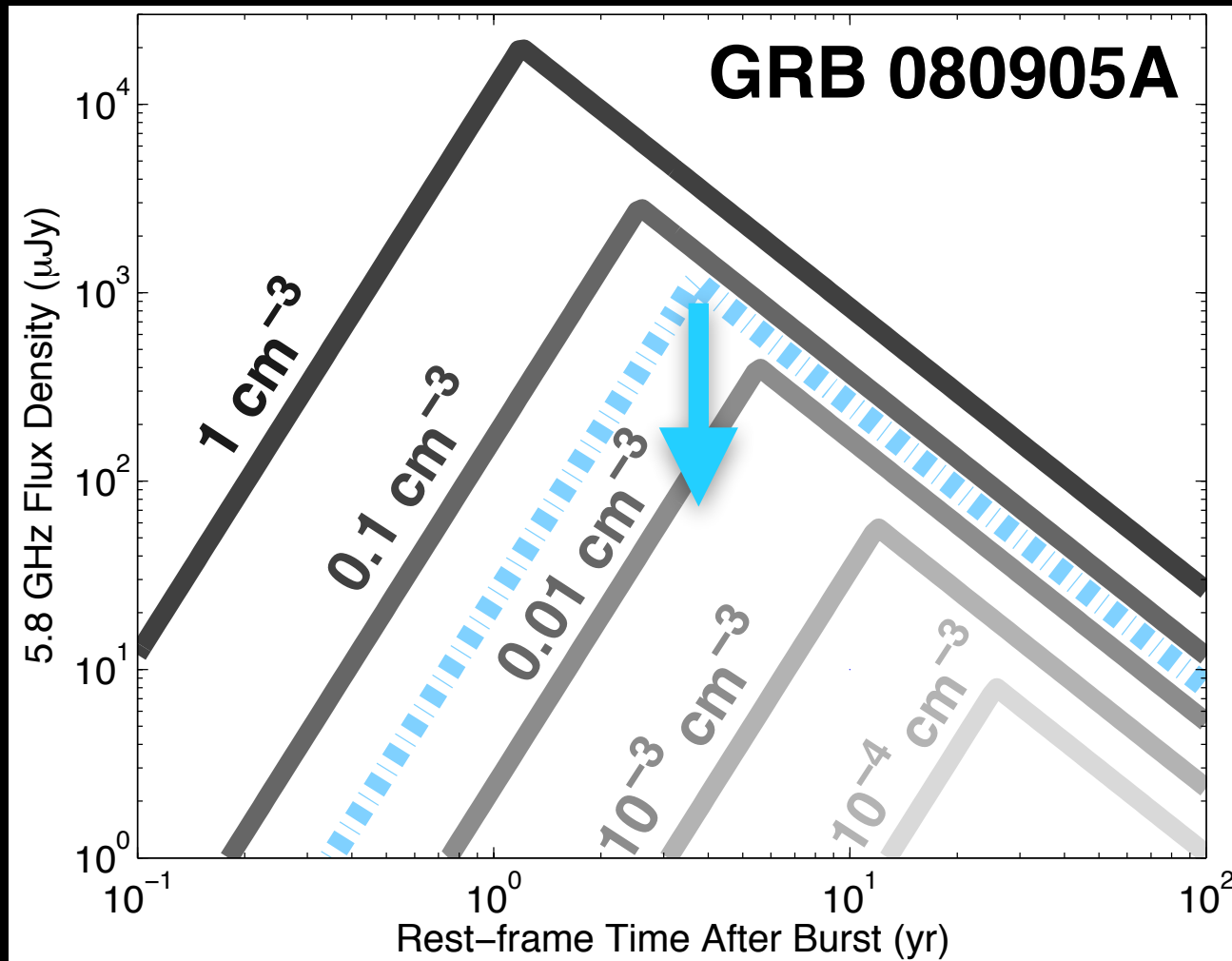
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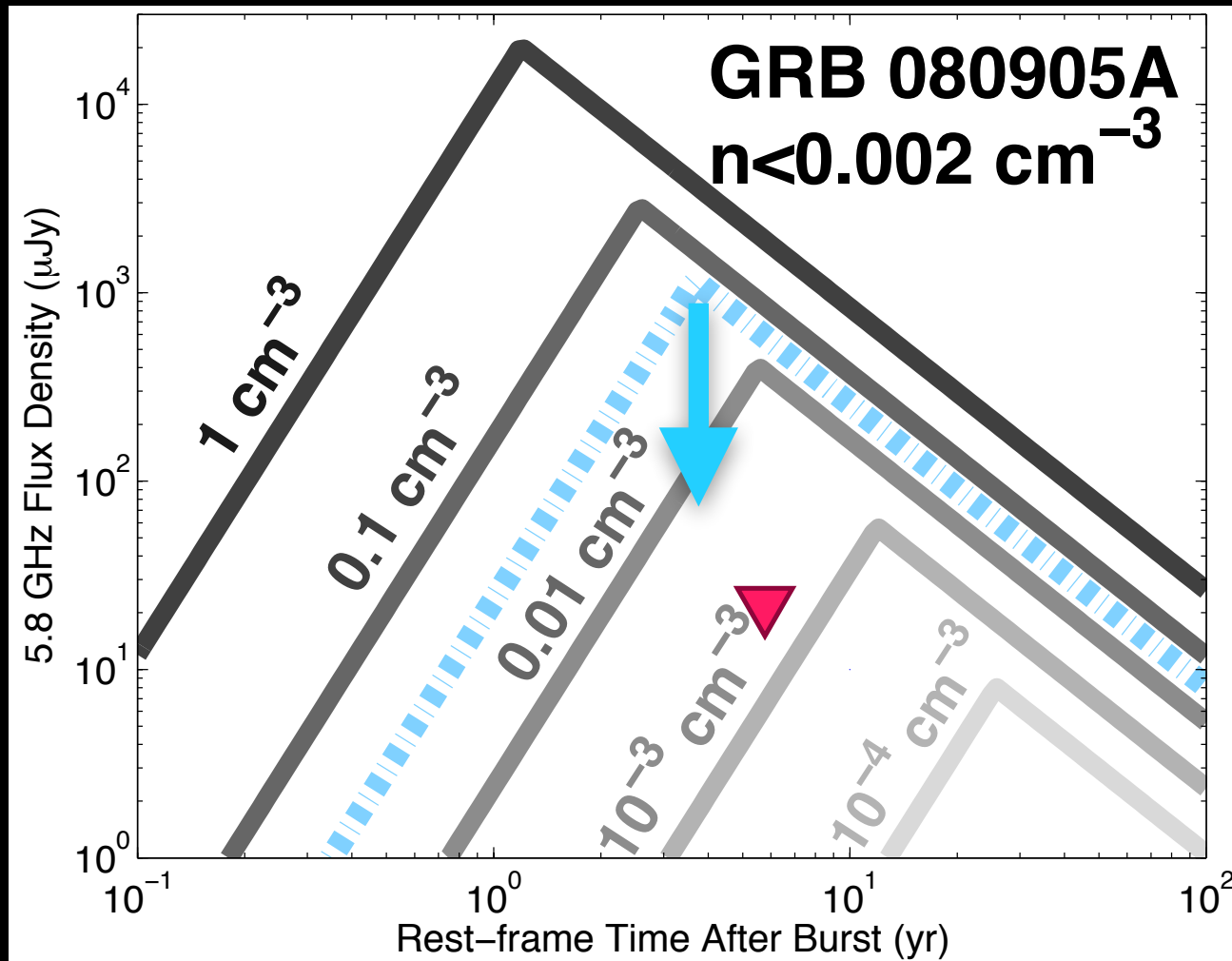
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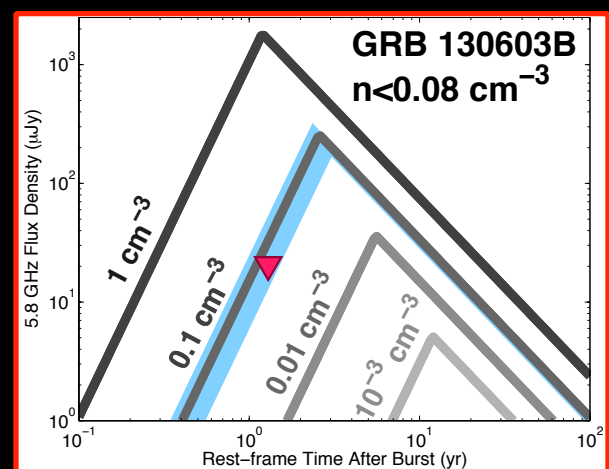
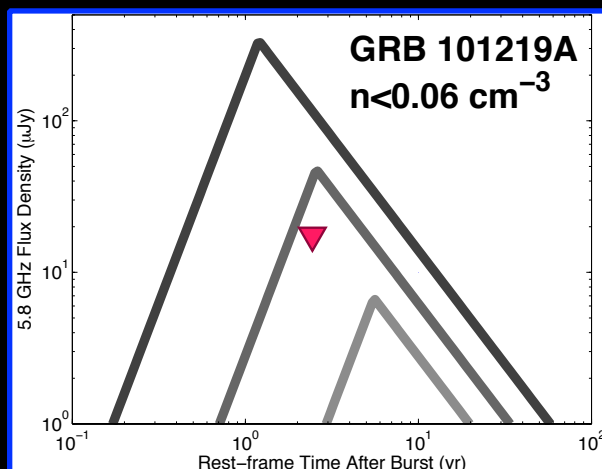
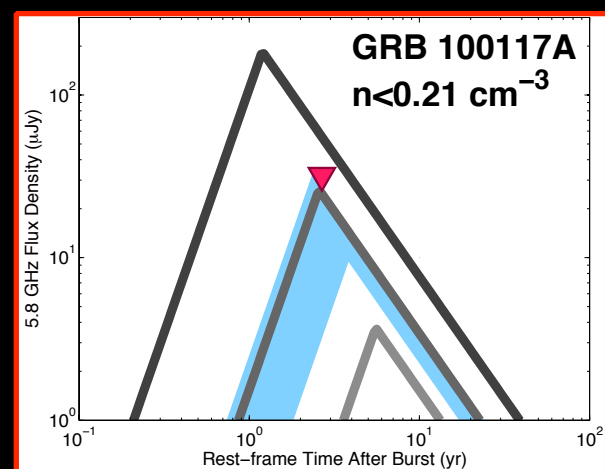
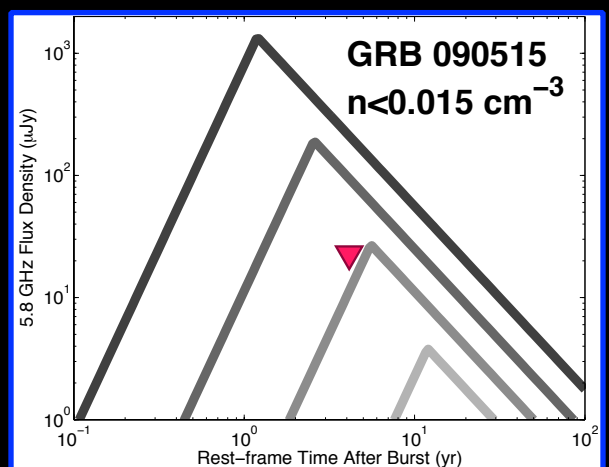
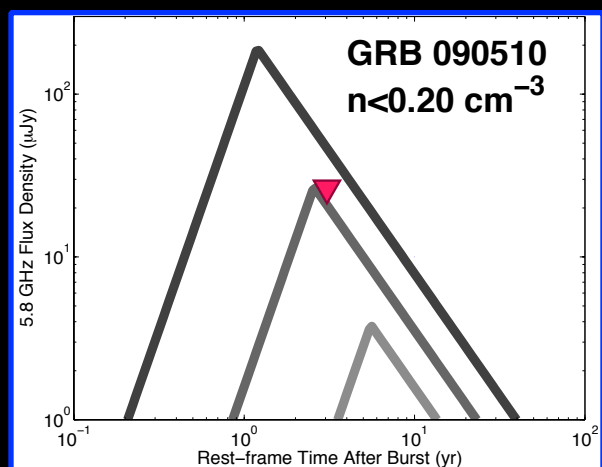
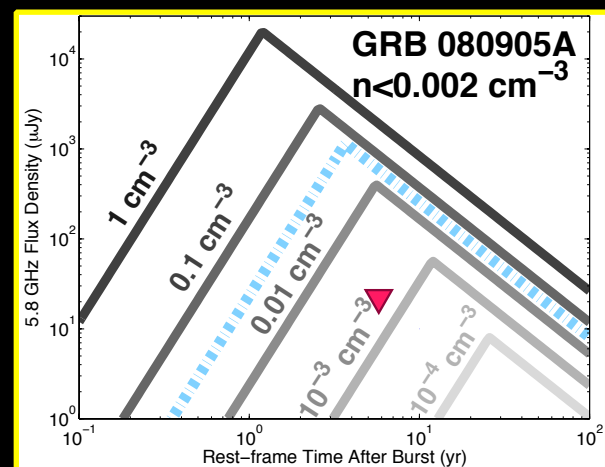
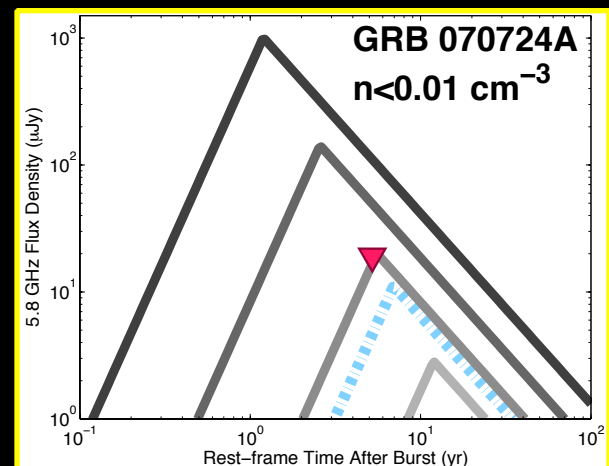
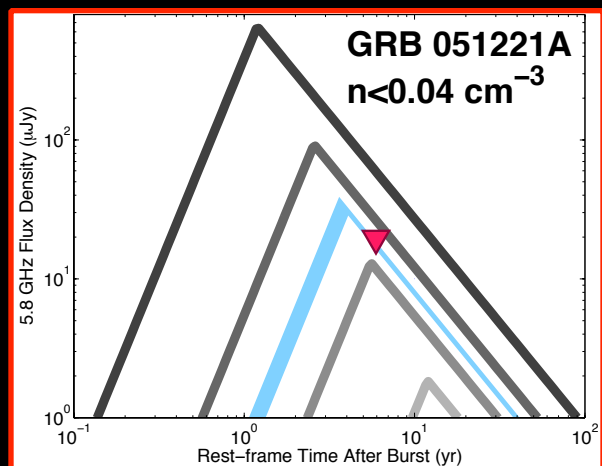
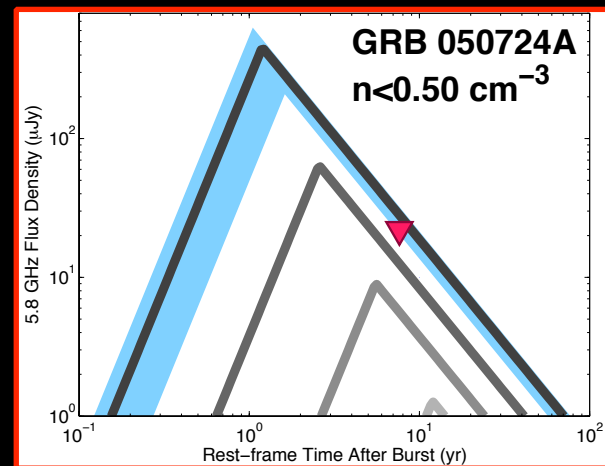


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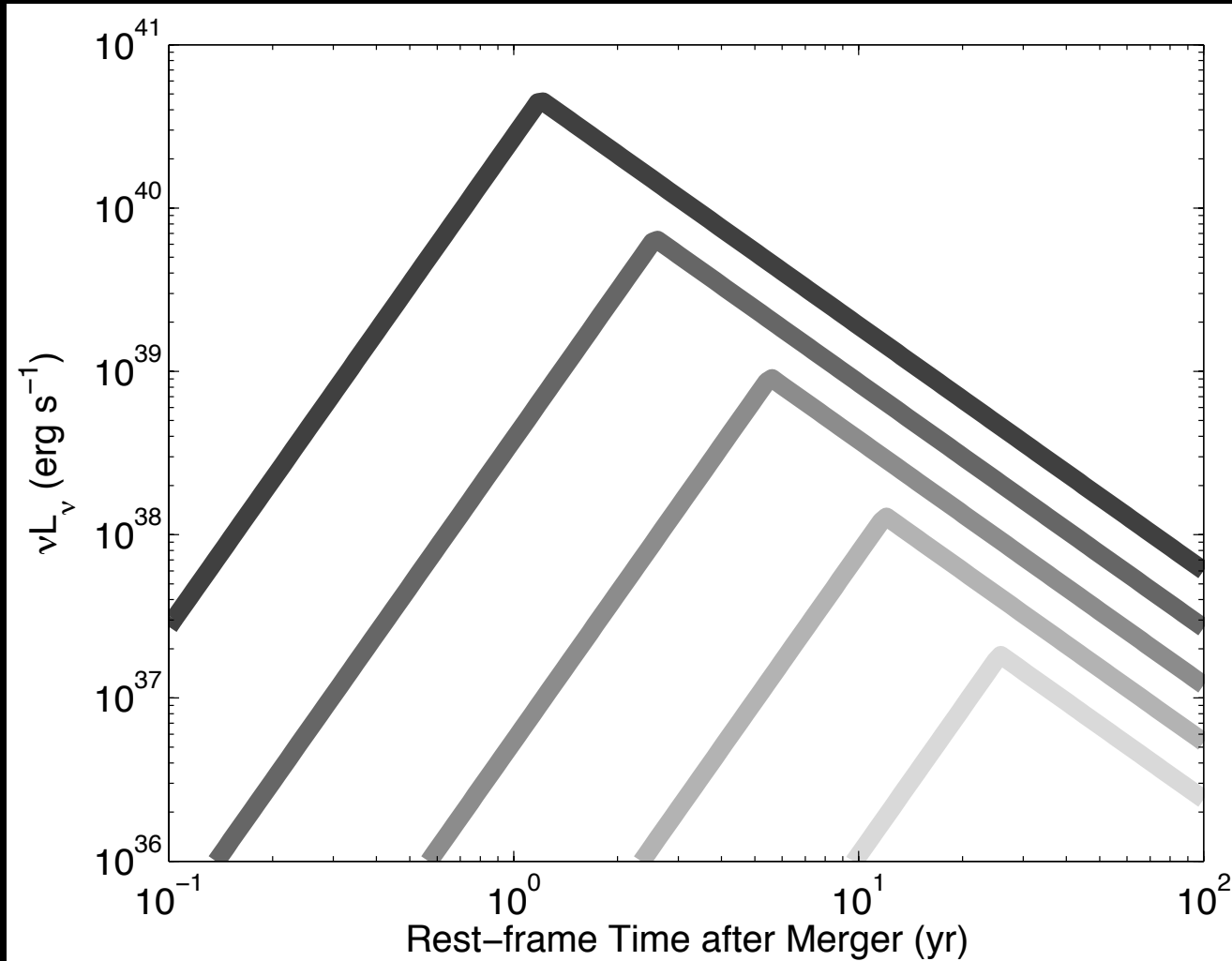


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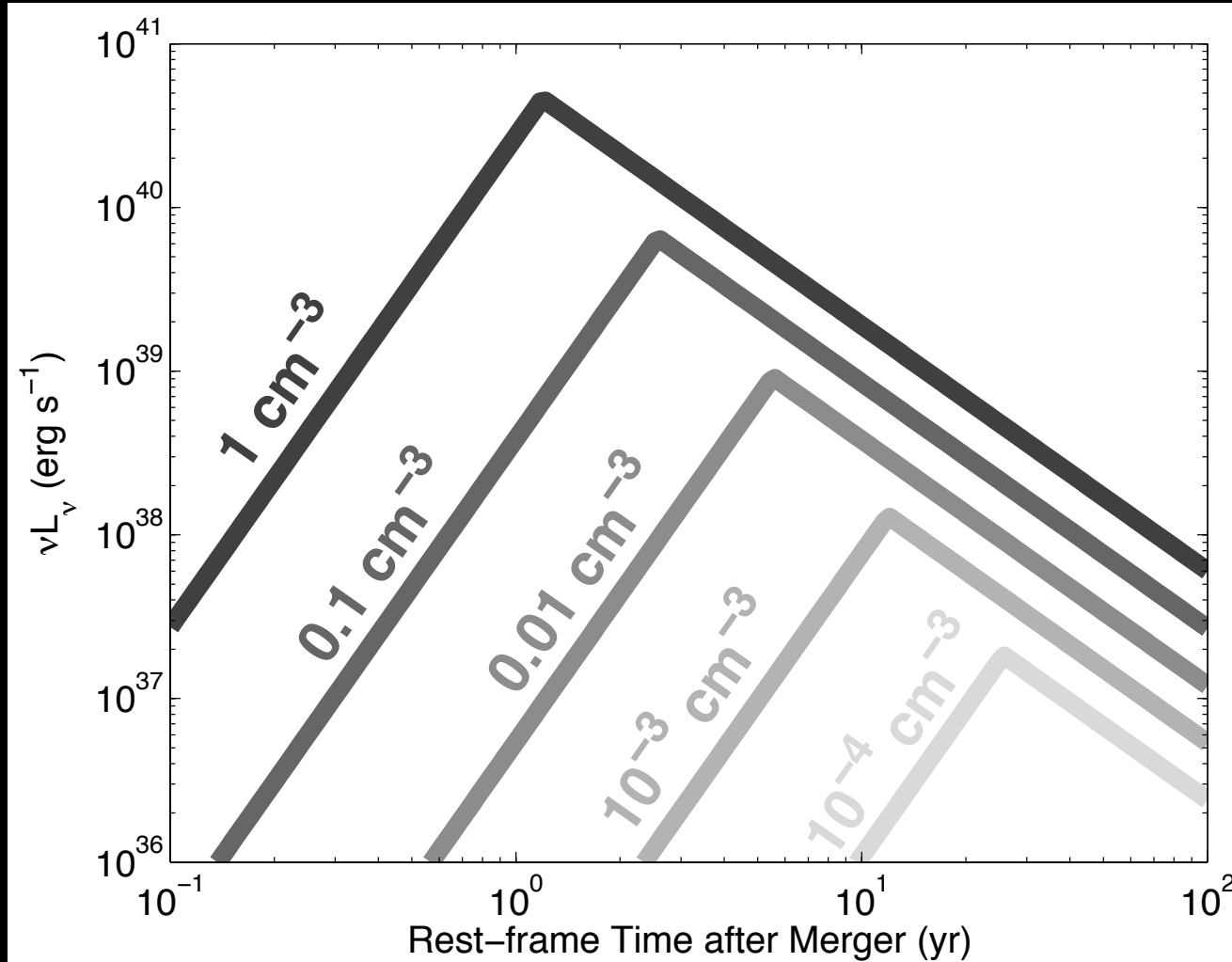




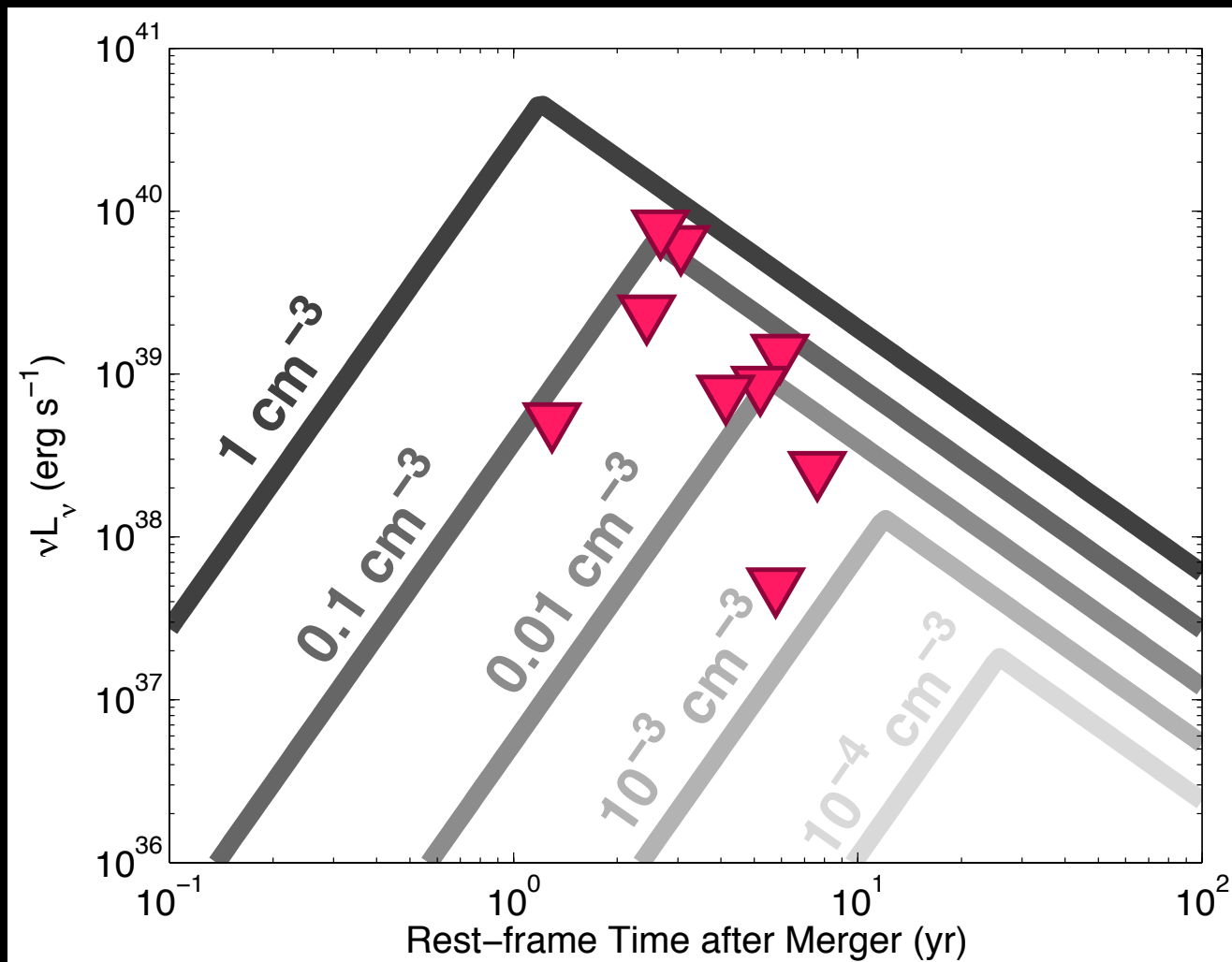
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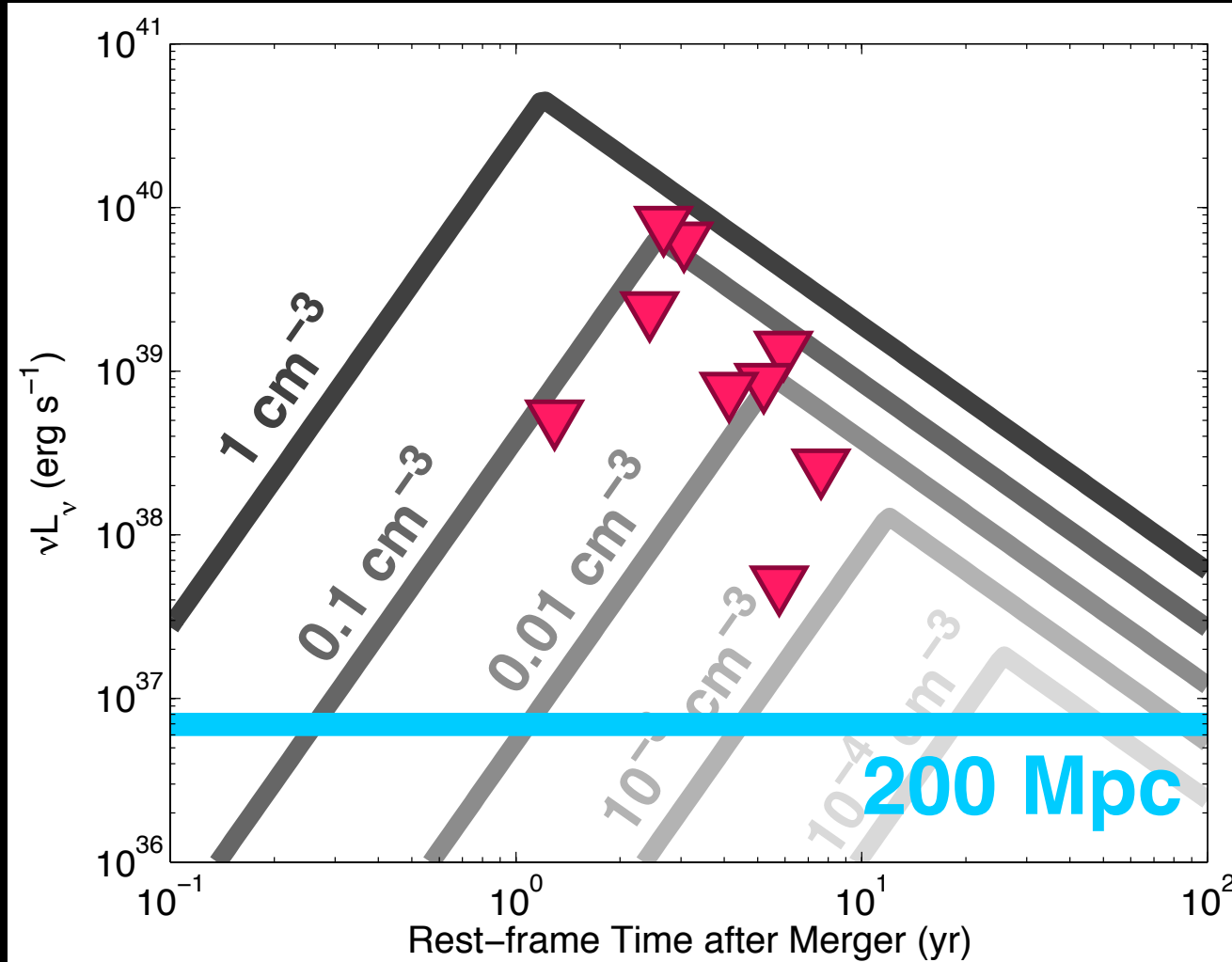
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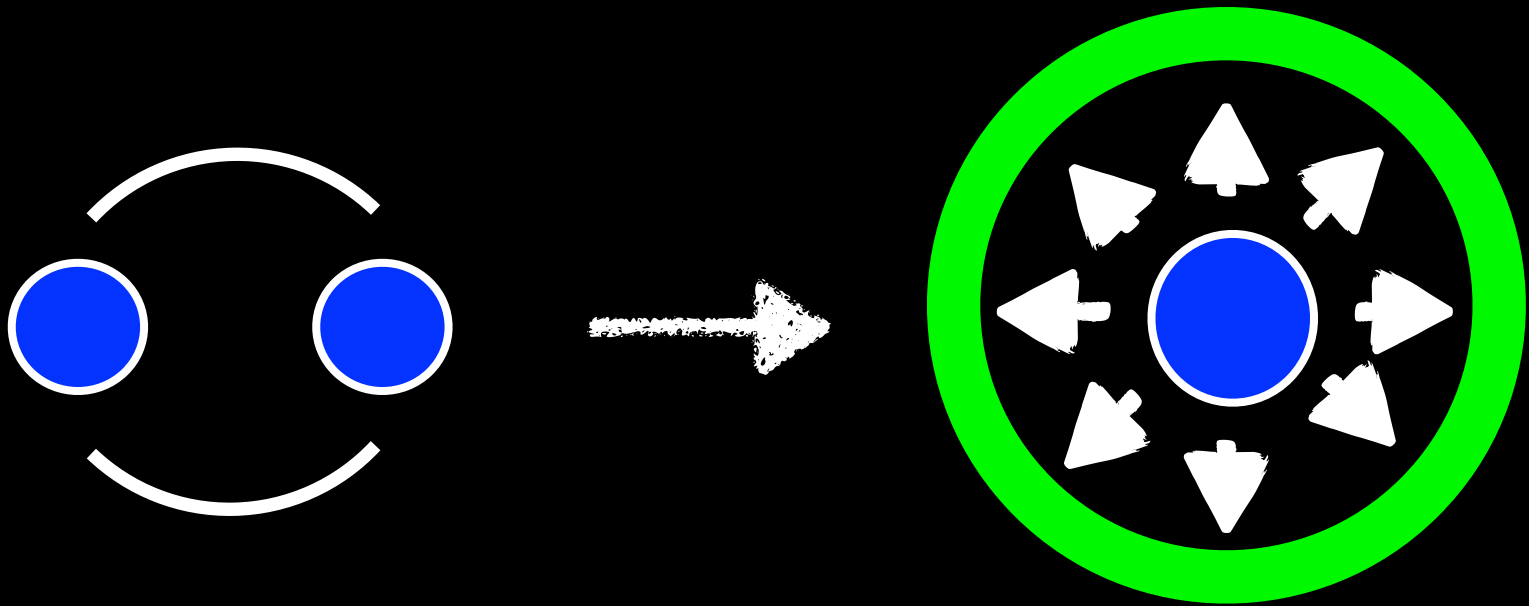
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aLIGO

200 Mpc

Summary & Future Directions



- + *Ruled out long-lived magnetars for densities greater than $0.01-0.1 \text{ cm}^{-3}$*
- + *Explore additional parameters (energy, velocity)*
- + *Consider future observations*