Science Working Group

Simultaneous Observations of the prompt emission with MXT and ECLAIRs (and more…)

D. Götz (Irfu/DAp) on behalf of the MXT SWG

Based on: Oganesyan, Nava, Ghirlanda, Celotti 2017 ApJ; O, N, G, V 2018 A&A; L. Nava ISSI-BJ meeting.

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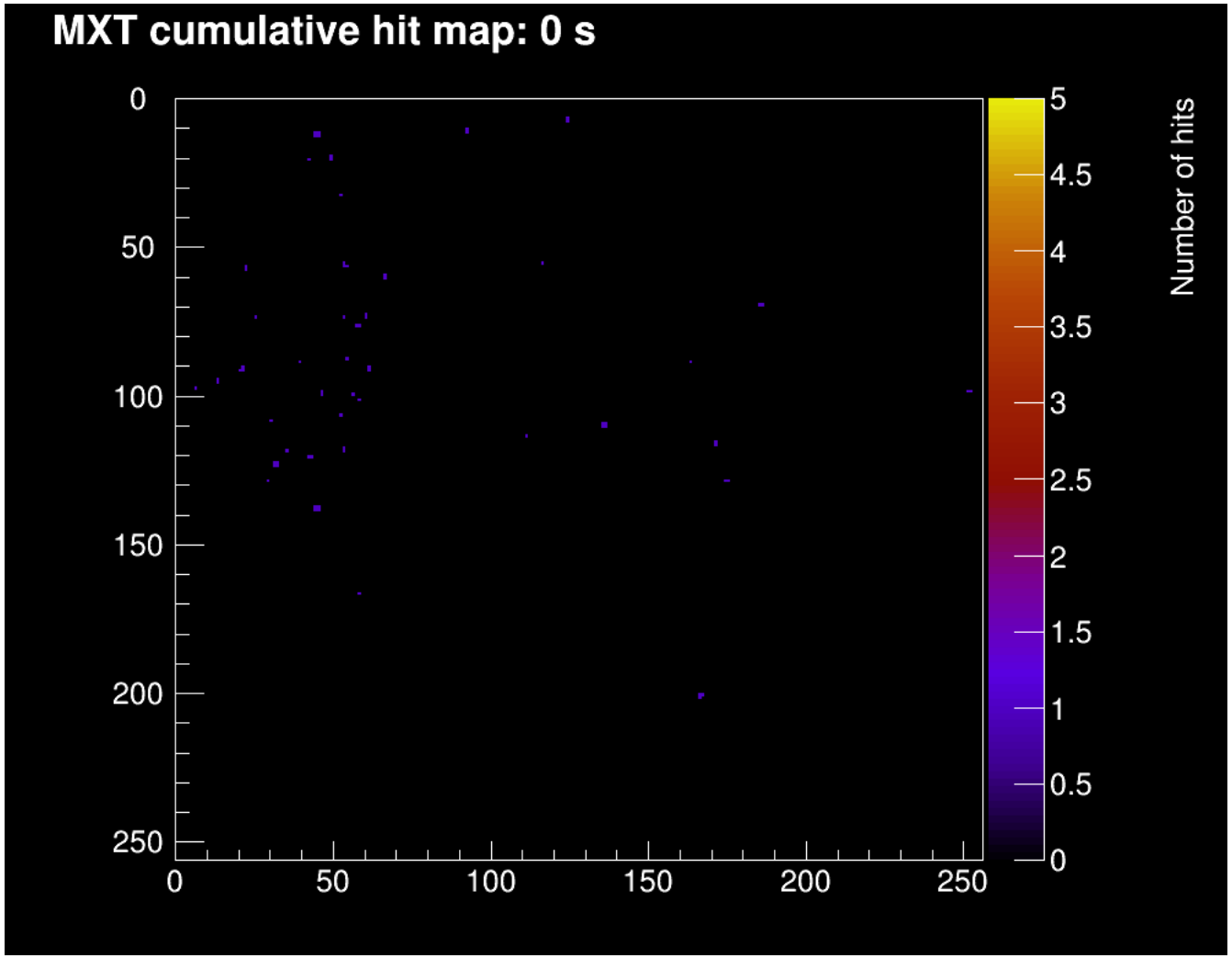
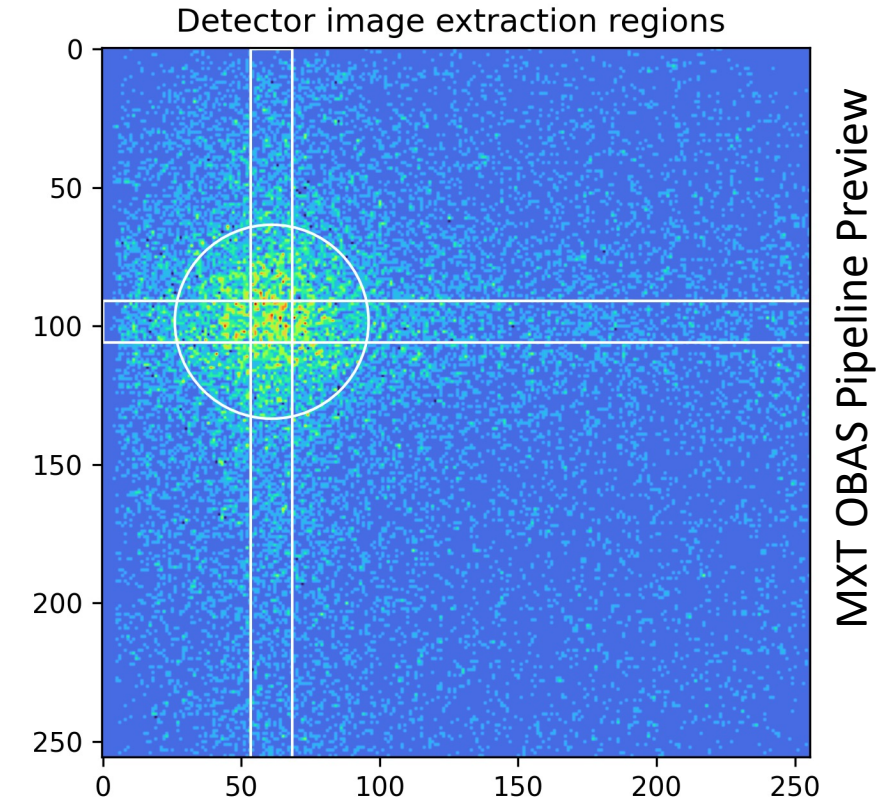


Credits: F. Robinet @ IJCLab

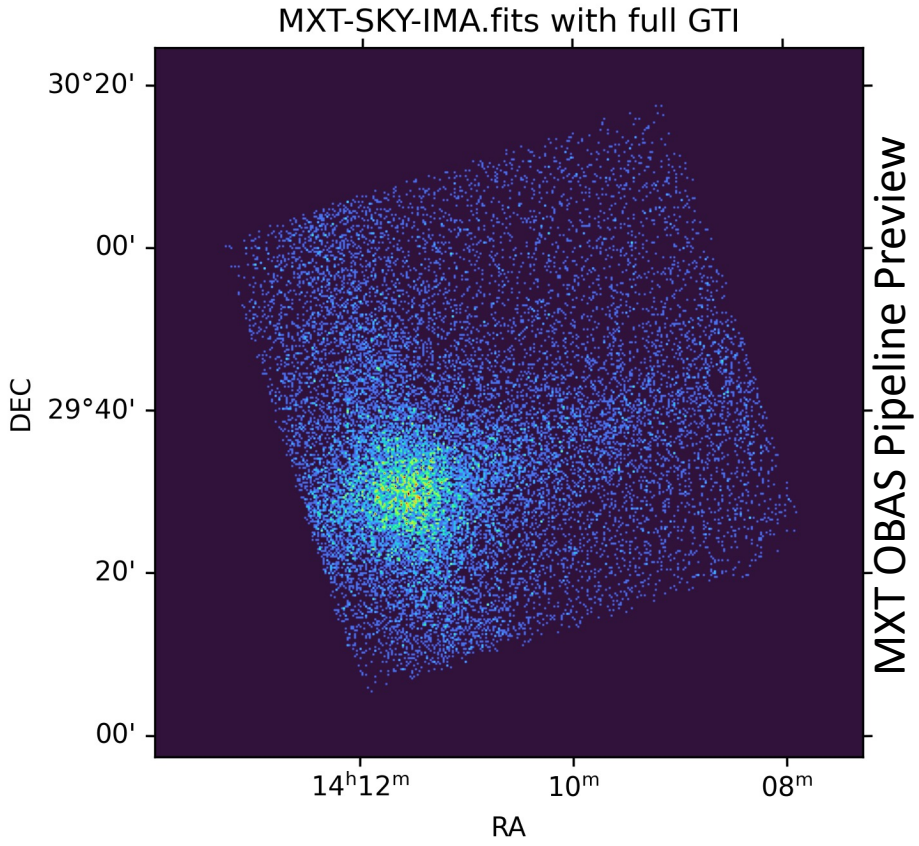
MXT data analysis (GRB061121 simulated for DC-4)

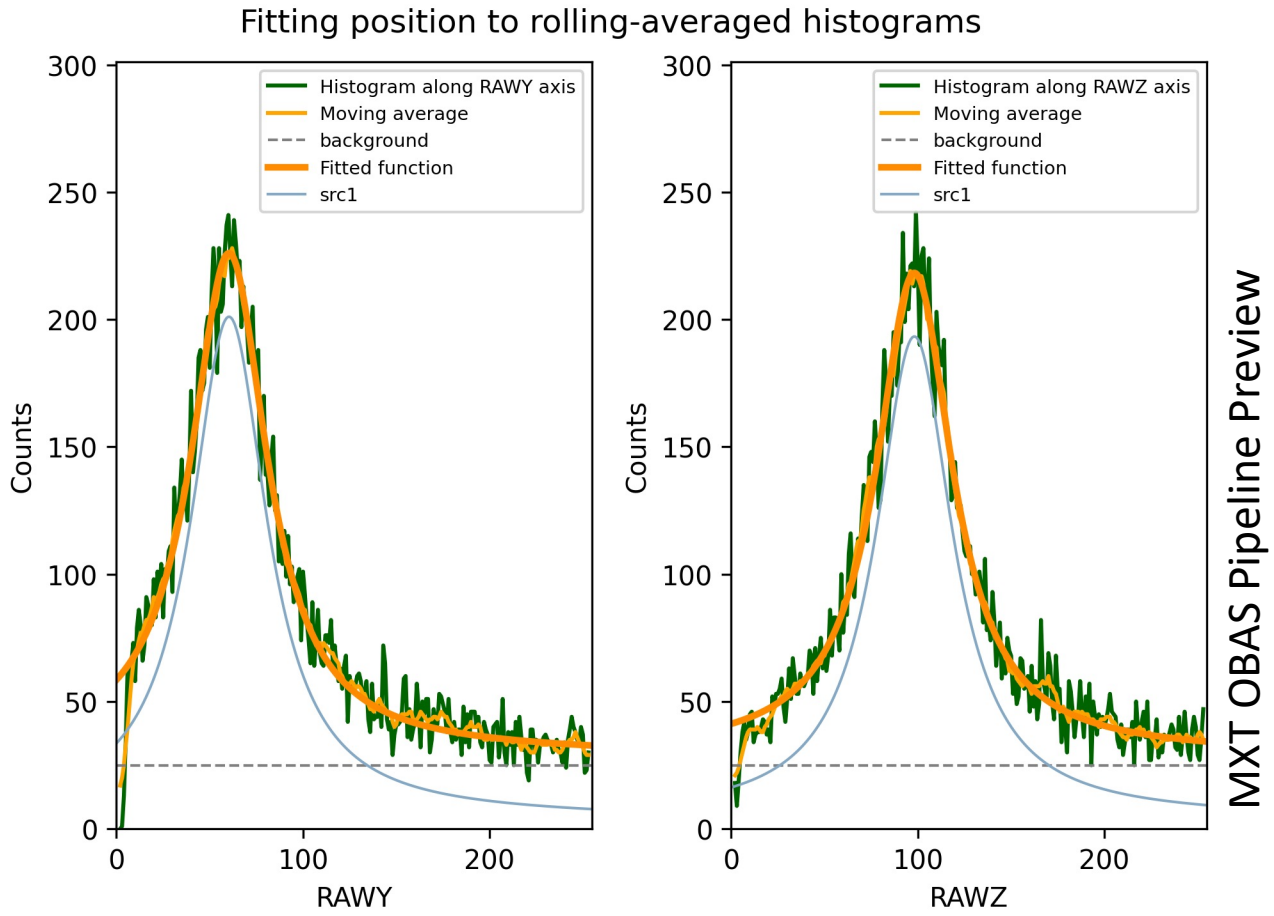
- MXT data analysis is “straightforward”, since it’s a classical X-ray imaging telescope, except for the fact of having a peculiar PSF
- The advantage of classical imaging is that one can measure the source flux and background at the same time
  - MPOs have an additional difficulty: less than 10% of the flux of the source does not interact with the optics (“straight through”) and is detected over the entire FOV



MXT data analysis

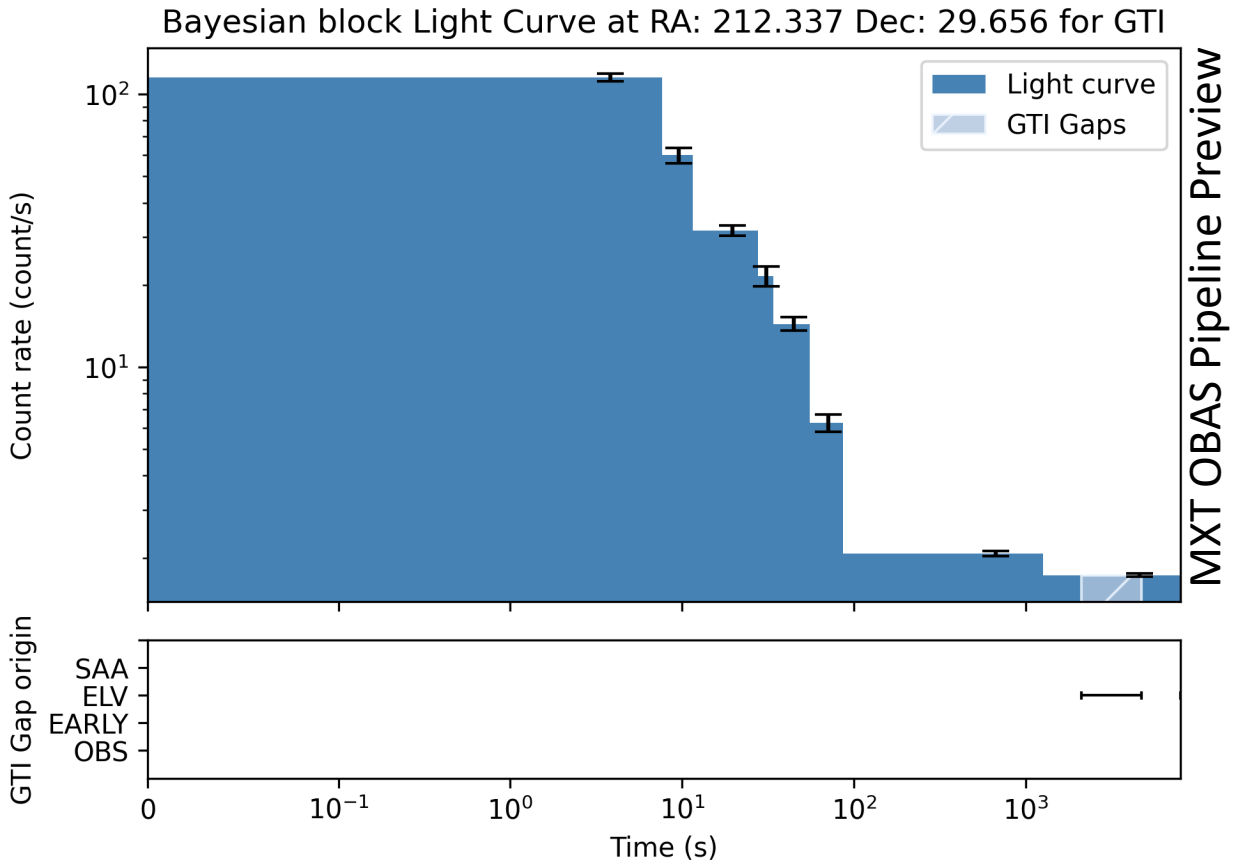
- Localization & Sky image

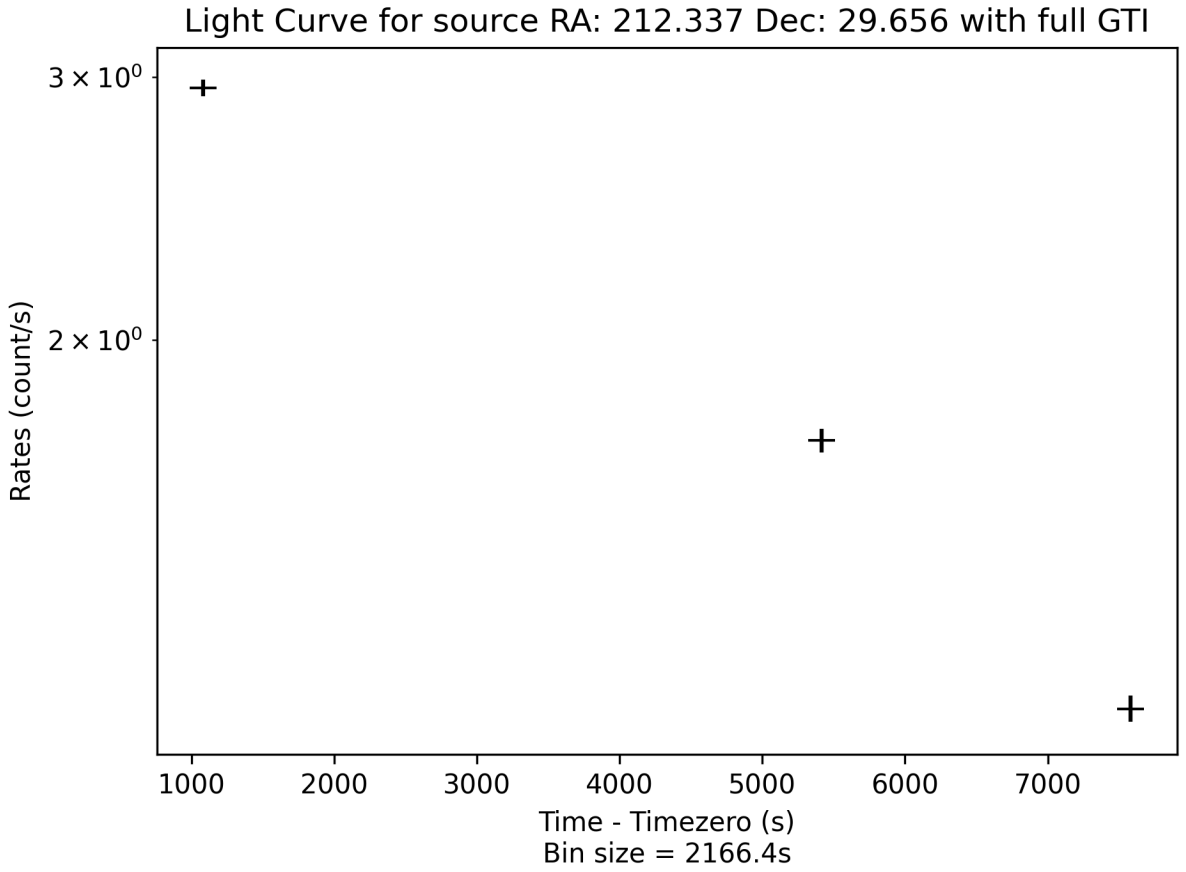




MXT data analysis

- Bayesan Block Light Curve





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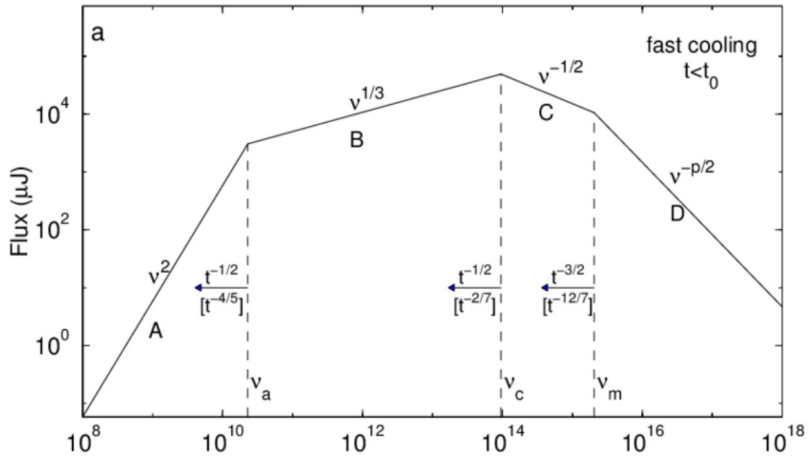
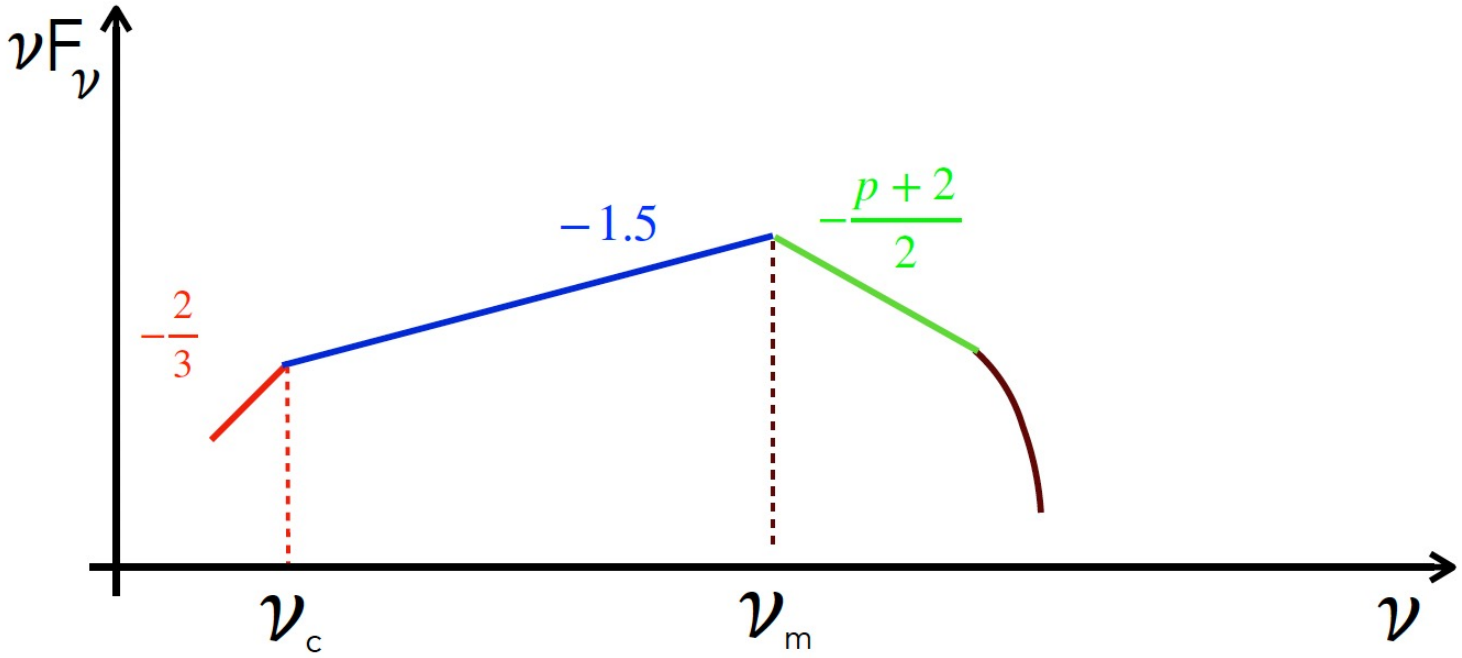
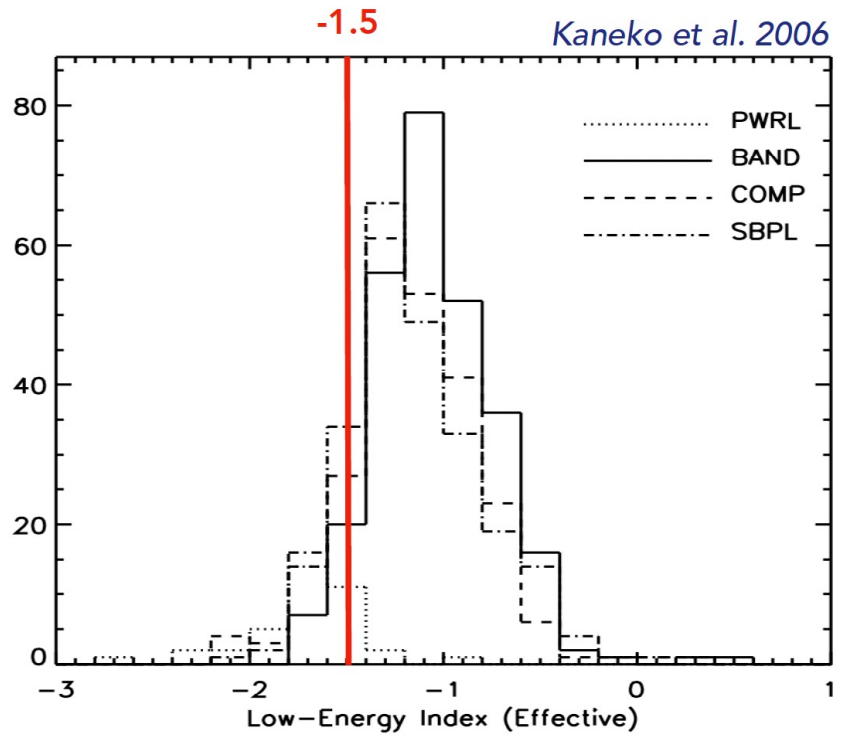
Context: late prompt



Synchrotron interpretation of keV-MeV emission



Fast cooling regime



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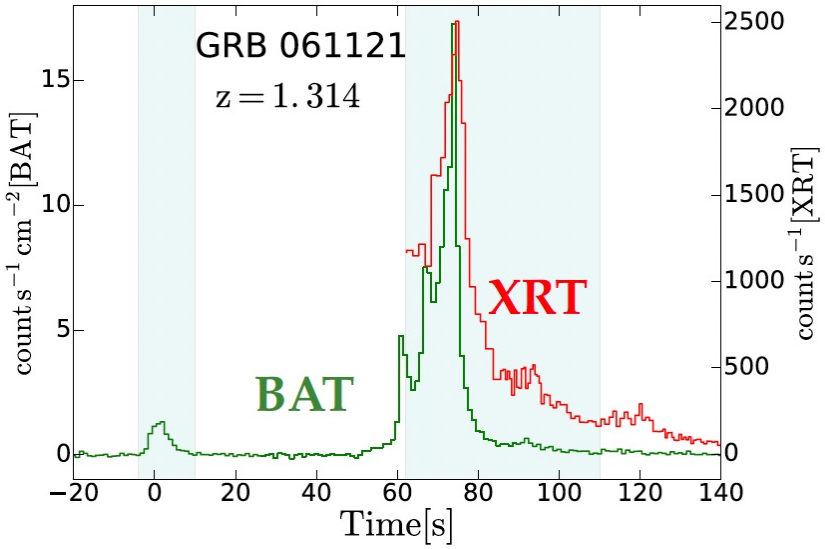
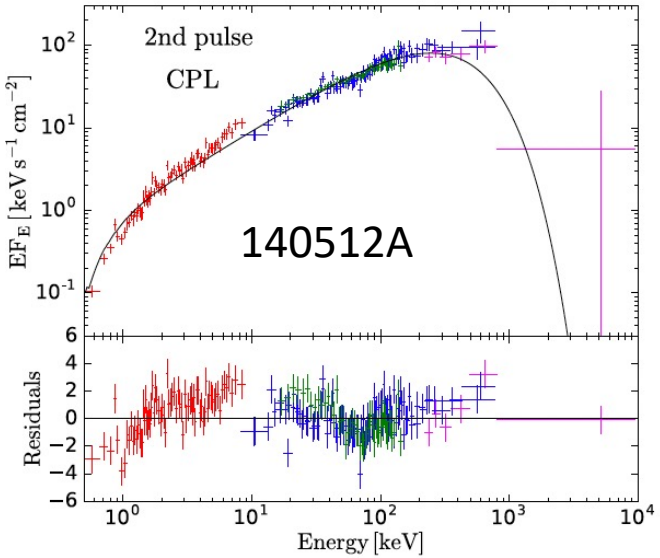
Swift GRB BAT+XRT

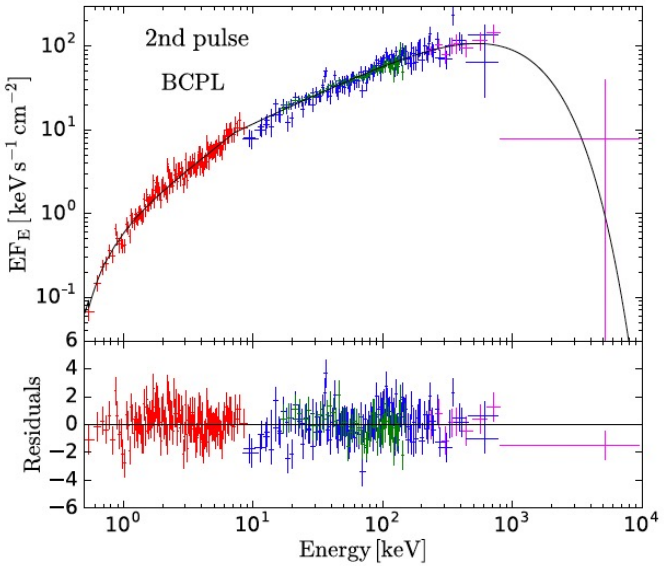
Swift GRBs with BAT+XRT simultaneous prompt observations



In some cases, the prompt emission is long enough and the slew is short enough to allow for simultaneous observations

Oganesyan, LN et al., 2017, ApJ, 846,137





Cutoff PL model

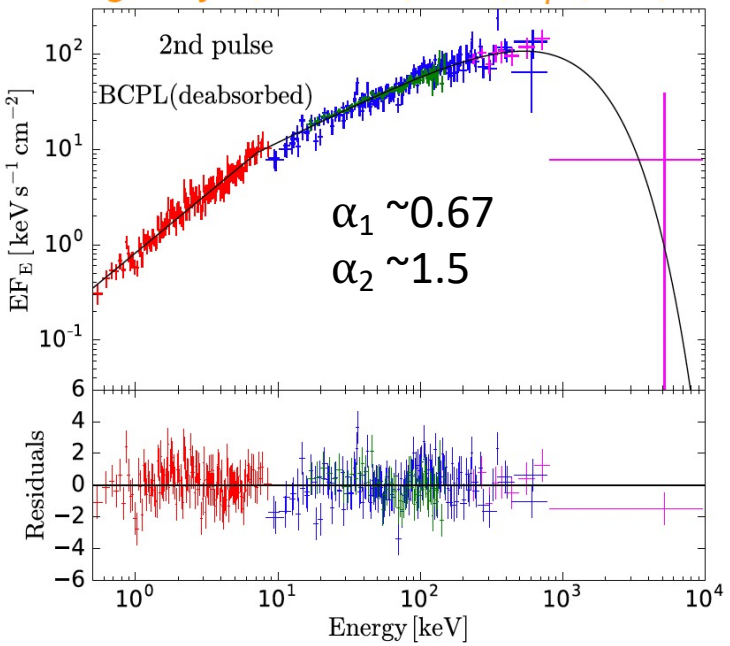
> 8σ improvement

CPL + break at low energy

E_{break} = (7.2 ± 1) keV

E_{peak} = (532 ± 150) keV

Oganesyan, LN et al., 2017, ApJ, 846,137



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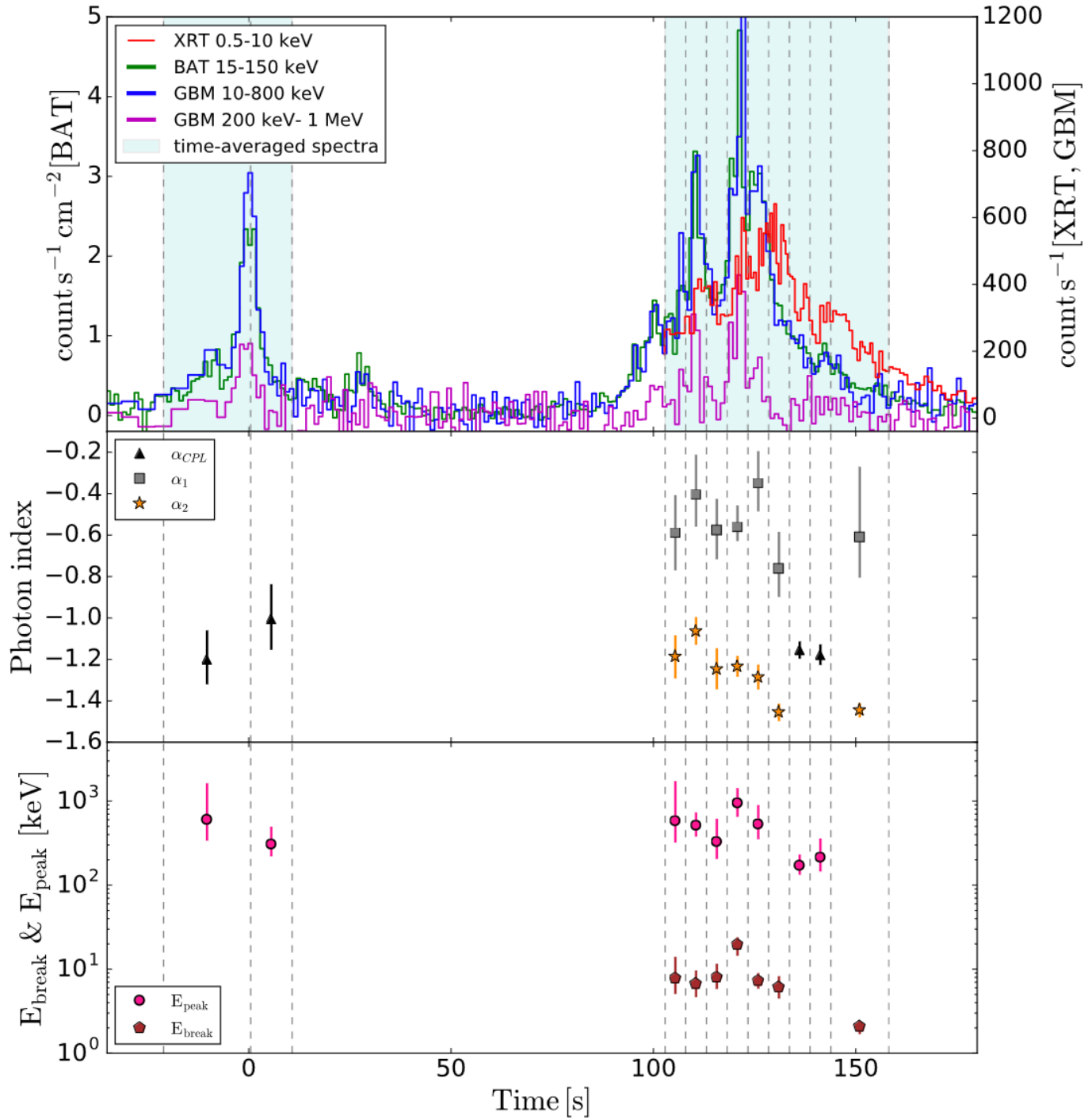
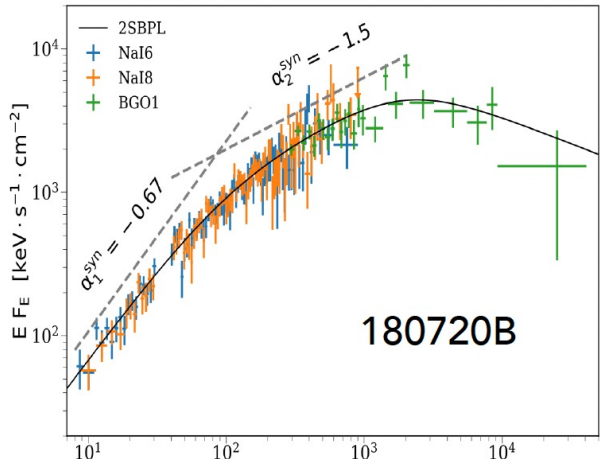


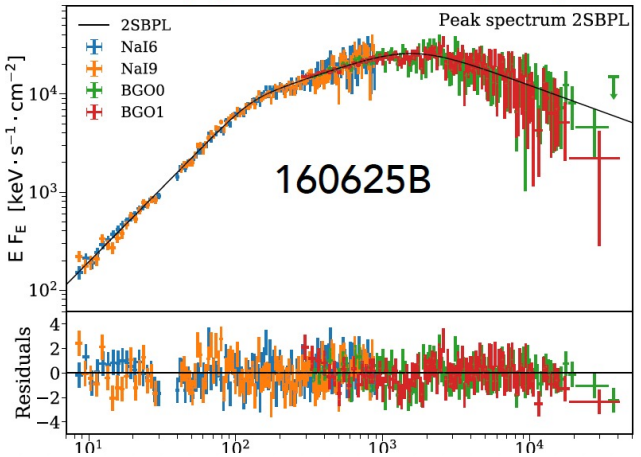
Fermi GBM data

- Out of the 10 brightest GBM GRBs, 8 have low energy breaks

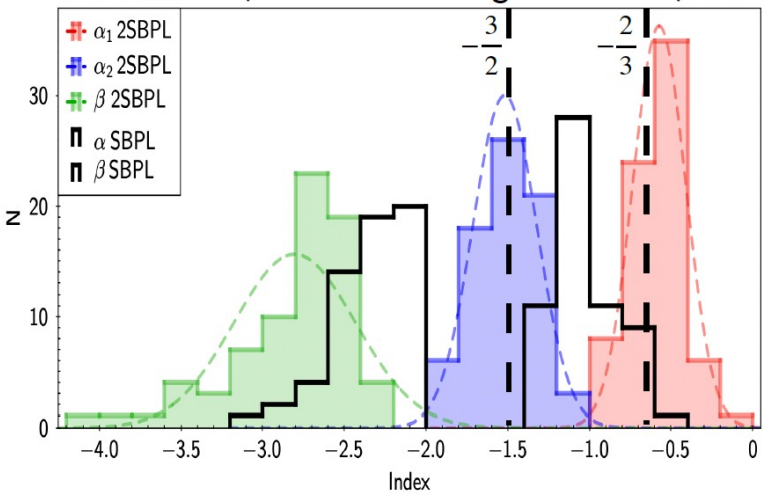
Ravasio,..., LN et al., 2019, A&A, 625, 60



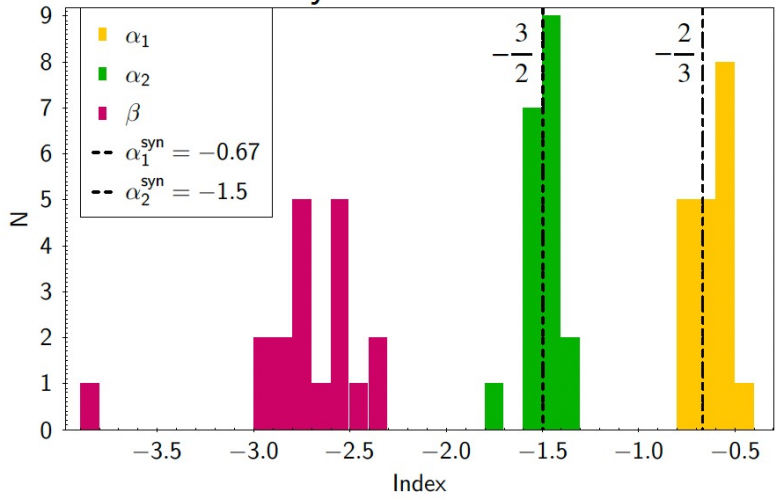
Ravasio,..., LN et al., 2018, A&A, 613A, 16



Photon index distribution of the 8 GRBs with breaks (out of the 10 brightest GRBs)



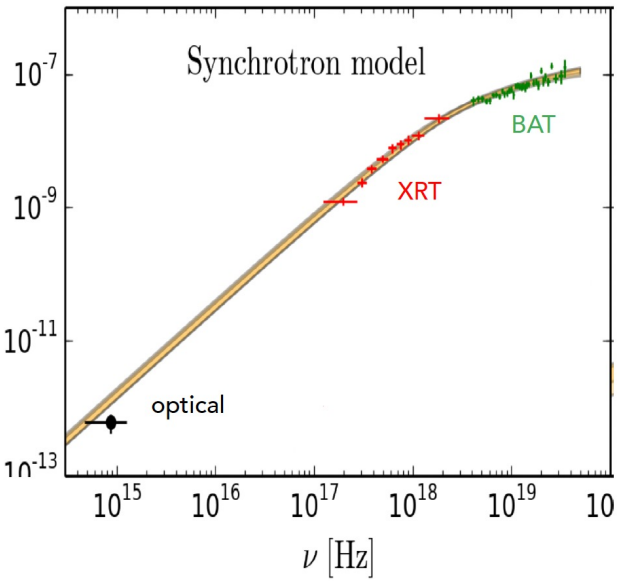
Photon index distribution time-resolved spactral analysis of GRB 160625B



Implications

- We are potentially able to constrain ν_c in addition to ν_m and p.
- A large ν_c, i.e. in the keV band, imply a magnetic field lower than expected and a larger emission region R, in order to suppress SSC.
- GWAC/GFT observations can further constrain these parameters (see Oganesian+19)

Oganesyan, LN, et al., 2019, A&A, 628, 59



Sample of 21 GRBs with simultaneous optical, XRT and BAT data. Synchrotron provides a good fit.