

THE 2ND FERMI/LAT GRB CATALOG

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on behalf of the Fermi GRB group



PEOPLE

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 - Michele Palatiello
- and more!

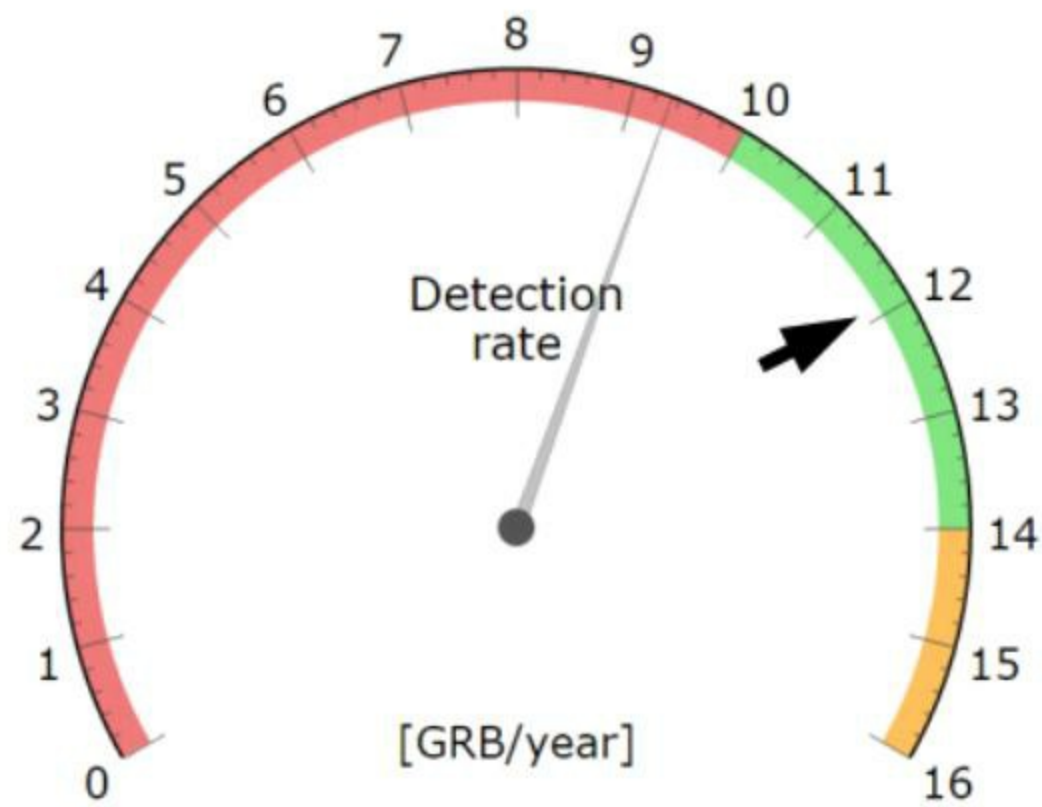
SAMPLE

- Time interval: 2008-08-04 to 2018-08-04 (10 years)
- 3146 triggers (GBM, IPN, Swift, INTEGRAL, AGILE, MAXI)
 - 186 detections
 - 168 standard > 100 MeV
 - 91 LLE > 30 MeV
 - 18 LLE-only
 - 34 LAT GRBs with redshift measured
- Detection criteria:
 - > 5 sigma after trials in one search (multiple time scales, multiple locations)
 - False Discovery Rate over entire list with 1% contamination
 - At least 3 photons with $p > 0.9$ of belonging to the GRB
 - Manual check to exclude blazars, Limb...

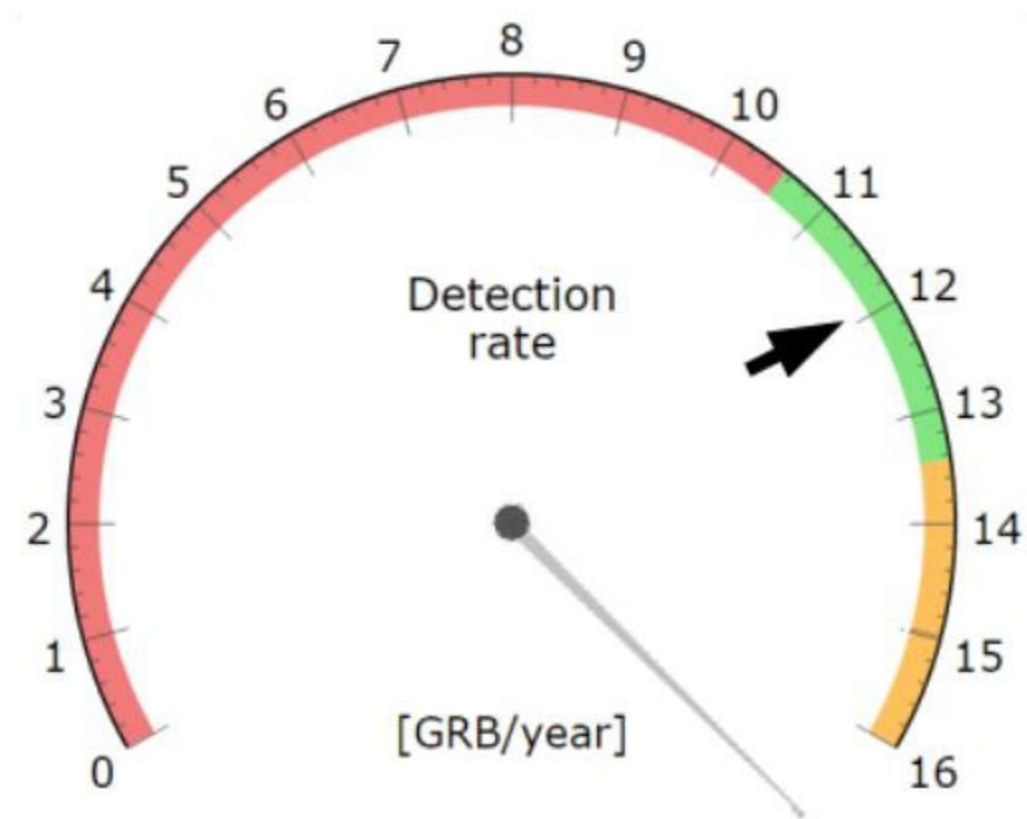


"Missing GRBs" problem solved

First few years we observed less GRBs than predicted (~5% chance probability for 3 years).
Lower Lorentz factors (Guetta et al. 2010)? Spectral cutoffs? ...

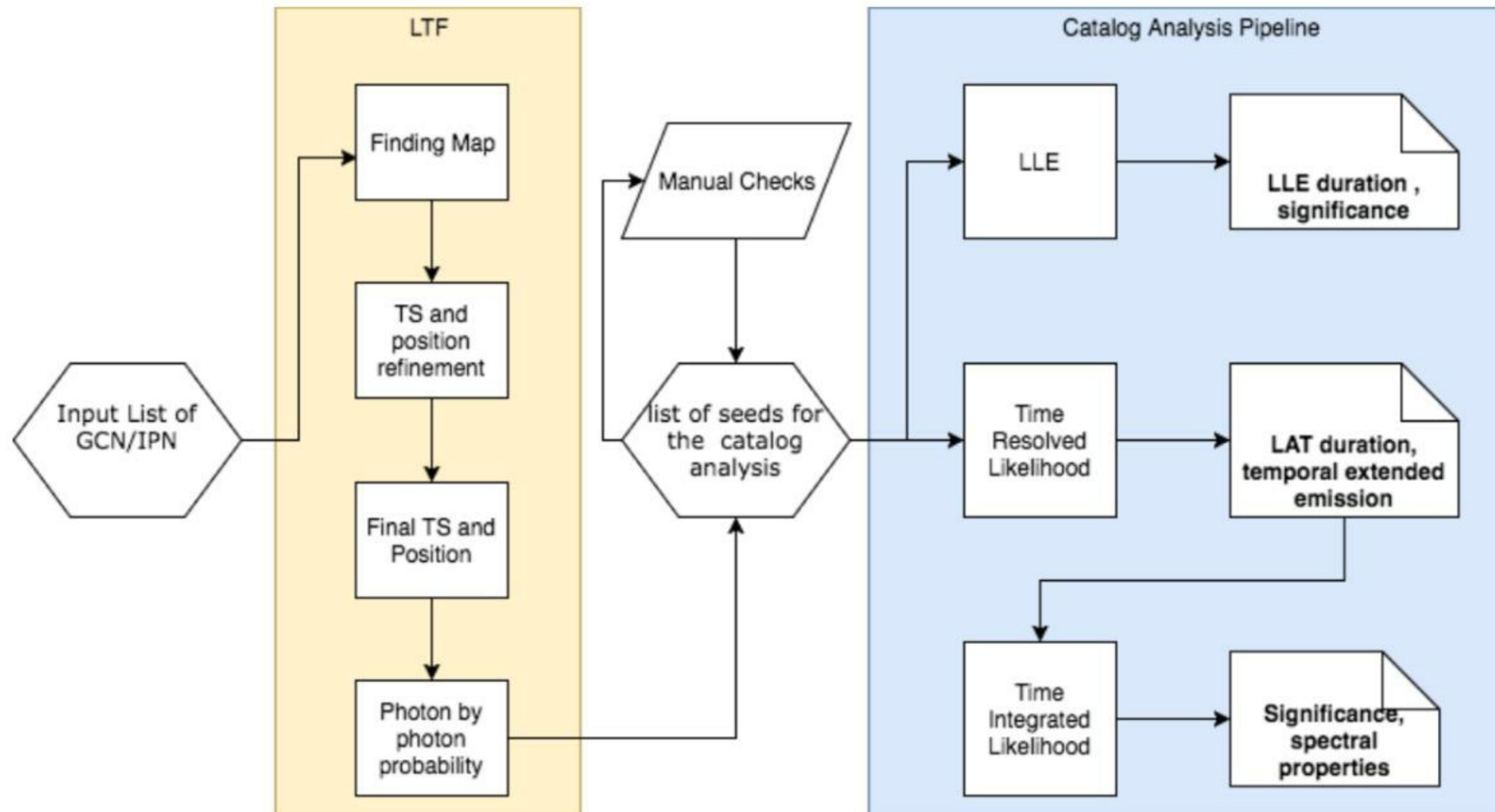


(Pass 6, old algorithm)

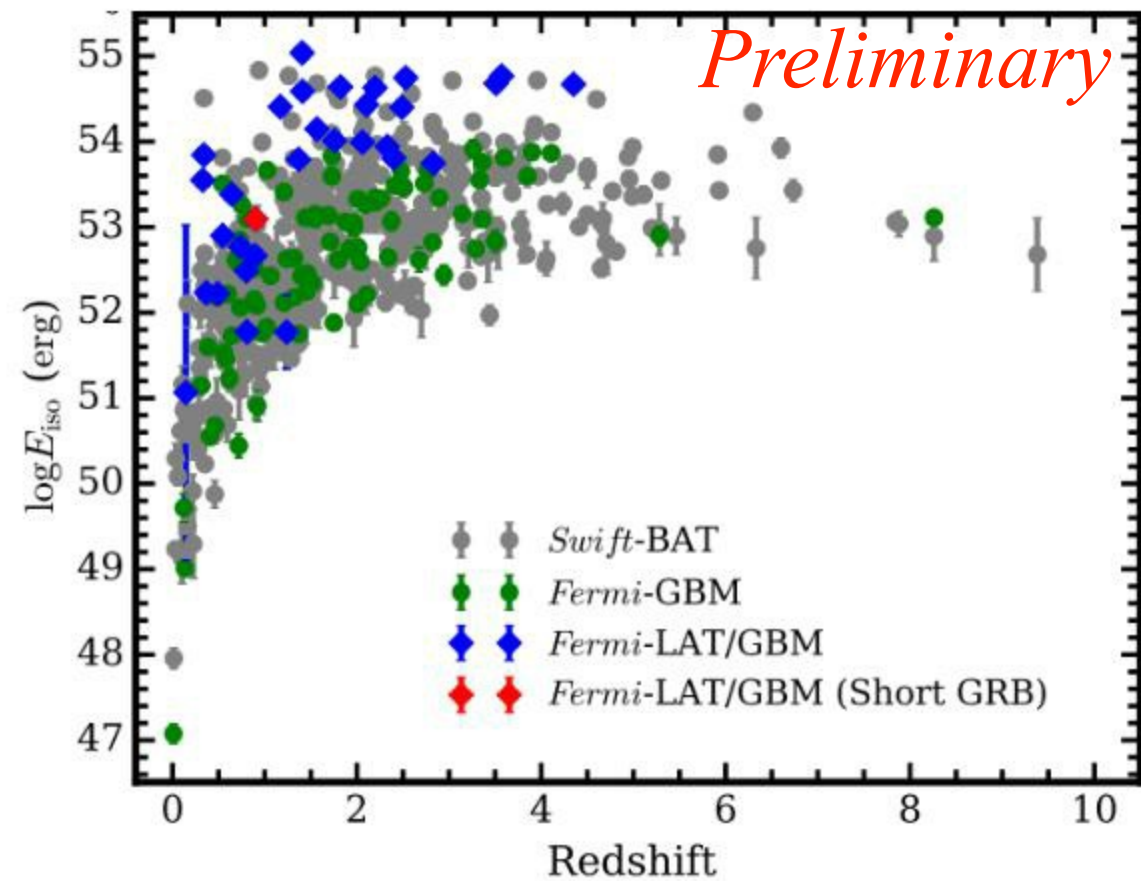
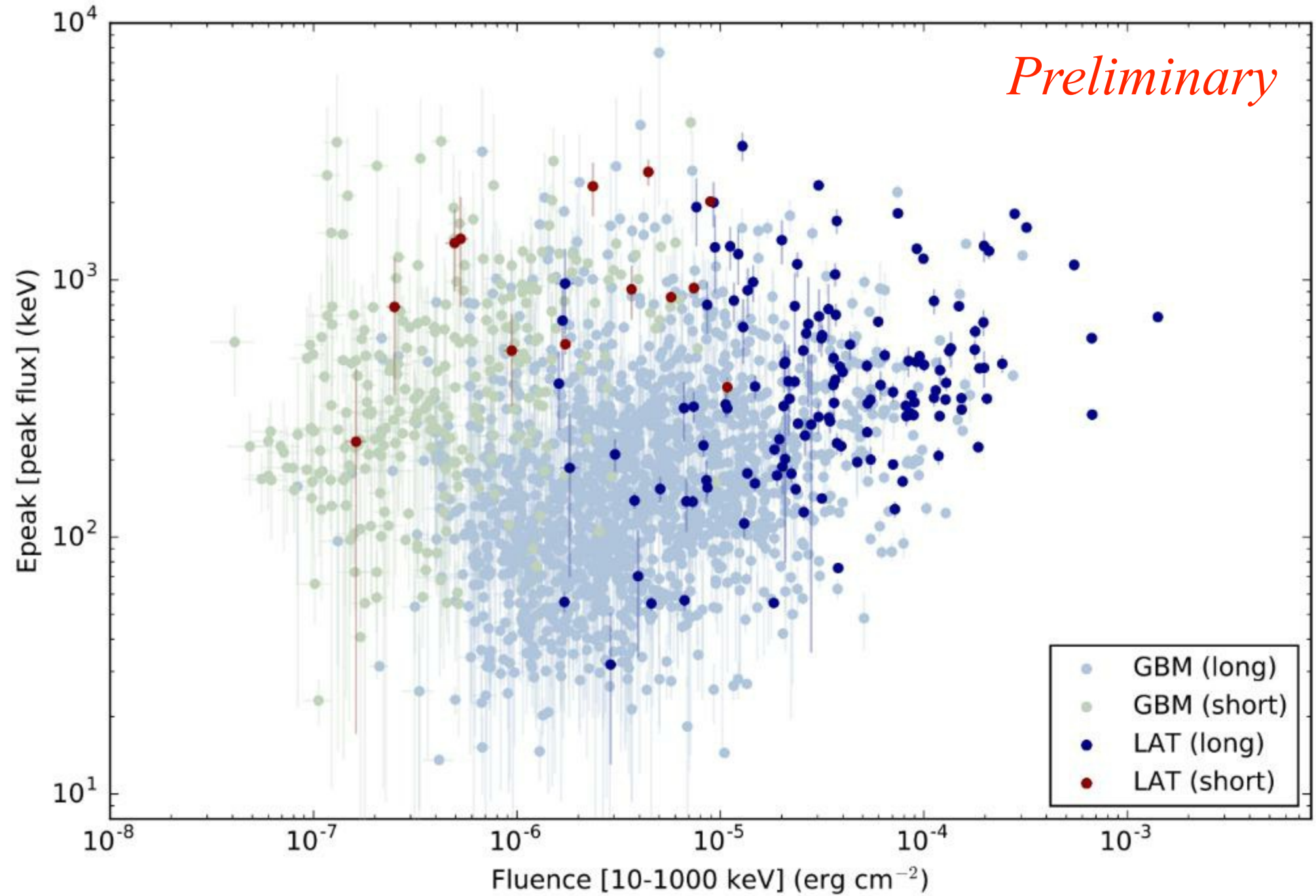
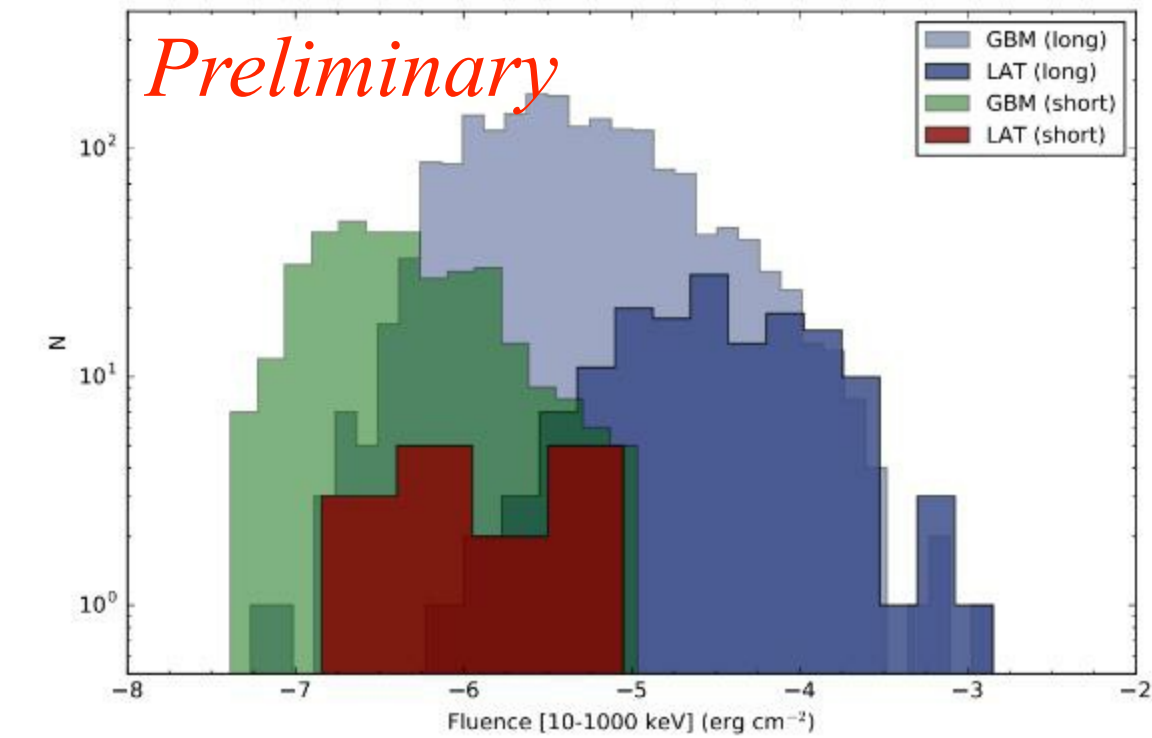


(Pass 8 + new algorithm)

CATALOG PIPELINE

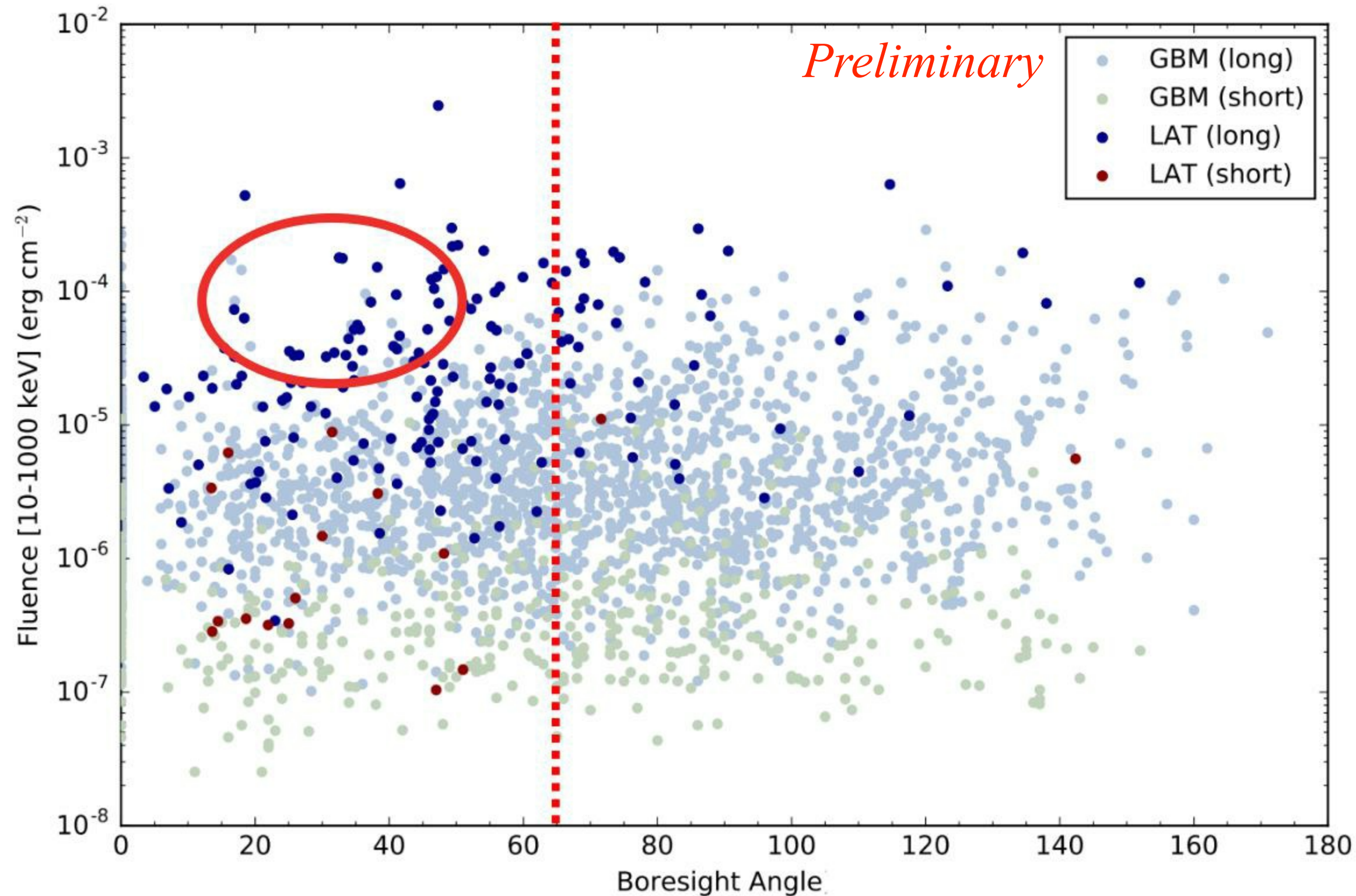


MOSTLY BRIGHT GRBS, BUT...



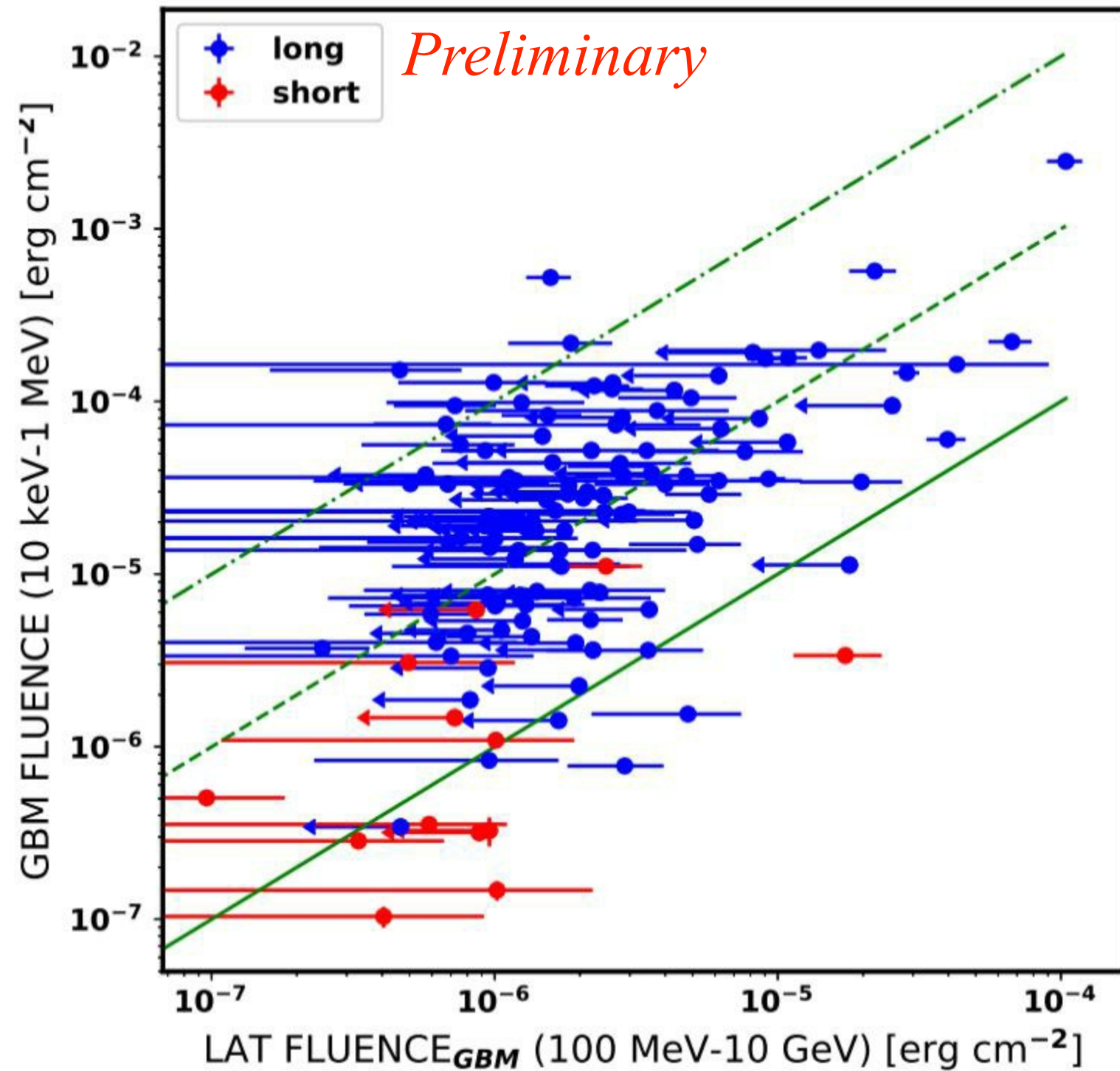
Preferentially GRBs intrinsically bright and with high E_p , but several exceptions

MEV CUTOFFS



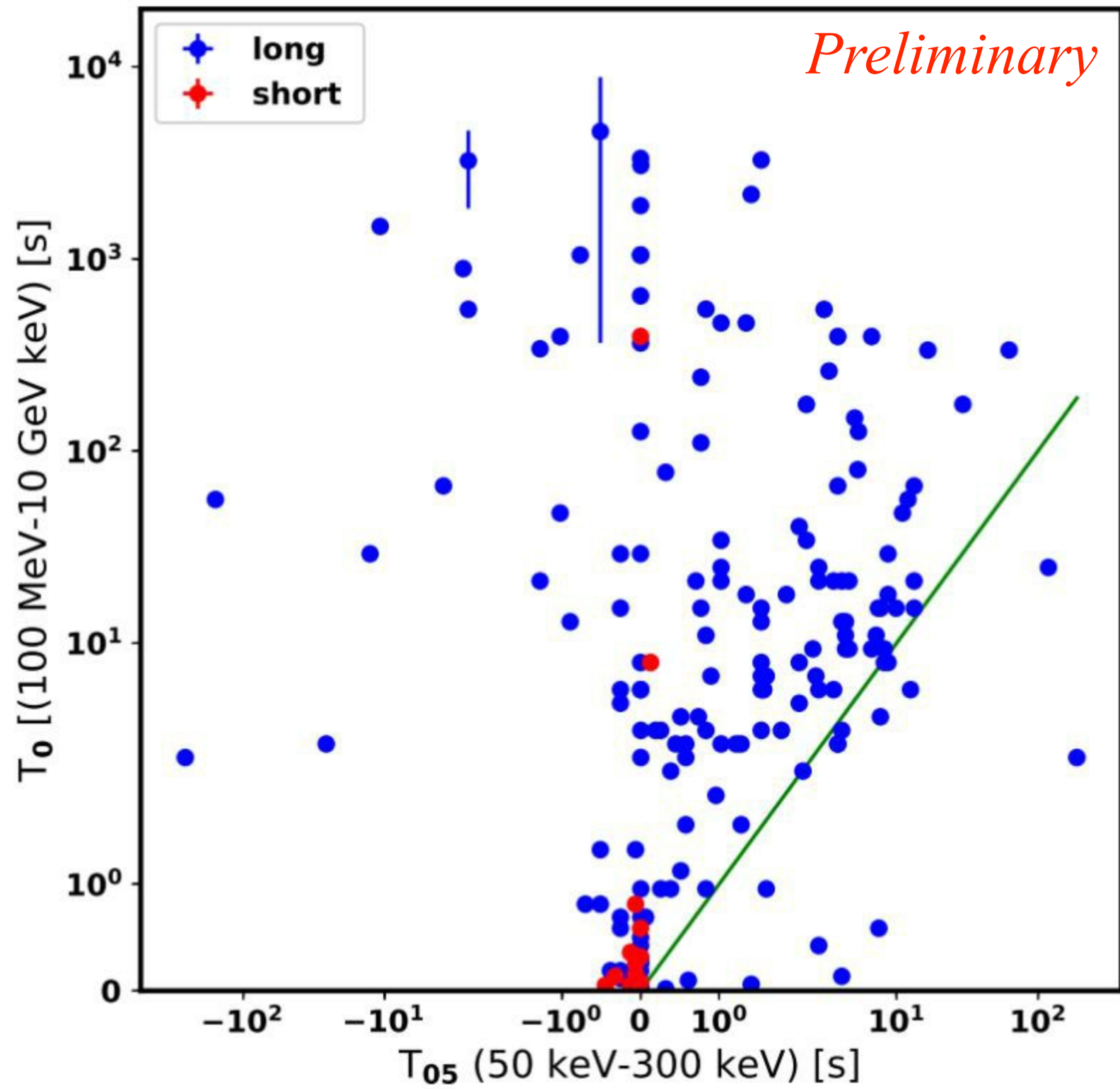
- There are bright GRBs with no LAT emission
- MeV cutoffs
 - see also Vianello et al. 2018, Tang 2015

PROMPT EMISSION



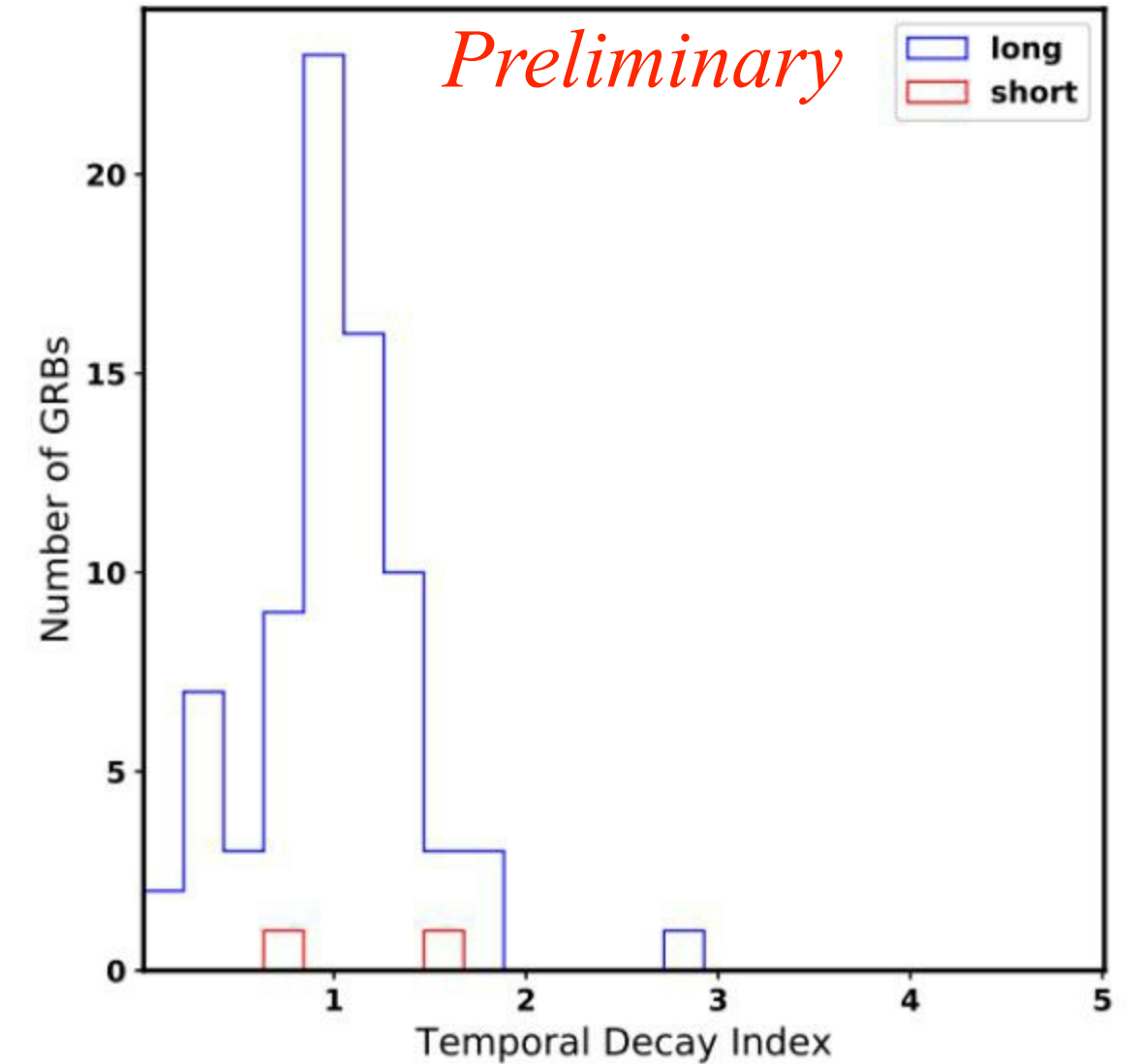
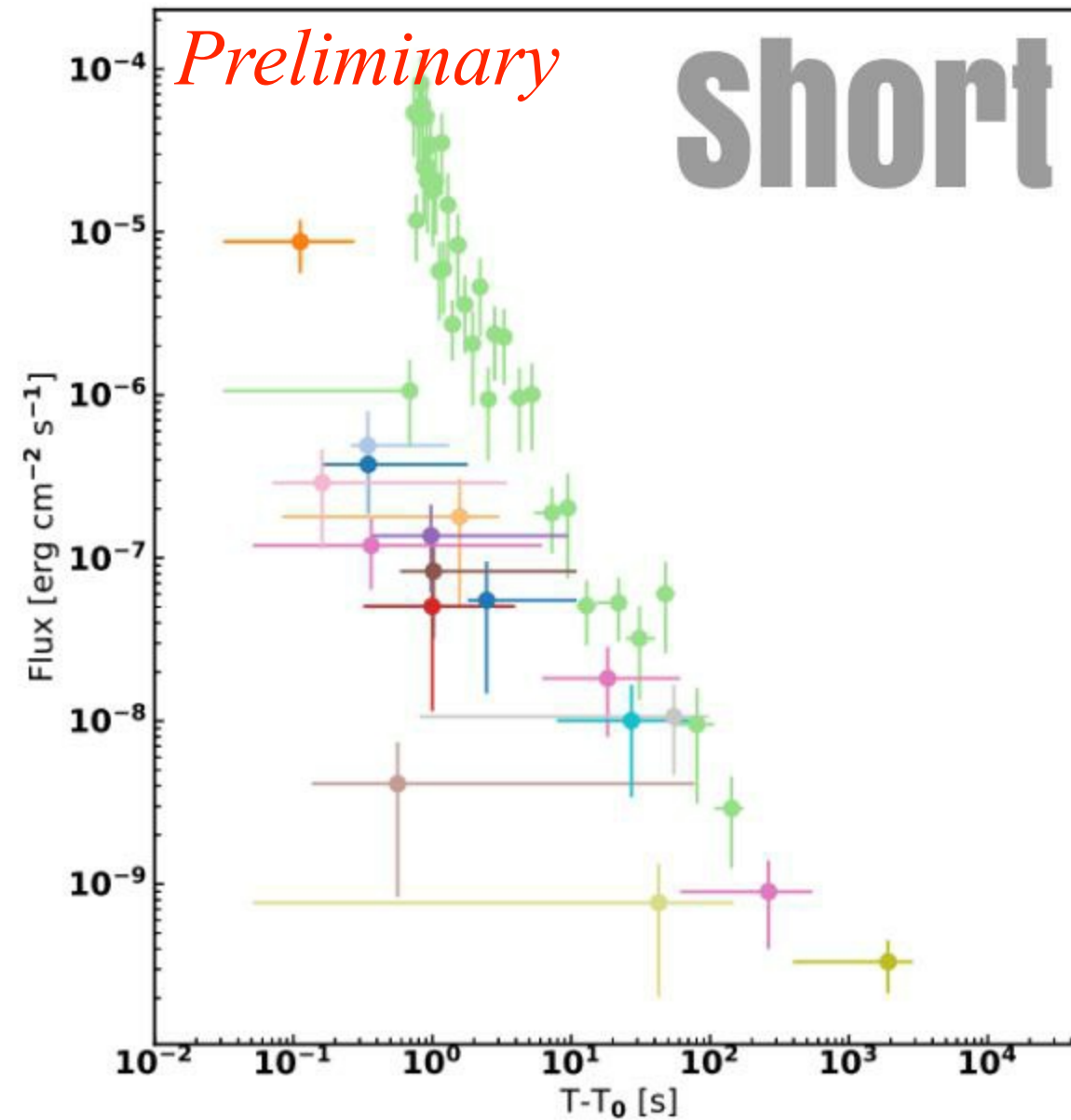
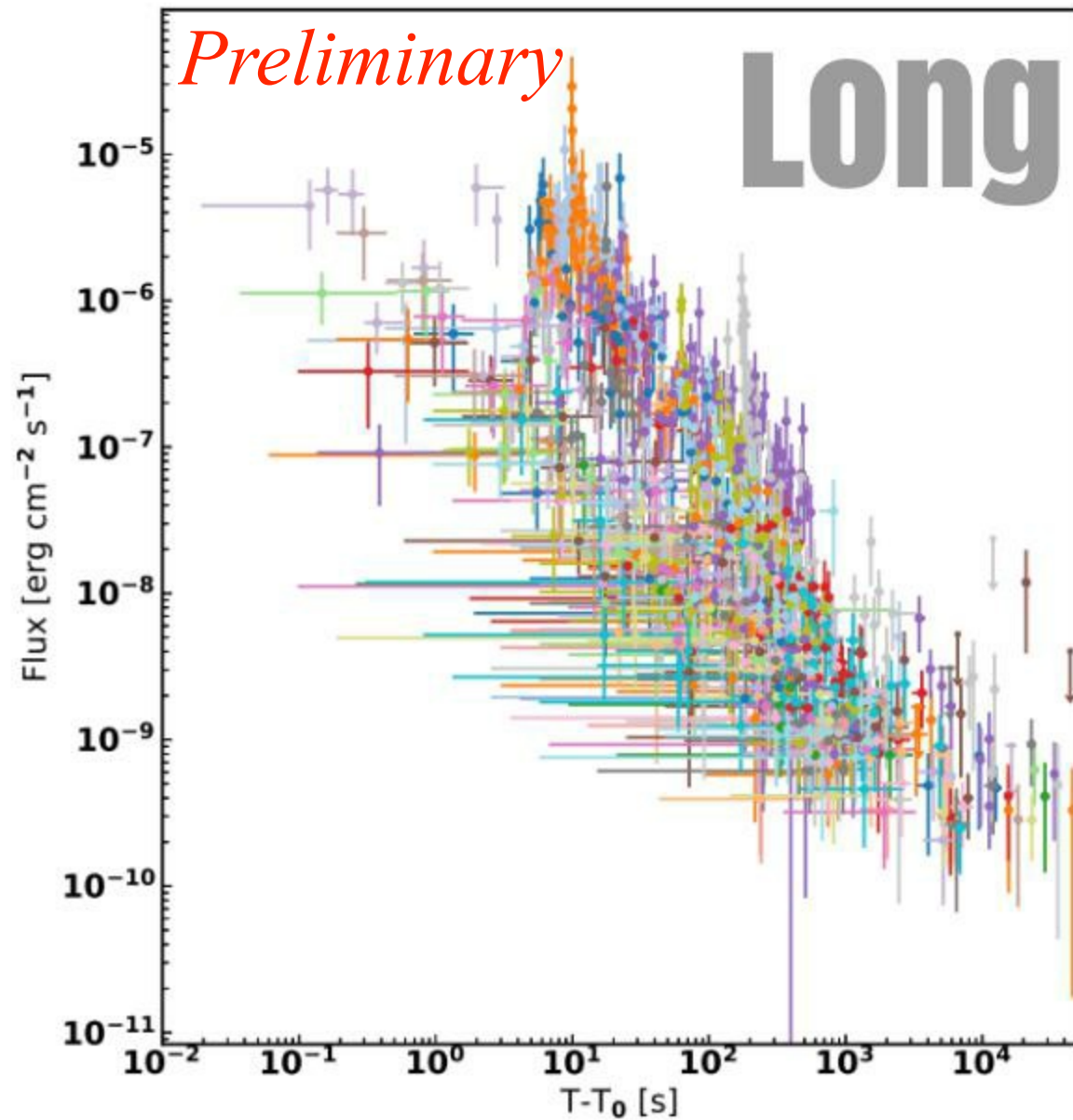
- LAT and GBM emission are not strongly correlated during GBM T₉₀
- While there is definitely "cross-talk", LAT and GBM seems to be dominated by different components
 - prompt Vs afterglow?

DELAYED ONSET



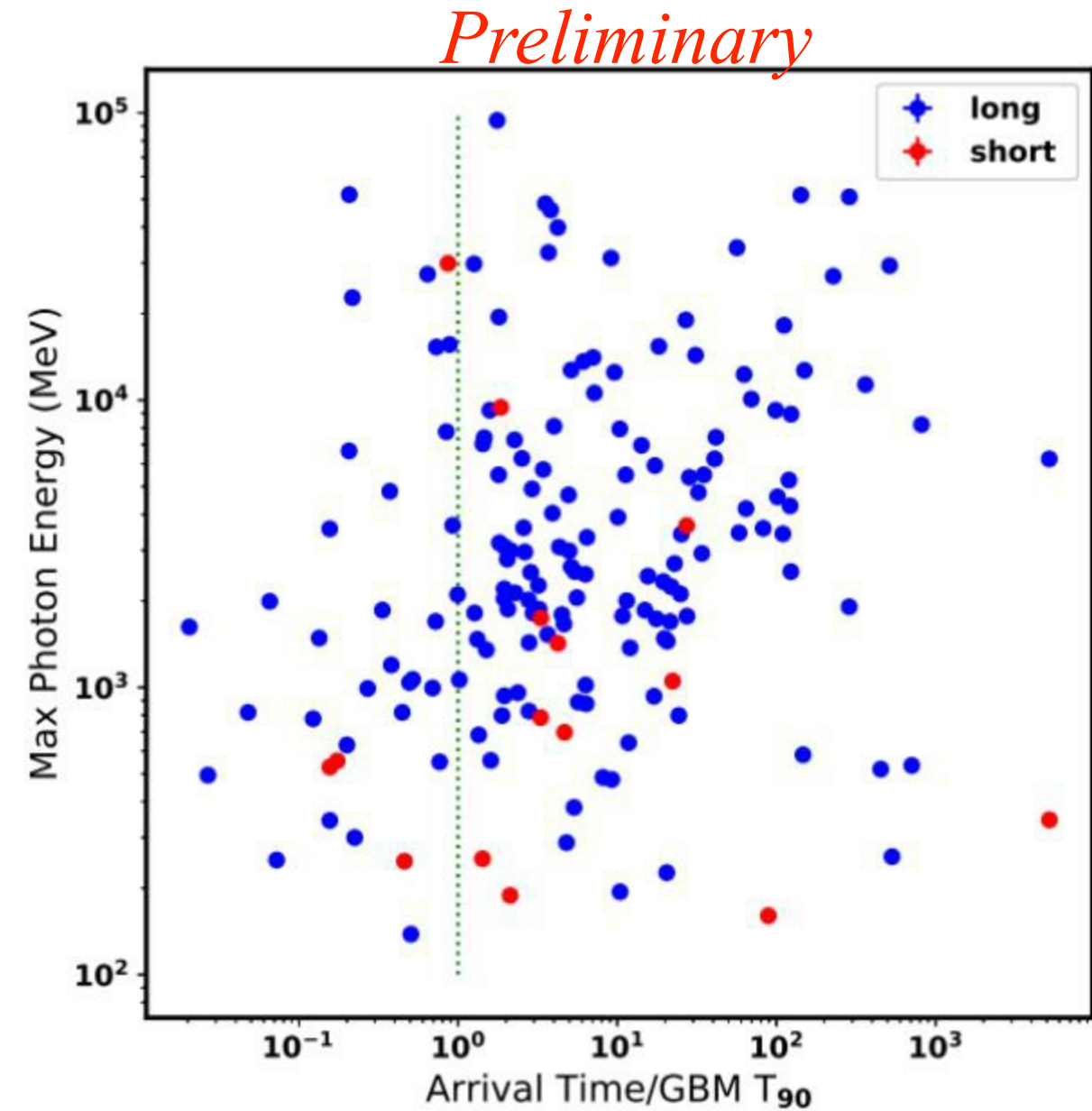
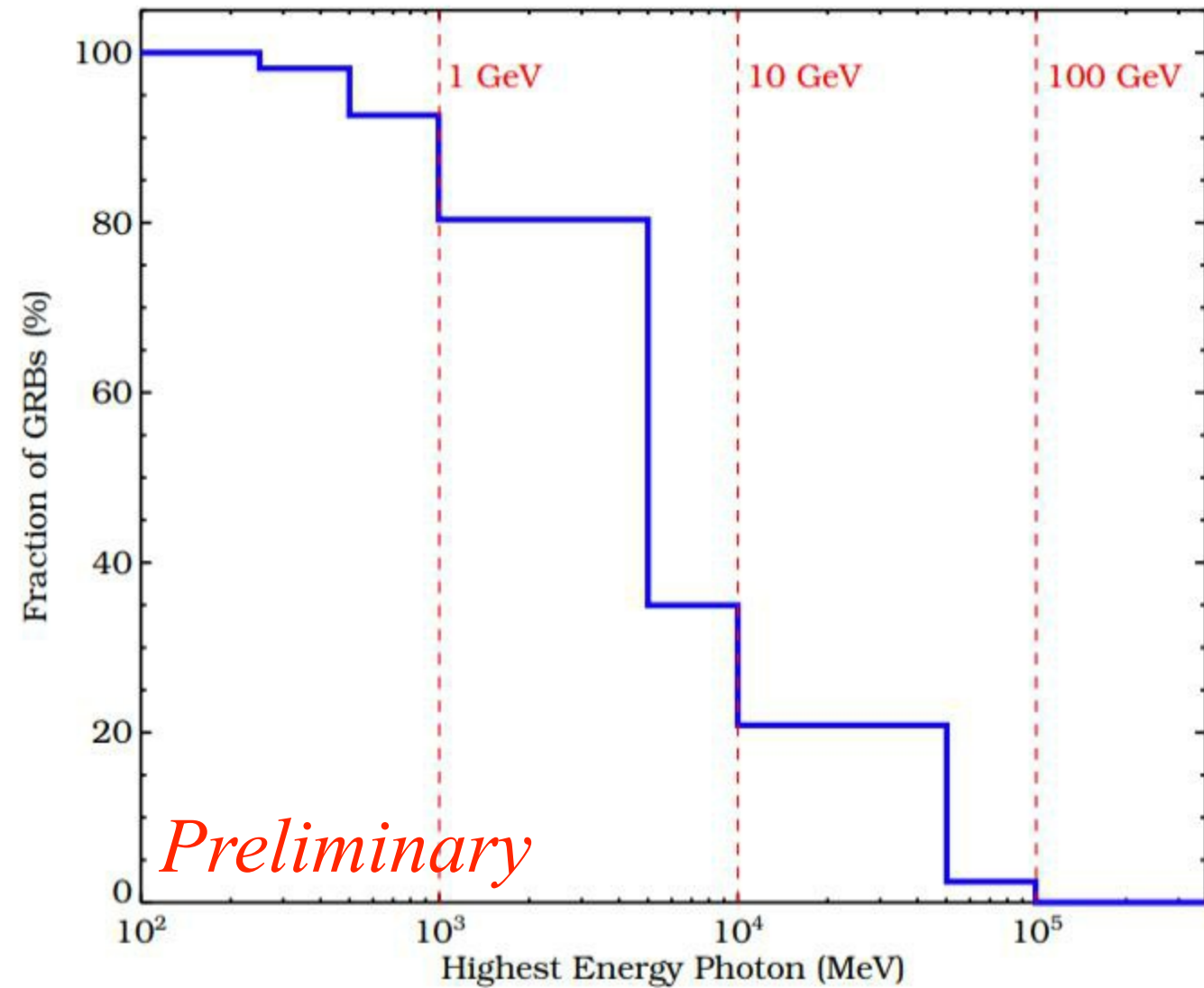
- Onset of LAT emission ("first photon") is most of the time after the onset of the GBM emission

EXTENDED EMISSION



- LAT emission lasts much longer (typically) than GBM emission, compatible with adiabatic fireball (decay index ~ -1)

HIGH-ENERGY PHOTONS



- 80% of LAT GRBs emit > 1 GeV, 20% above 10 GeV
- High-energy photons mostly after end of prompt emission (NOTE: not all GRBs have same observational conditions)
 - some photons incompatible with Synch. emission
 - No spectral evolution makes a SSC explanation unlikely

conclusions

- 2nd LAT GRB catalog
 - 186 GRBs in 10 years (previous catalog: 35 in 3 years)
 - Draft is in good shape, submitting to the journal by the end of the year
- Focused on observational features, will provide a lot of material for future studies both from within and from outside Fermi
- LAT sees high-fluence, high- E_p bursts, with exceptions (MeV cutoffs, a few sub-luminous GRBs detected anyway)
- LAT emission is delayed and extended above 100 MeV, seems to be dominated by prompt < 100 MeV (LLE)
- Decay index distribution is centered on -1 -> adiabatic fireball
- High-energy photons arrive late, often after prompt emission
 - some incompatible with Synch., SSC emission could explain them but no spectral evolution