The Nustar View of Gamma Ray Bursts

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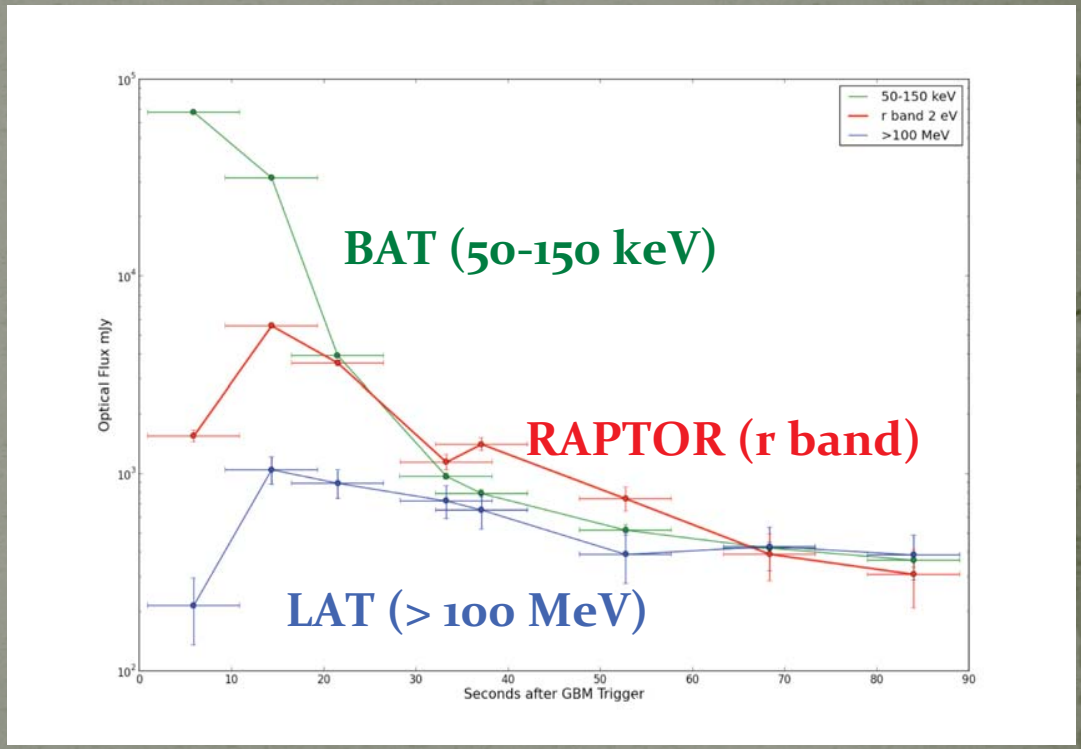
GRB 130427A

- First observation of hard X-ray emission (>10 keV)
- Well detected from 3-80 keV in observations at ~1 day and ~5 days
- Remarkable Features
  - *NuSTAR* data confirm and constrain single component from optical to GeV at timescale of days
  - Challenges standard synchrotron origin of afterglow

- Kouveliotou et al., ApJ Letters, 2013

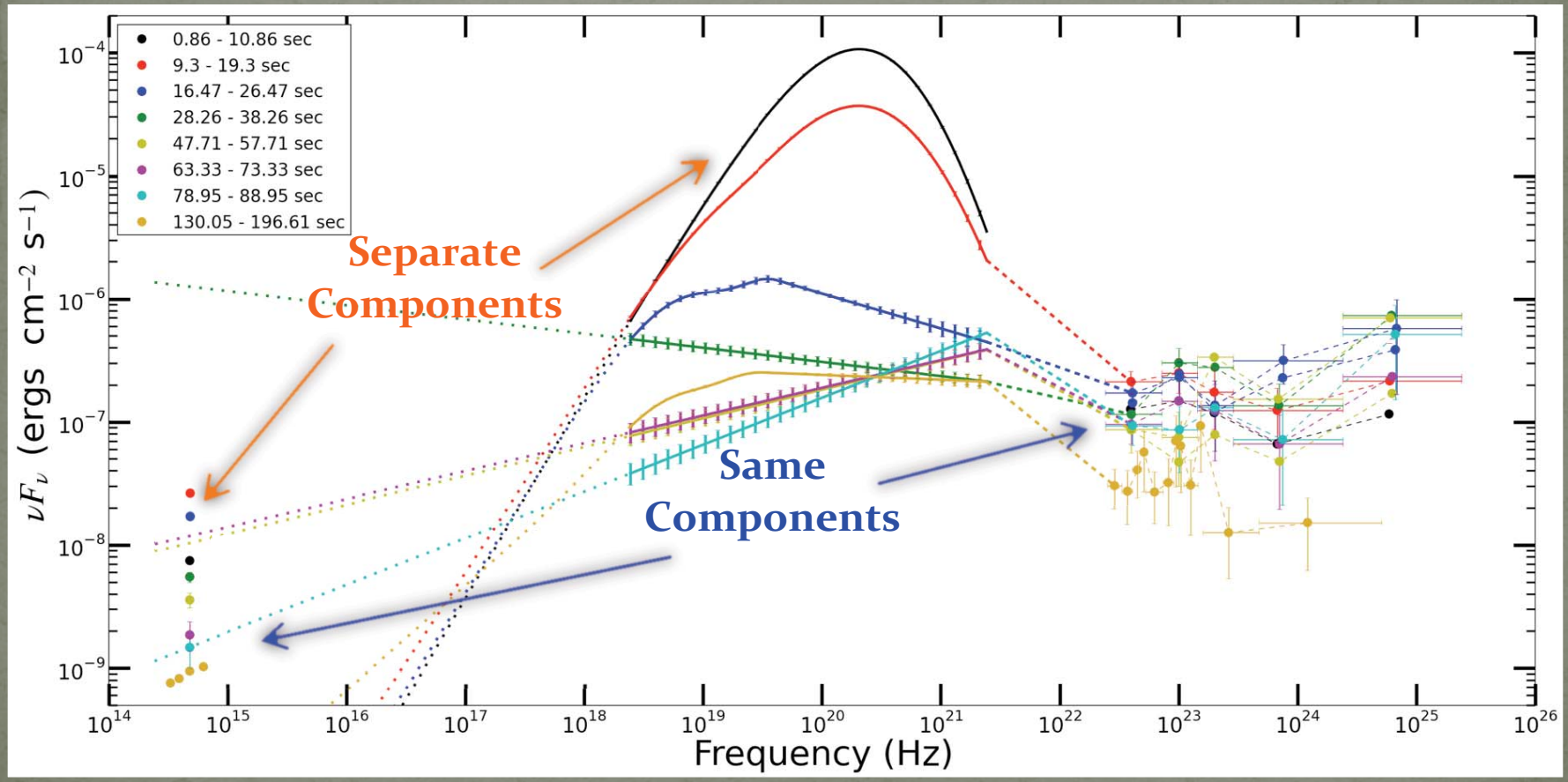
Prompt Optical Flash

- prompt optical peak at 7th magnitude in r band between 10-20 seconds after the GBM trigger
- Optical emission correlated with >100 MeV not keV emission



Vestrand et al., Science 2013

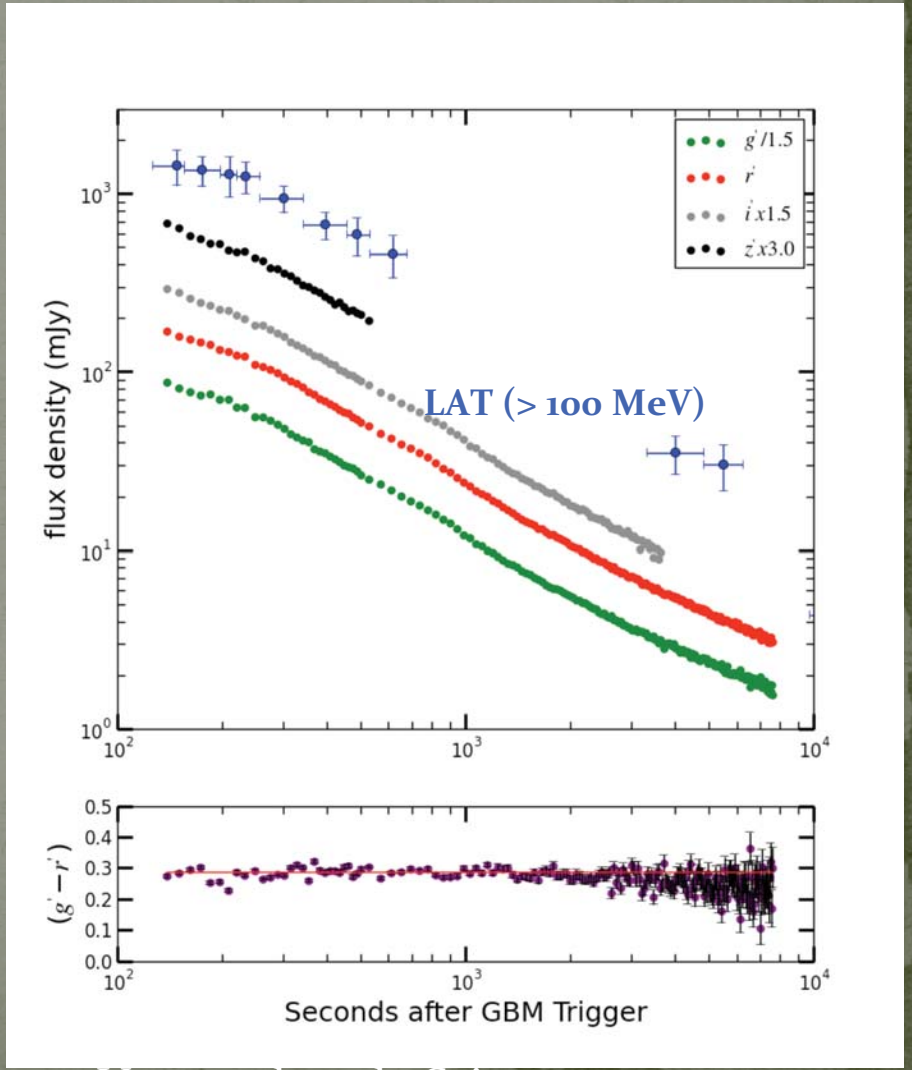
Multiple Components and Spectral Variability



Vestrand et al., Science, 2013

Correlated Early Optical & >100 MeV Afterglow

- Continued monitoring for first ~2 hours
- Break around 300 s similar in optical & LAT

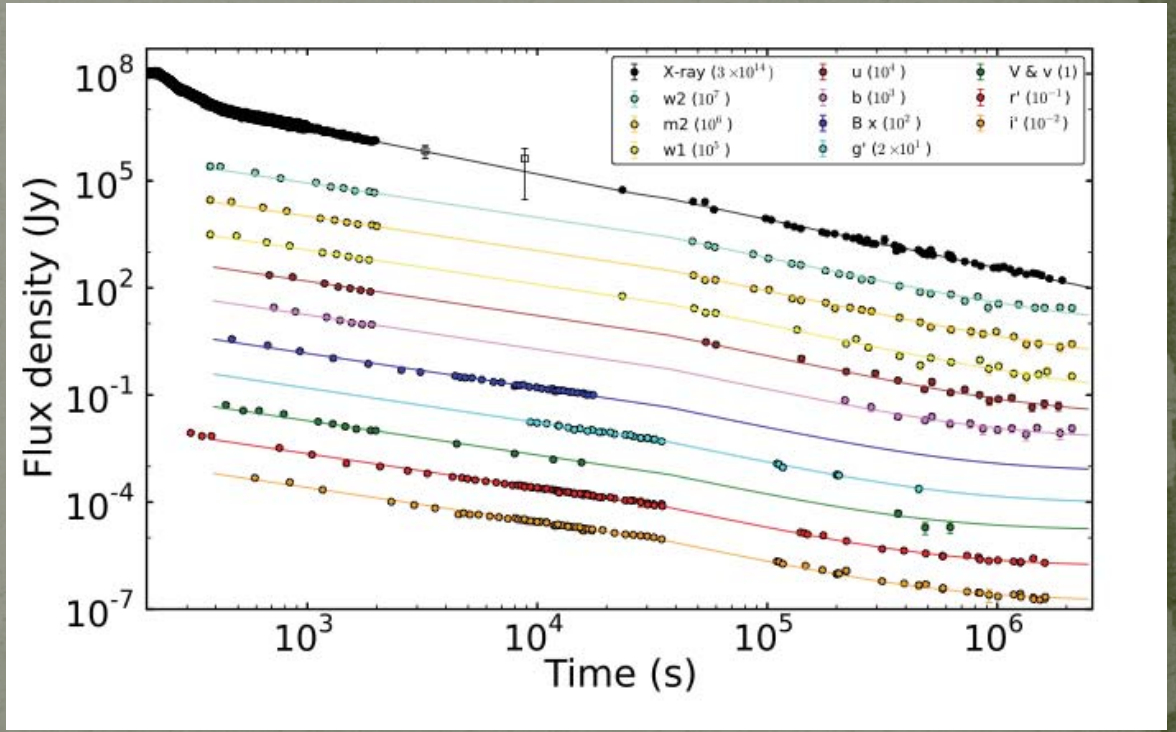


Vestrand et al., Science, 2013

Early Afterglow

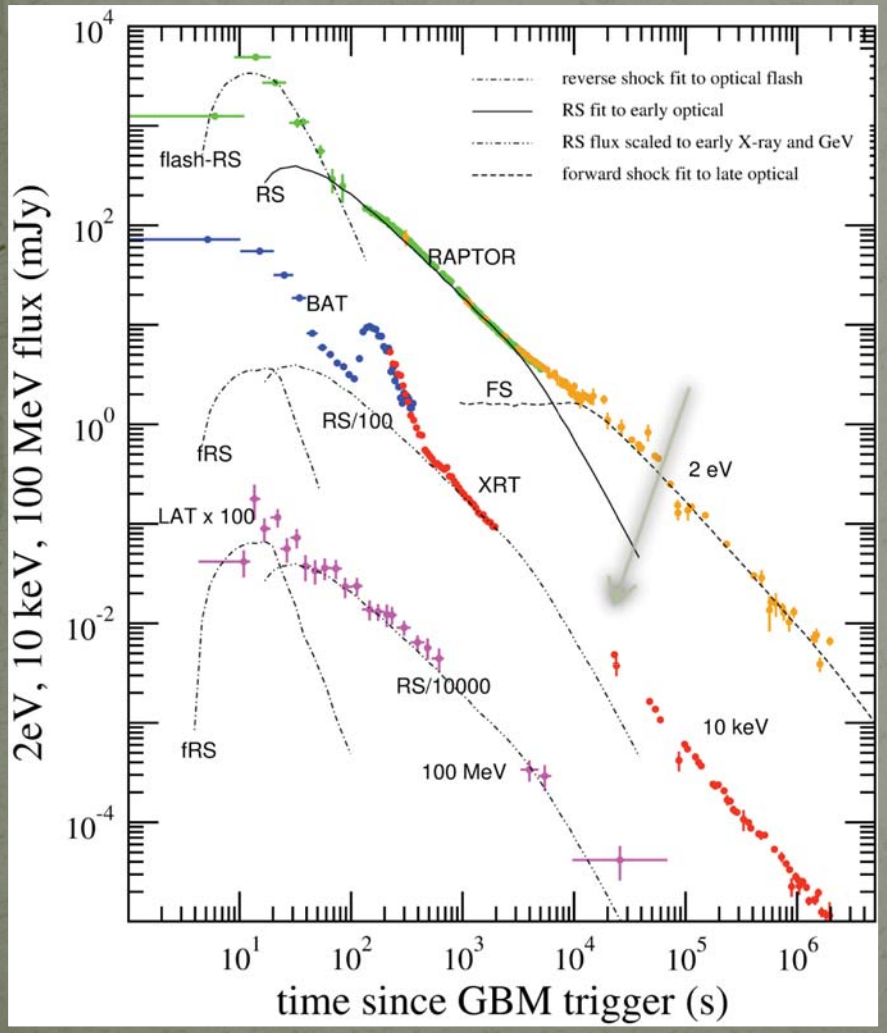
- X-ray initially steeper (α_0=3.32, α_1=1.28) than optical (α_1=0.96)
- Break to same slope (α~1.36) after ~37 ks

Optical + X-ray Afterglow

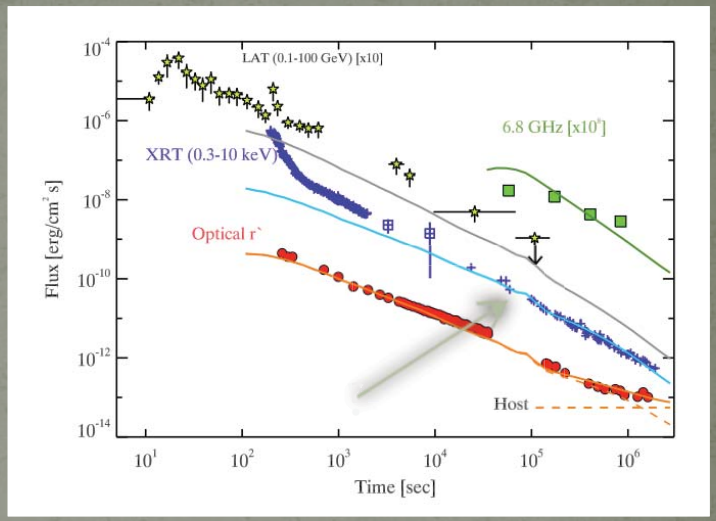


Maselli et al., Science, 2013

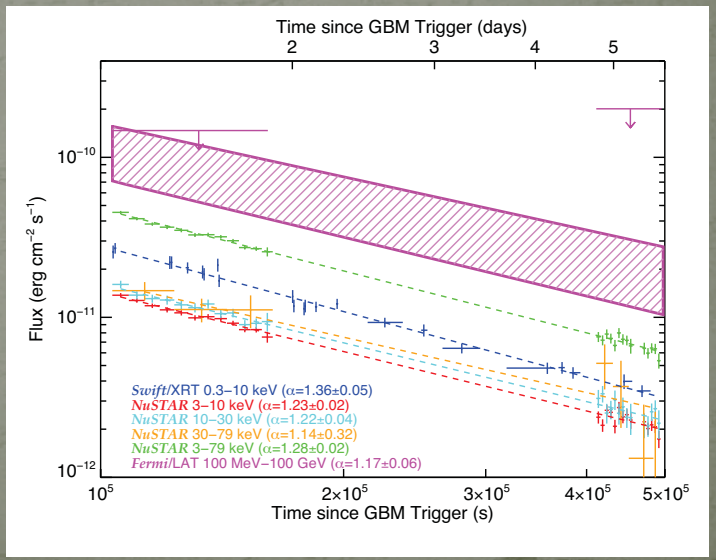
Broadband Data & Models



Vestrand et al., Science, 2013



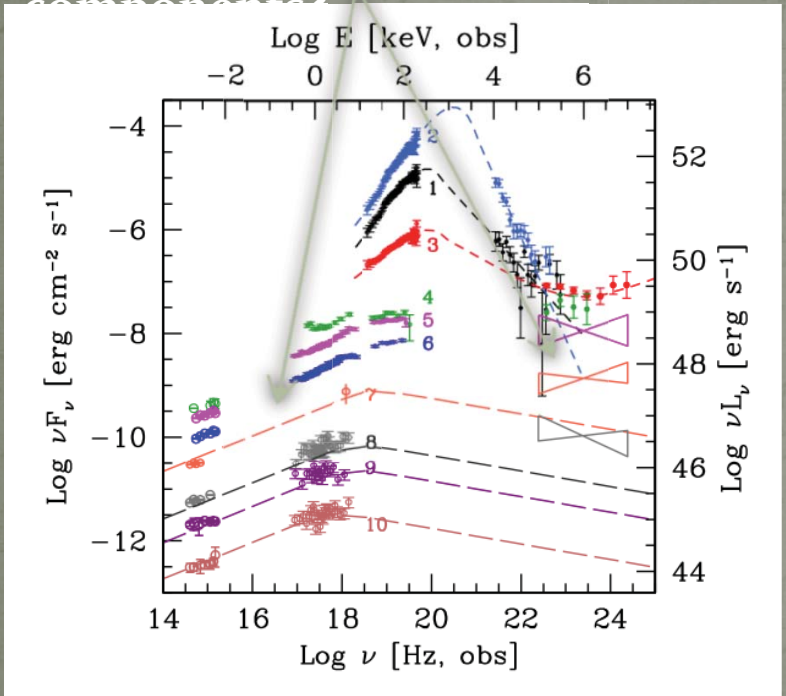
Maselli et al., Science, 2013



Kouveliotou et al., ApJ 2013

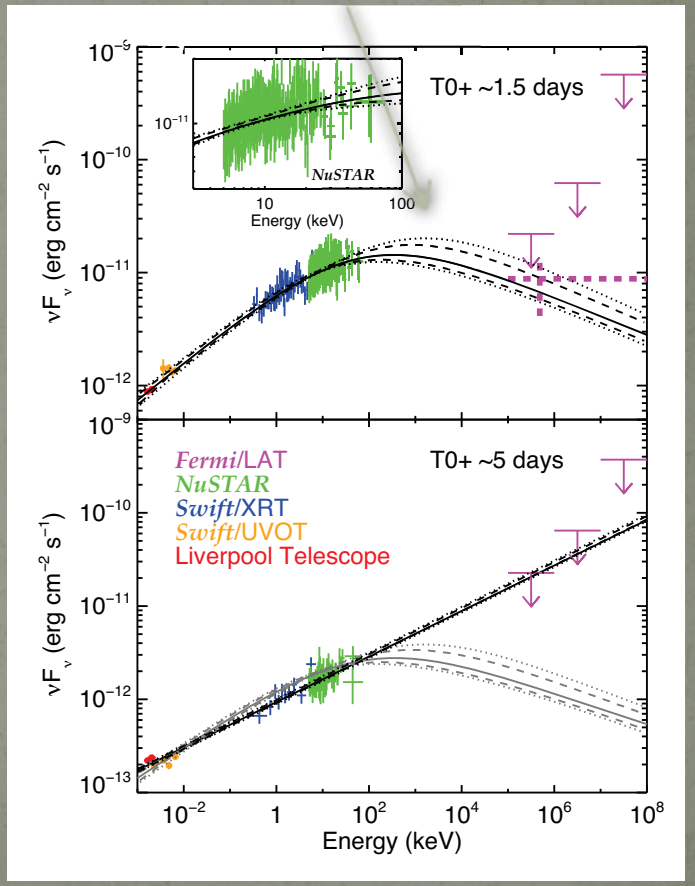
Spectral energy distributions

Separate Synchrotron & Inverse Compton components?



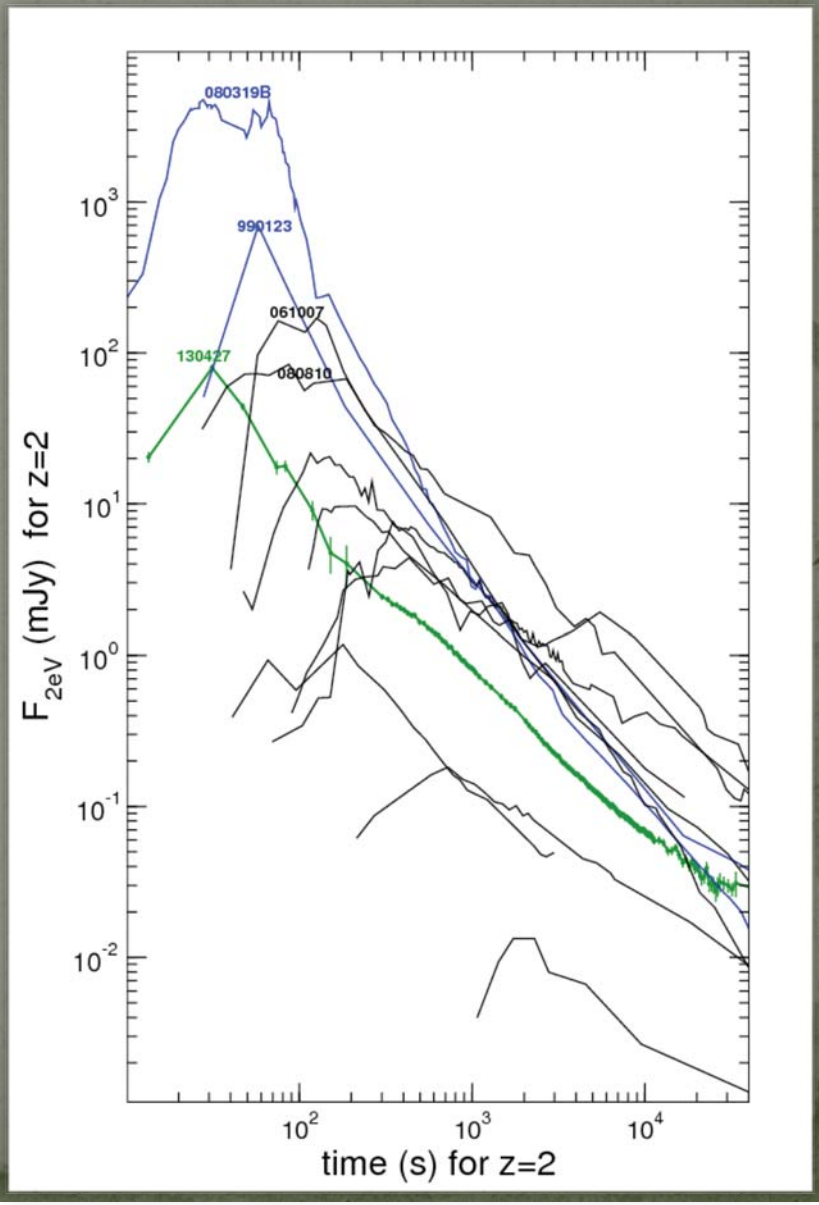
Maselli et al., Science 2013

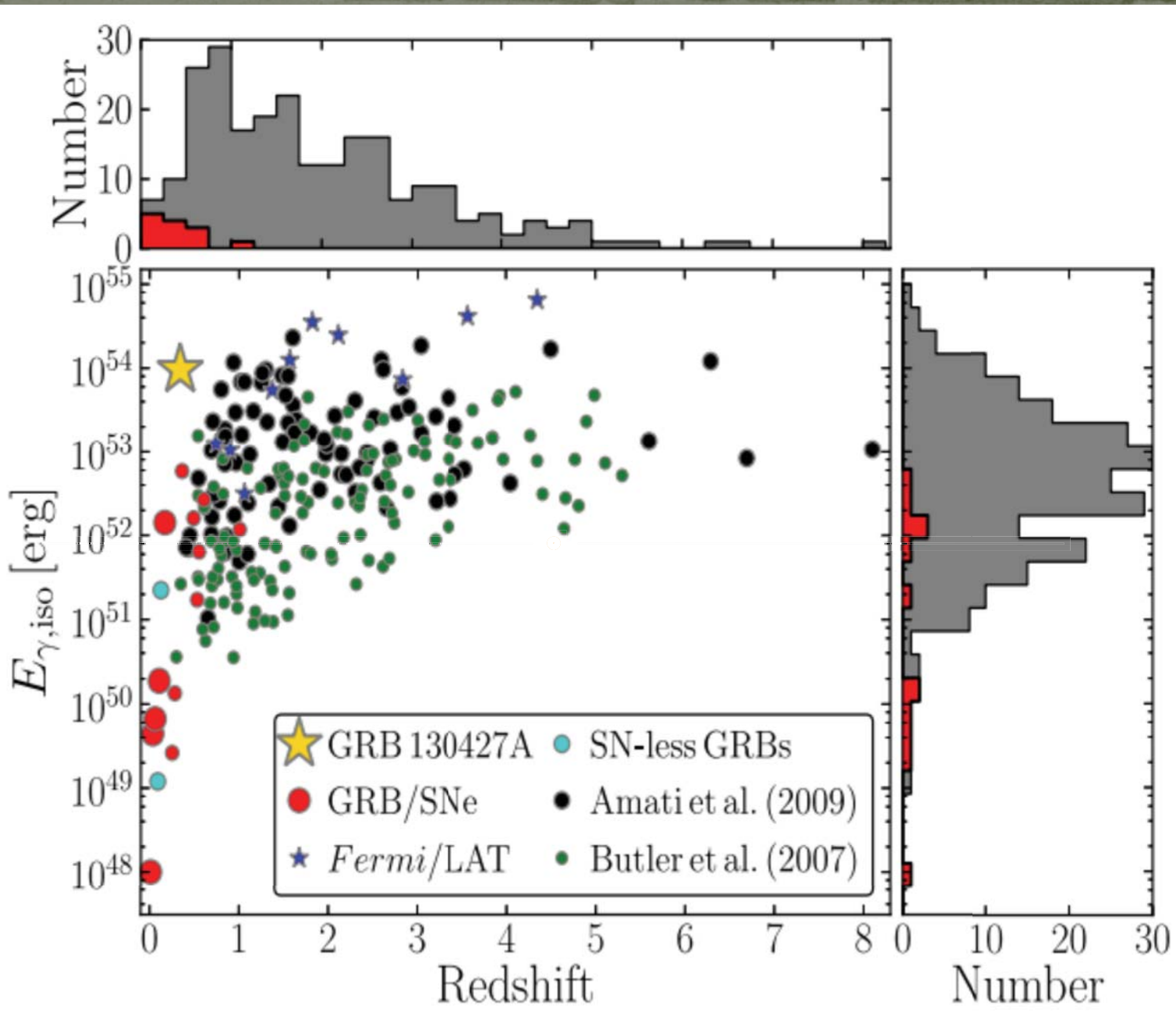
Single Component of Synchrotron or non-Synchrotron



Kouveliotou et al., Science, 2013

An Ordinary Monster

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GRB 130427A
GRB/SNe
Fermi/LAT
SN-less GRBs
Amati et al. (2009)
Butler et al. (2007)
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Redshift
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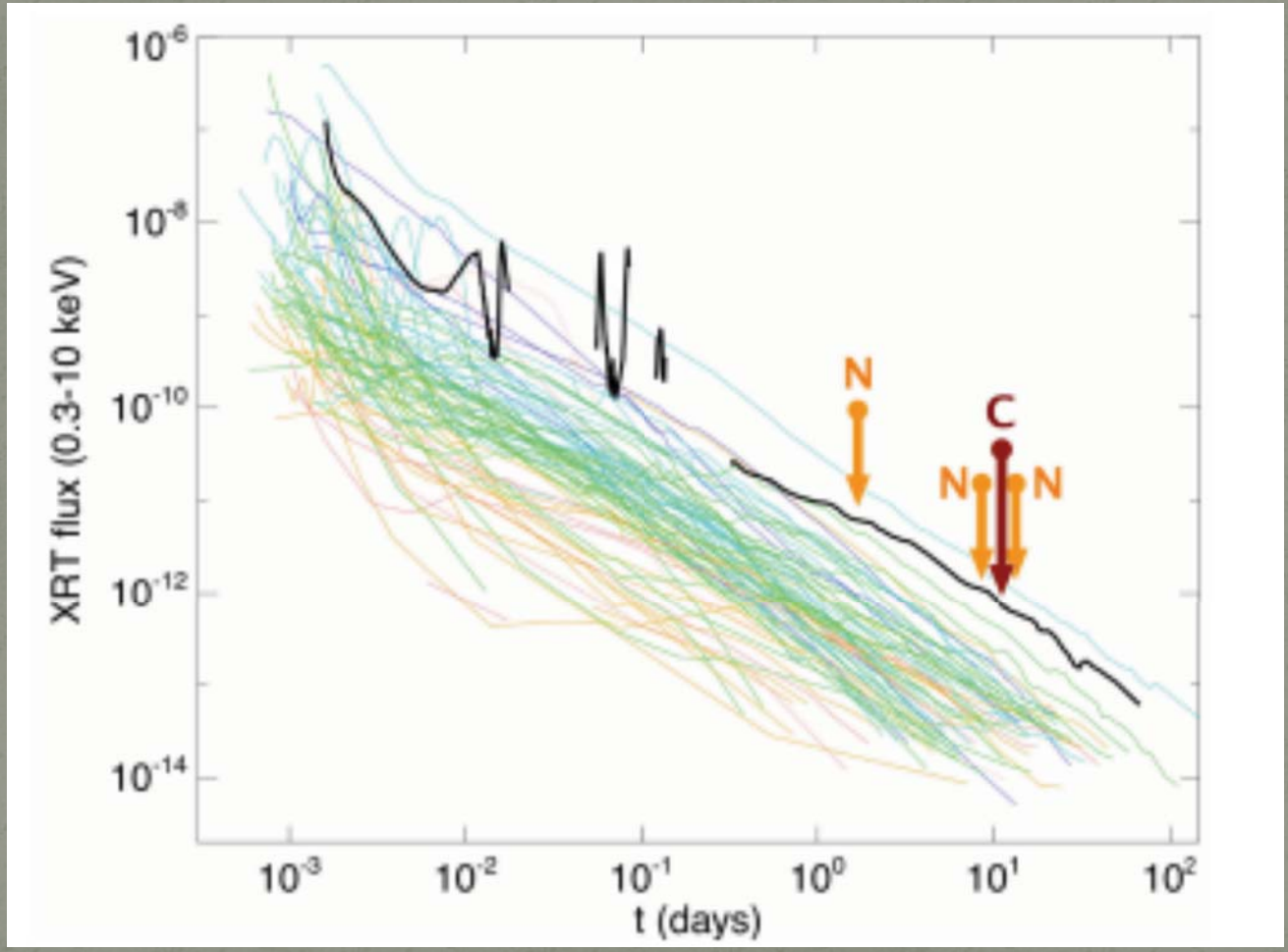
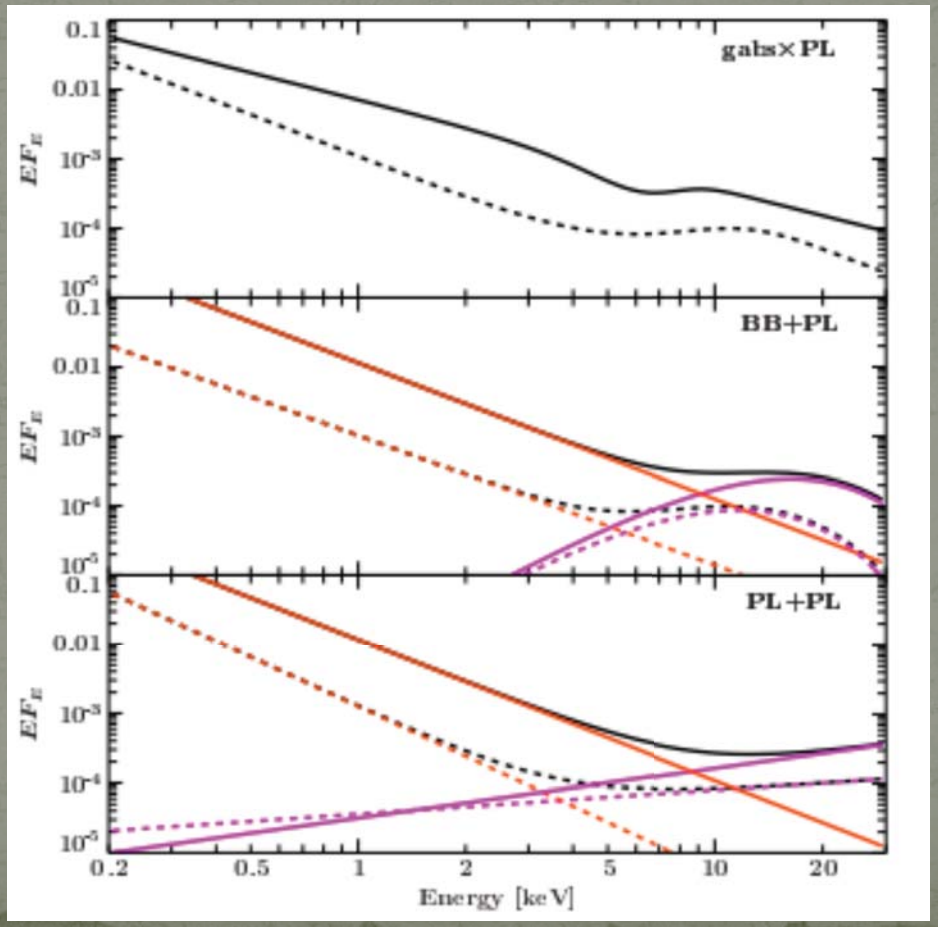


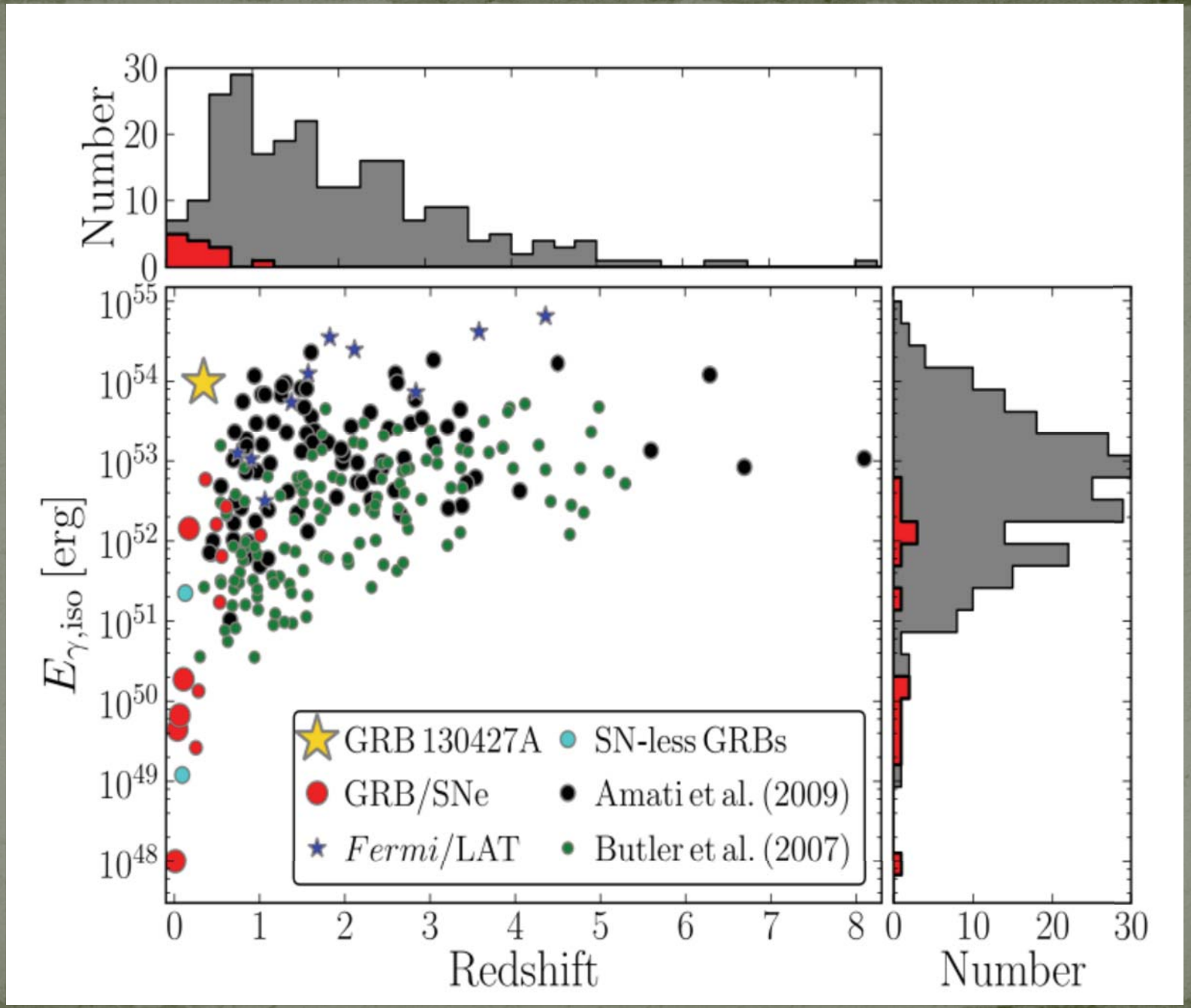
Bellm et al.,2014

GRB 130925A

- Multiple spectral components – thermal emission detected



Bellm et al, 2014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