Broadband Modeling of the GRB Prompt Emission from Optical to Gamma-rays;

Exploring GRBs as Standard Candles

Sylvain Guiriec

(The George Washington University / NASA GSFC)

on behalf of

C. Kouveliotou, D. Hartmann, R. Mochkovitch, F. Daigne, N. Gehrels & J. McEnery, …

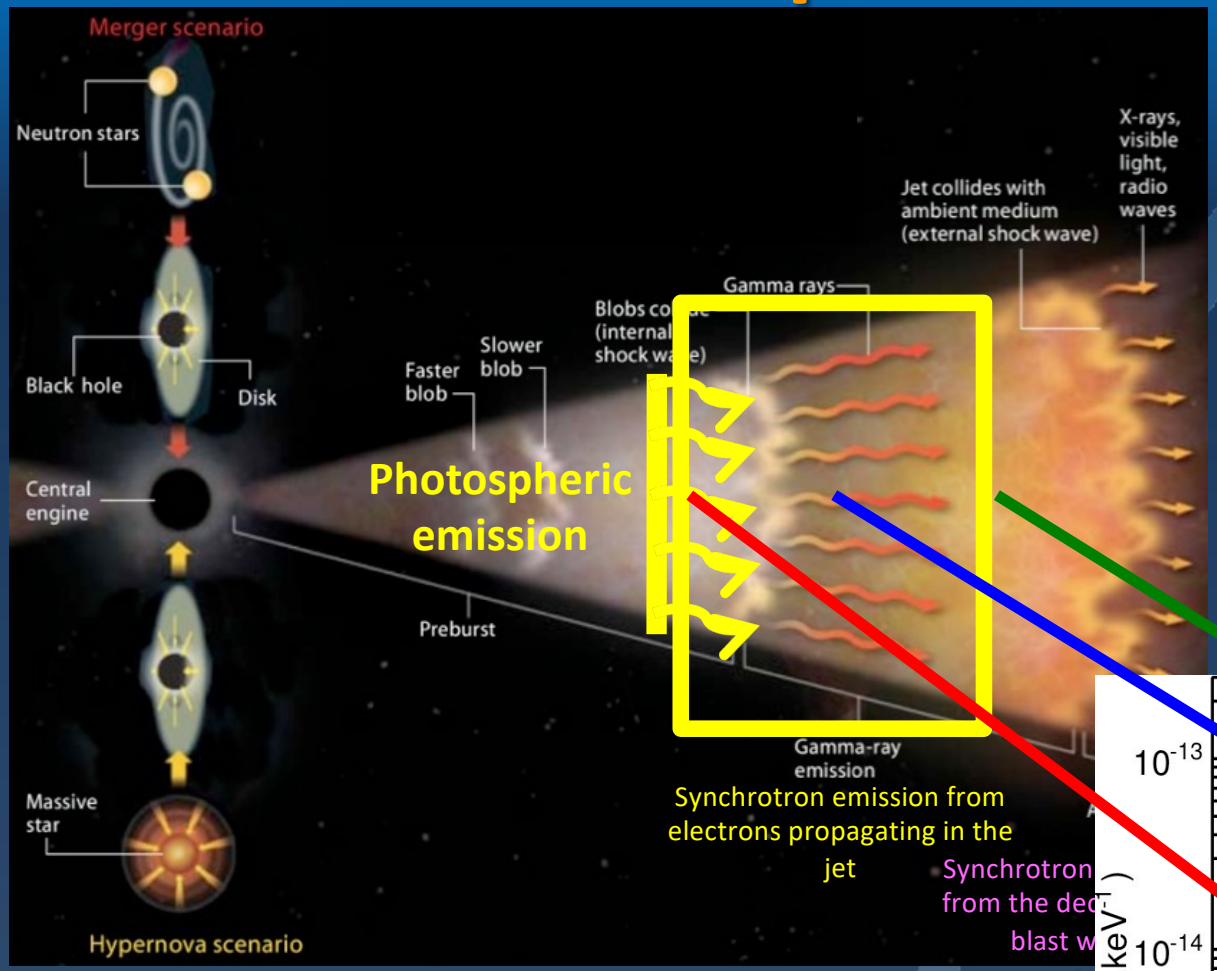
THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

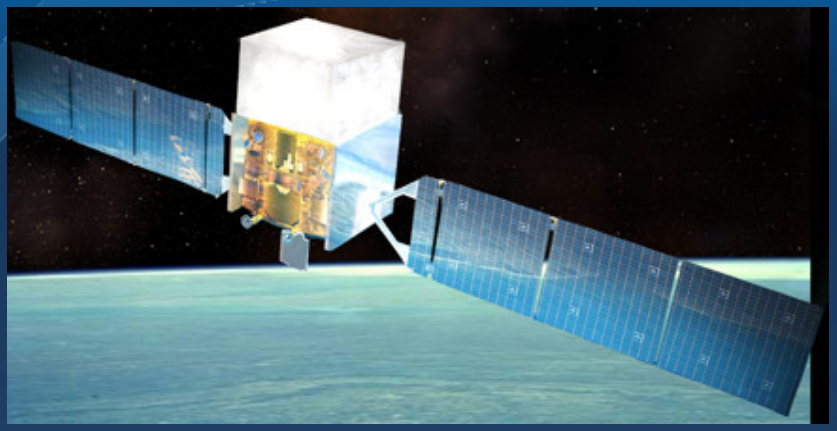
NASA

Fermi Gamma-ray Space Telescope

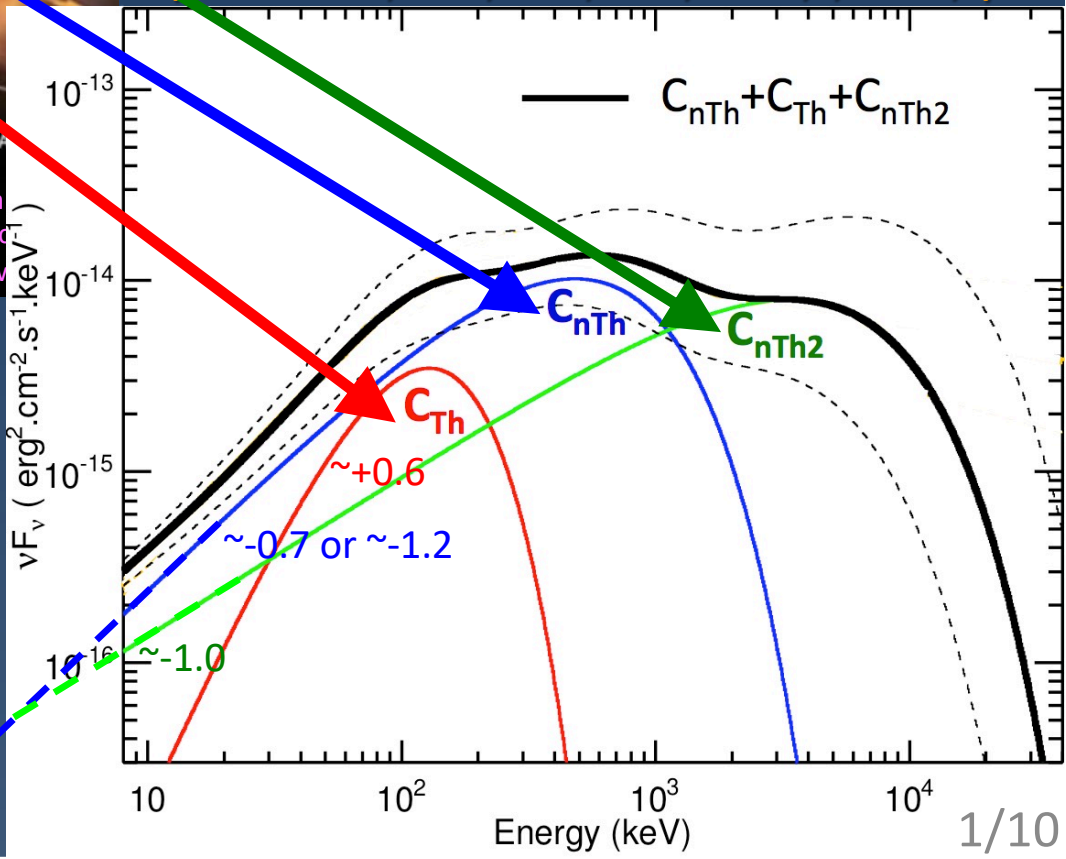
THESEUS Conference – March 25th, 2020

A New GRB Prompt Emission Model with Fermi





(Guiriec et al., 2010, 2011, 2013, 2015a,b, 2016a,b)

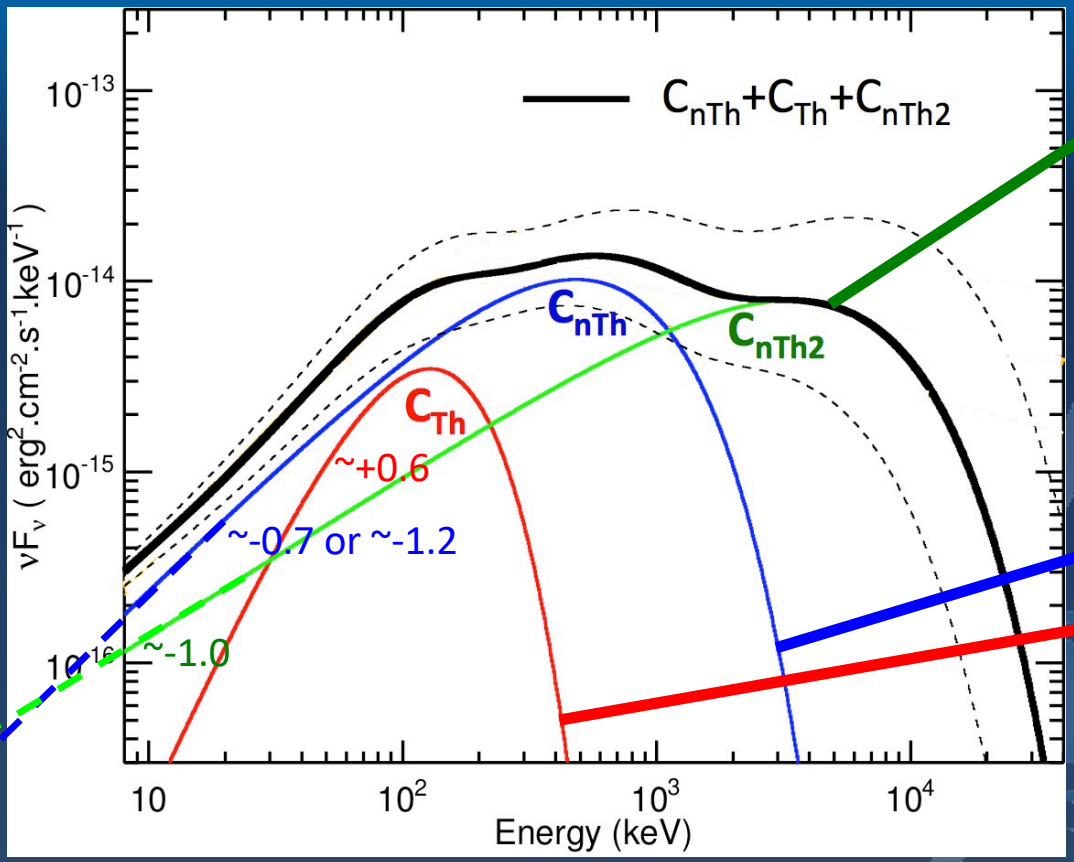


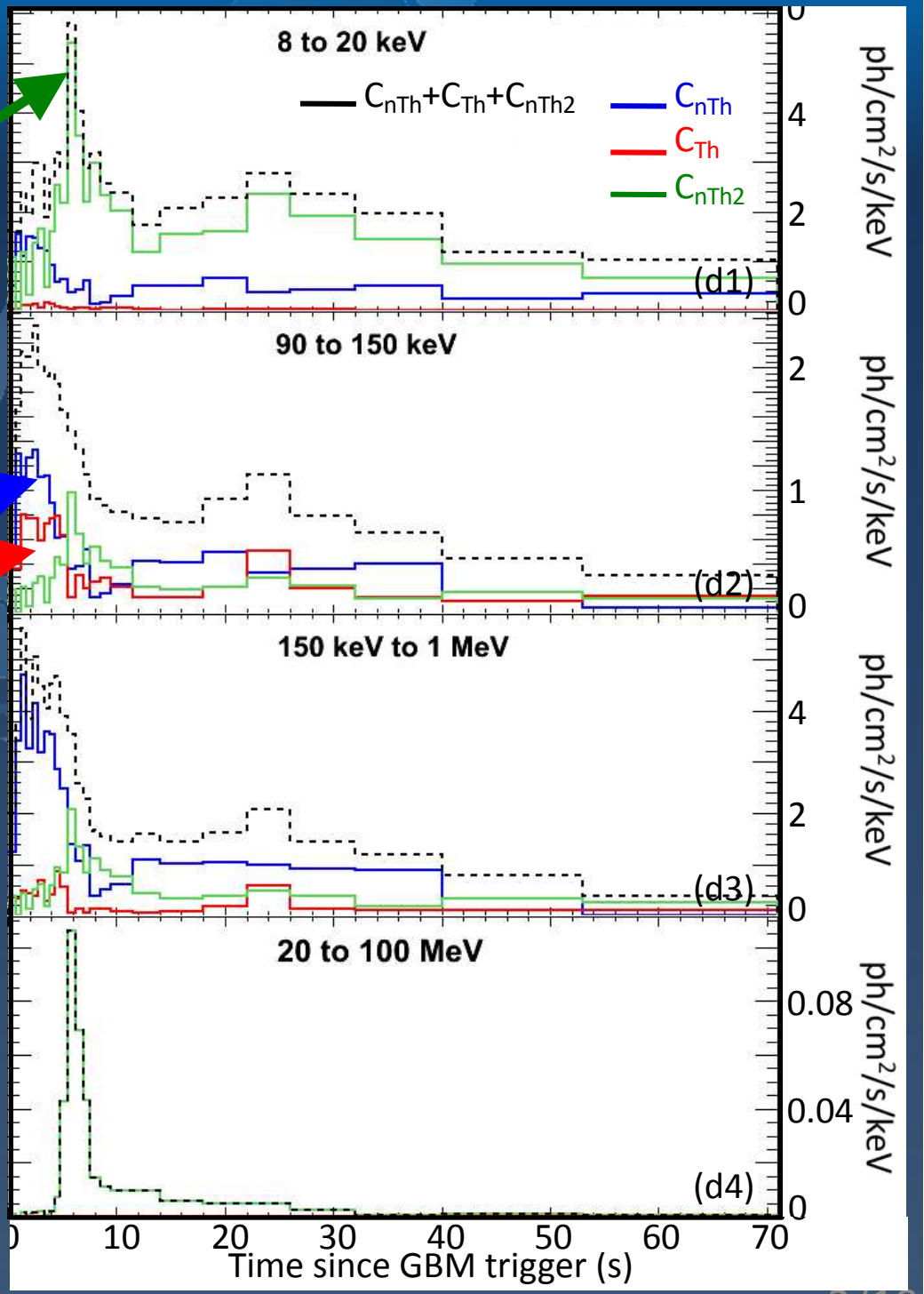
C_{Th}: thermal-like emission from the jet photosphere.

C_{nTh}: non-thermal emission - synchrotron (e.g., internal shocks, …).

C_{nTh2} (not always present): non-thermal emission from magnetic reconnections.

Spectro-Temporal Evolution with $C_{nTh1}+C_{Th}+C_{nTh2}$





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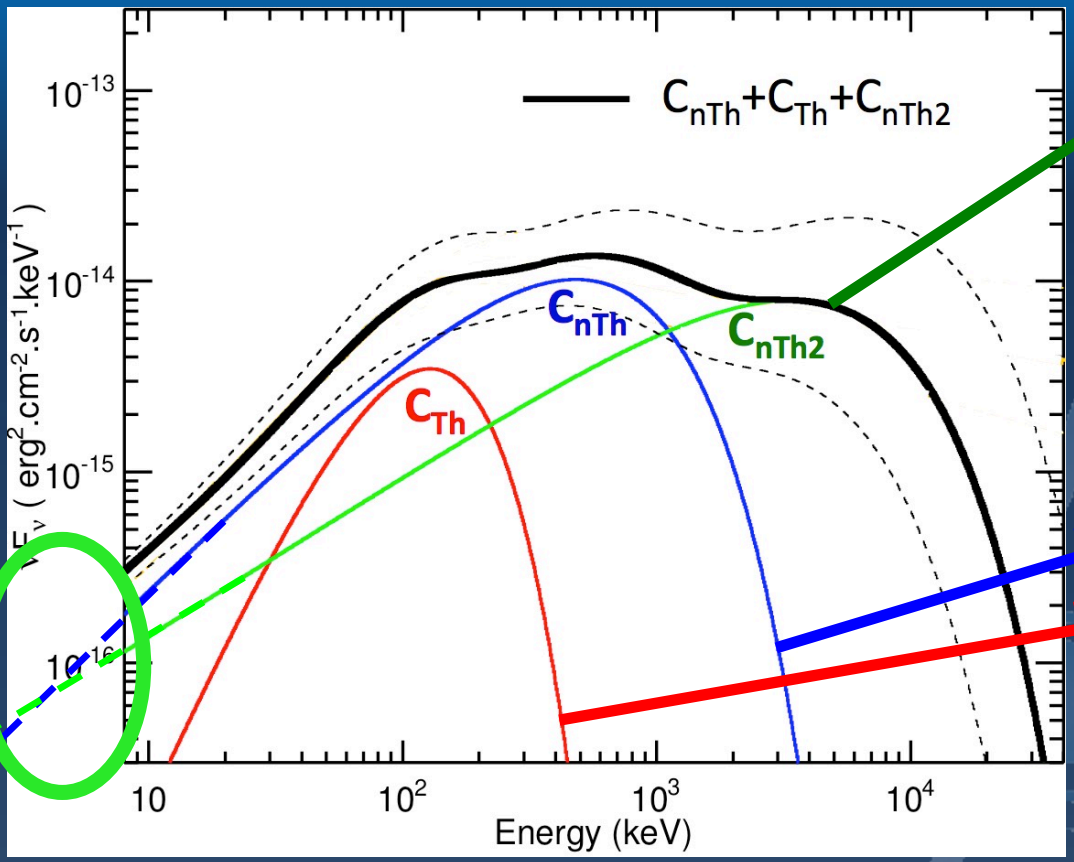

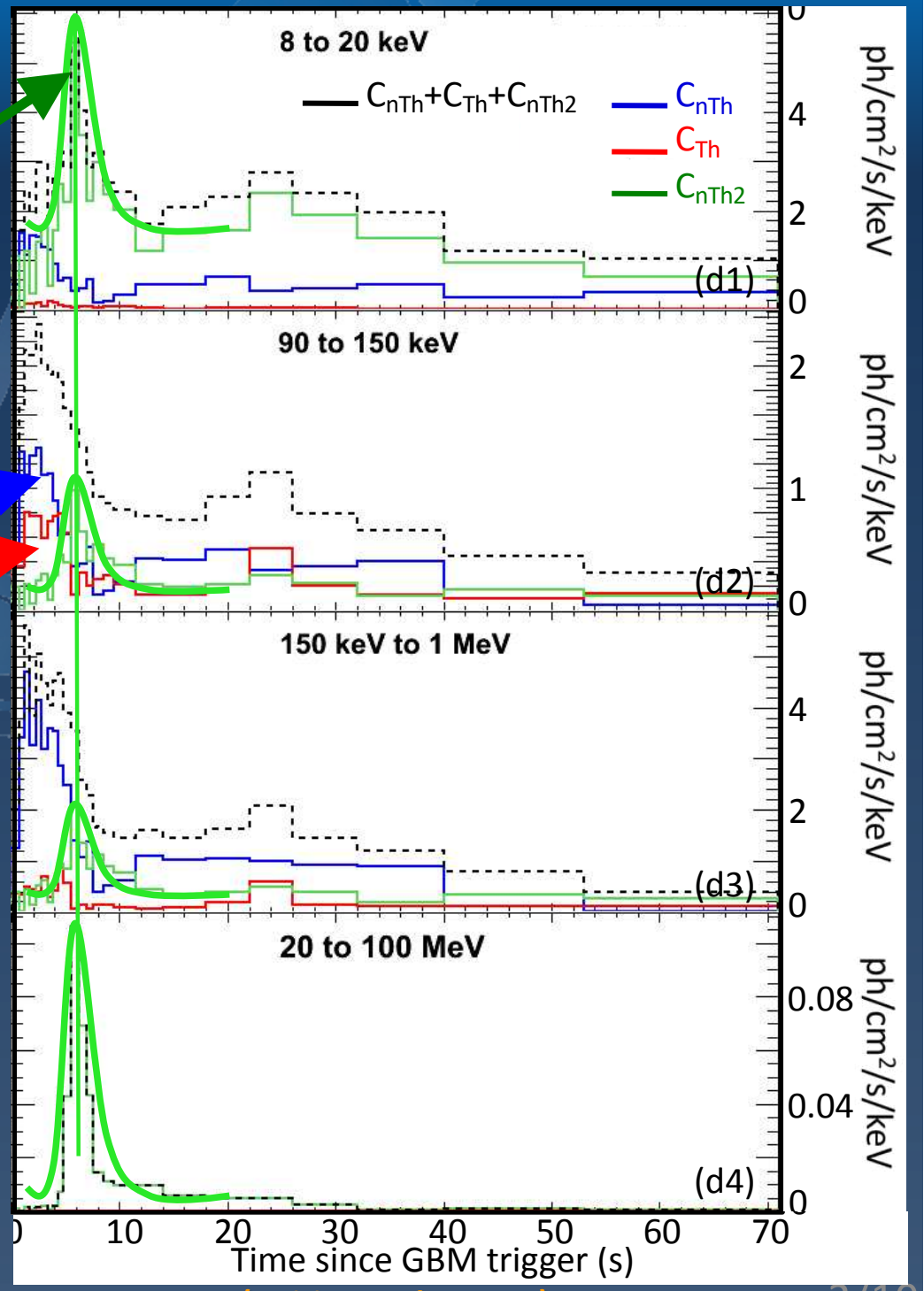

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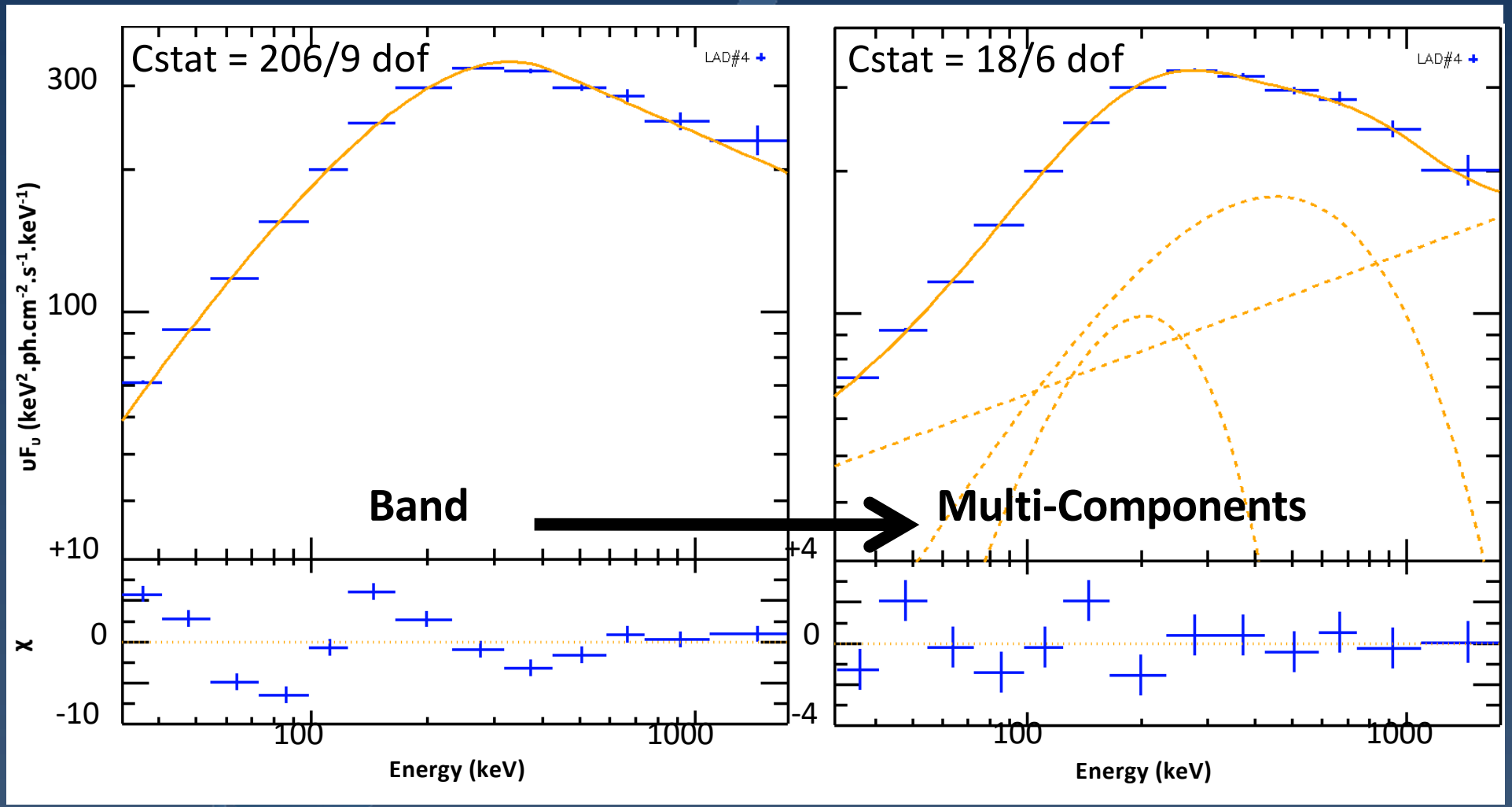
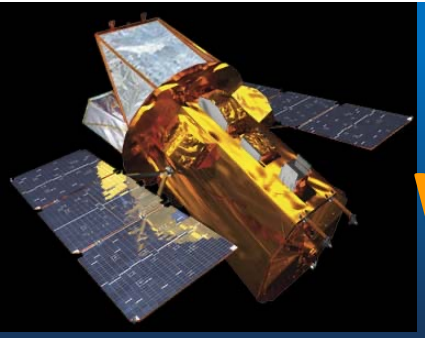
Does Only Fermi Capture Those Components ?

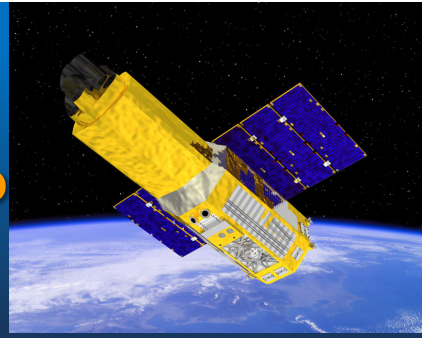
BATSE GRB 941017

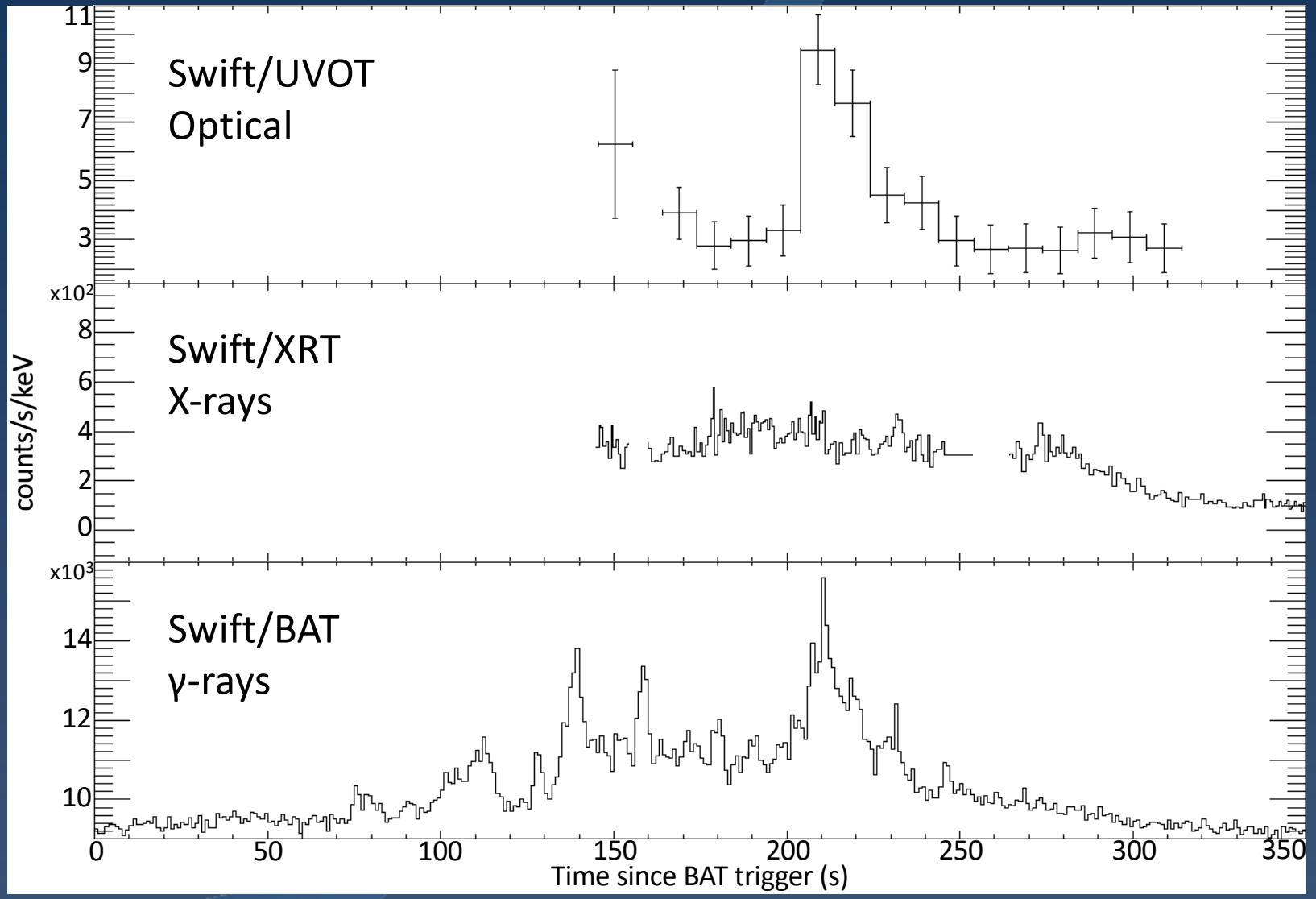


(Guiriec et al., 2016a)

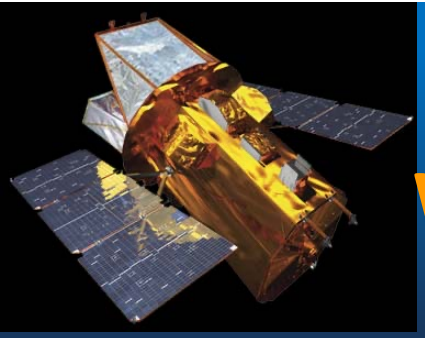


Swift/Suzaku GRB 110205A: What About Optical Prompt Emission?

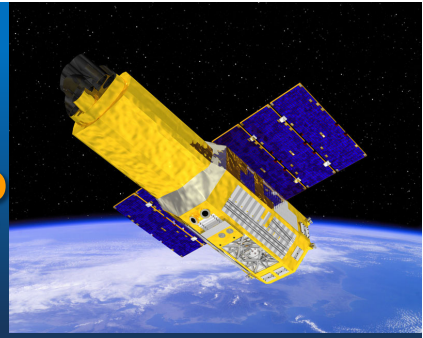


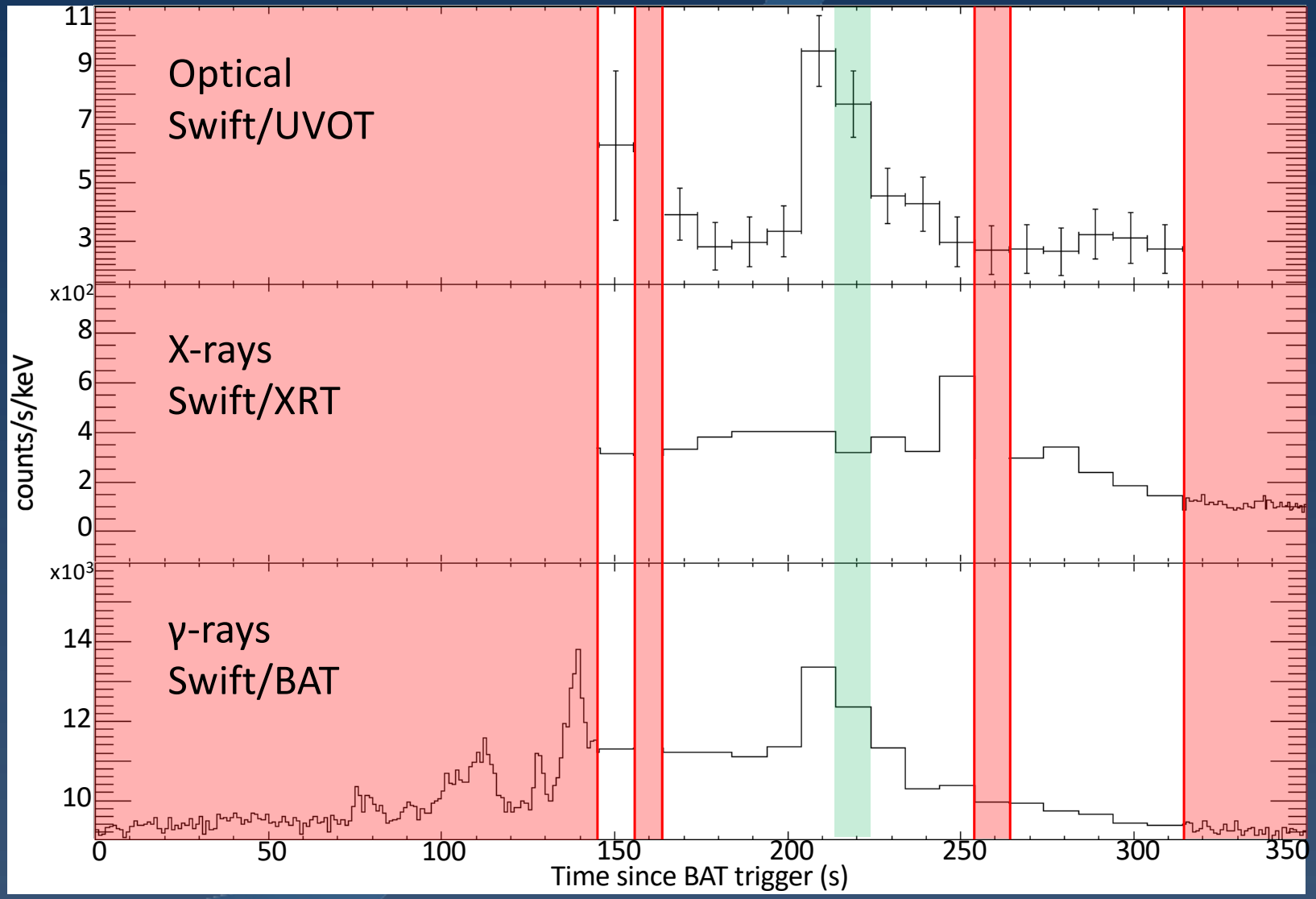


(Guiriec et al., 2016b)



Swift/Suzaku GRB 110205A: What About Optical Prompt Emission?





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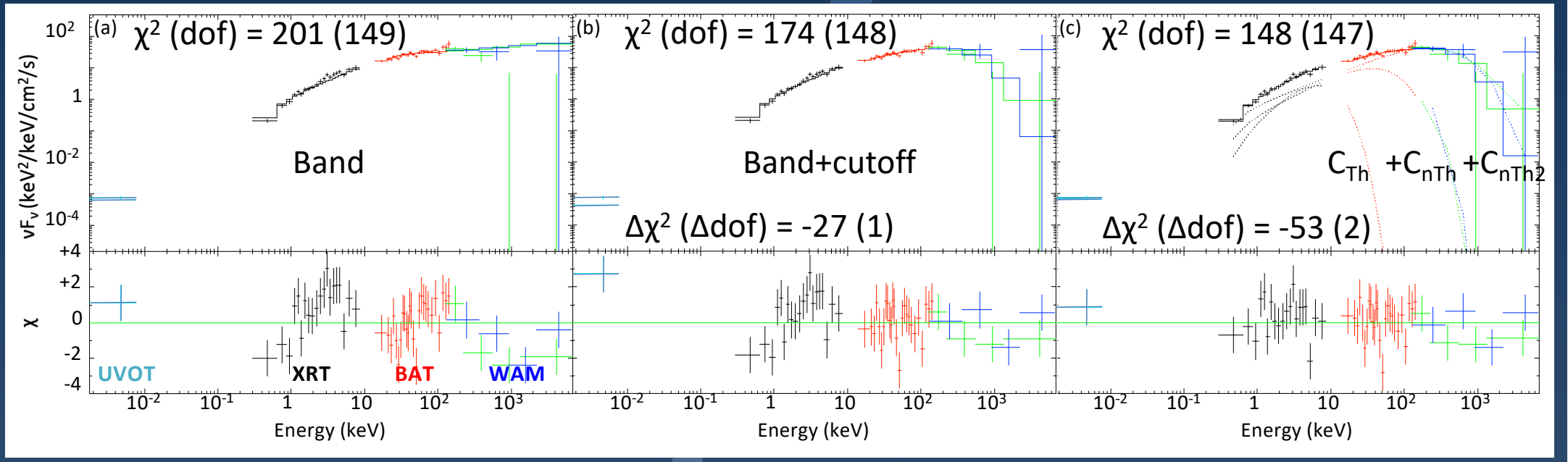
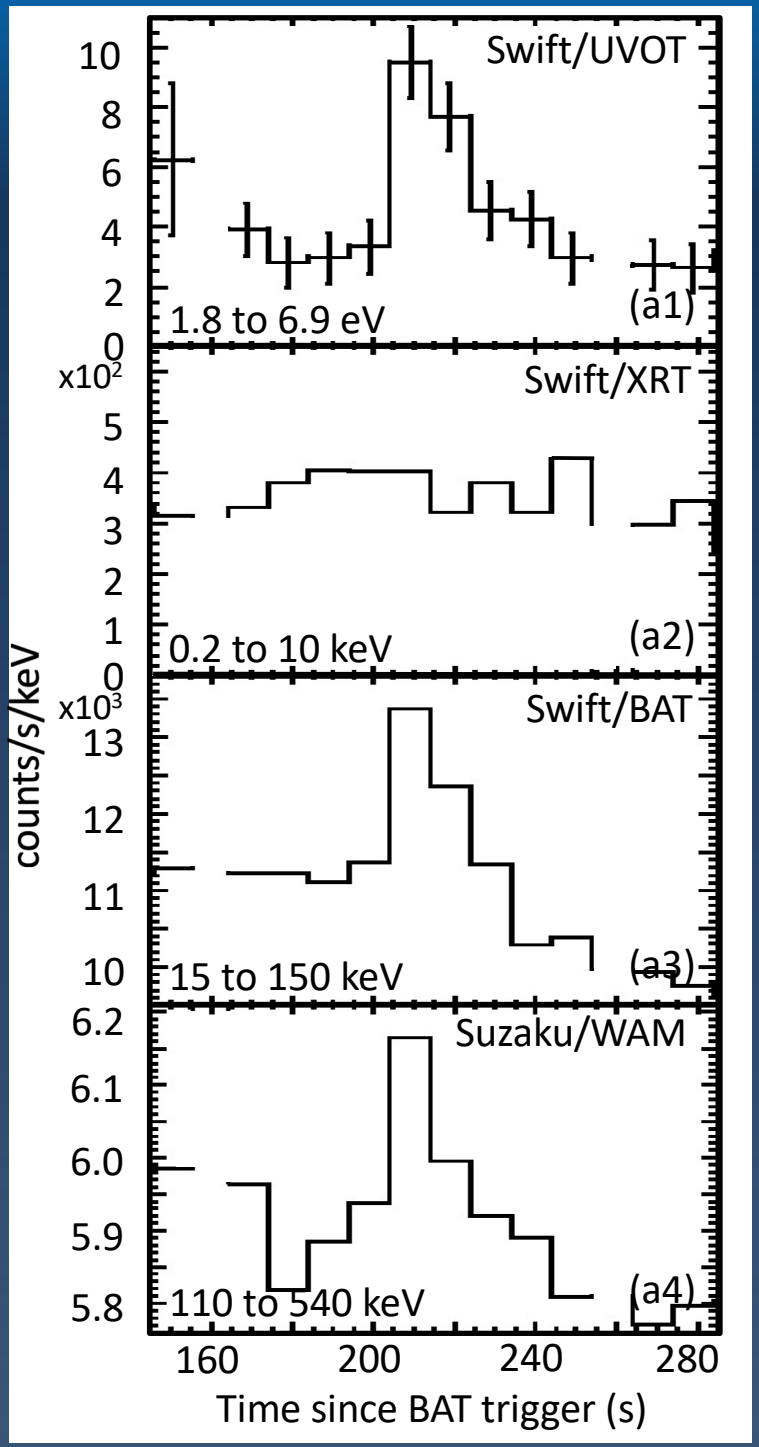
Broadband Prompt Emission



(Guiriec et al., 2016b)

4 free parameters | **5 free parameters** | **5-6 free parameters**

How Predictive is the Model?



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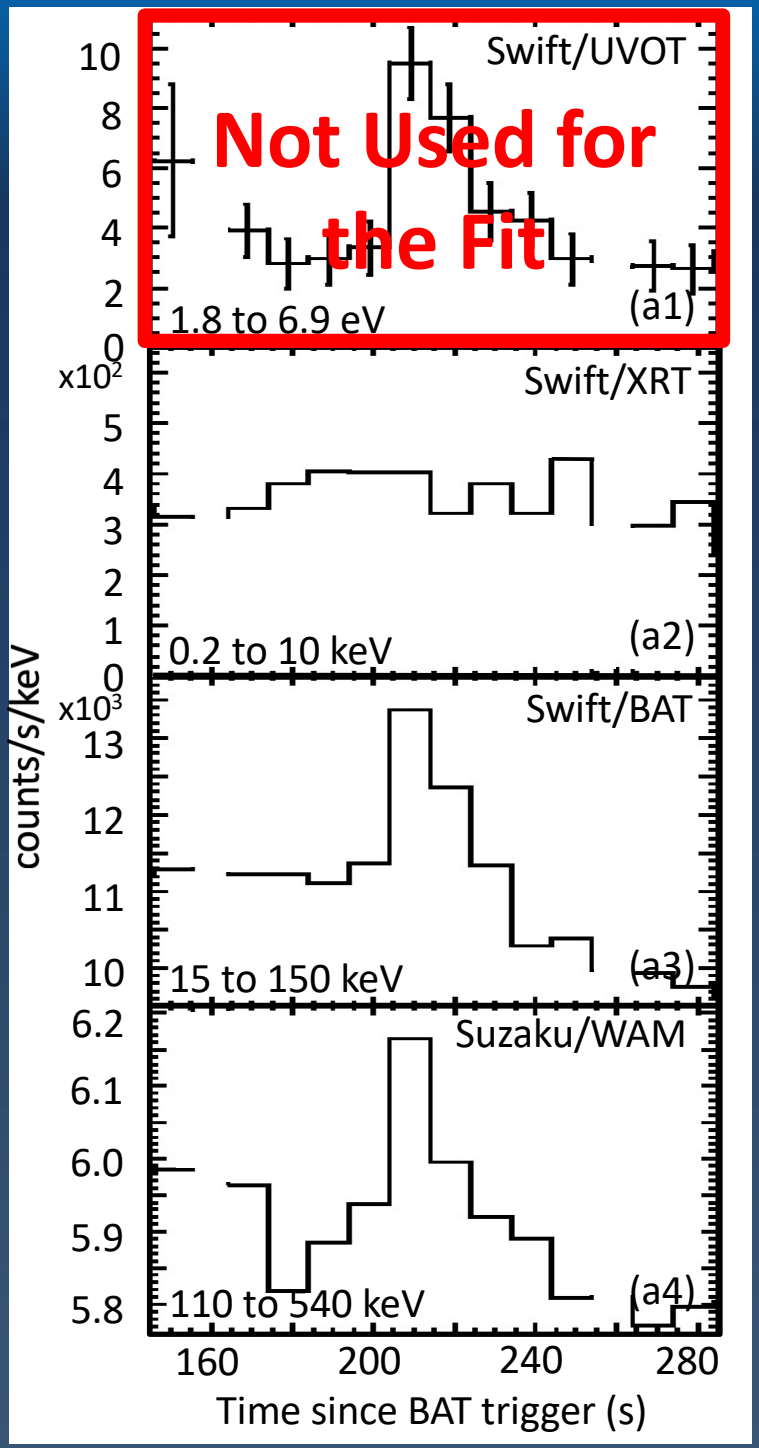

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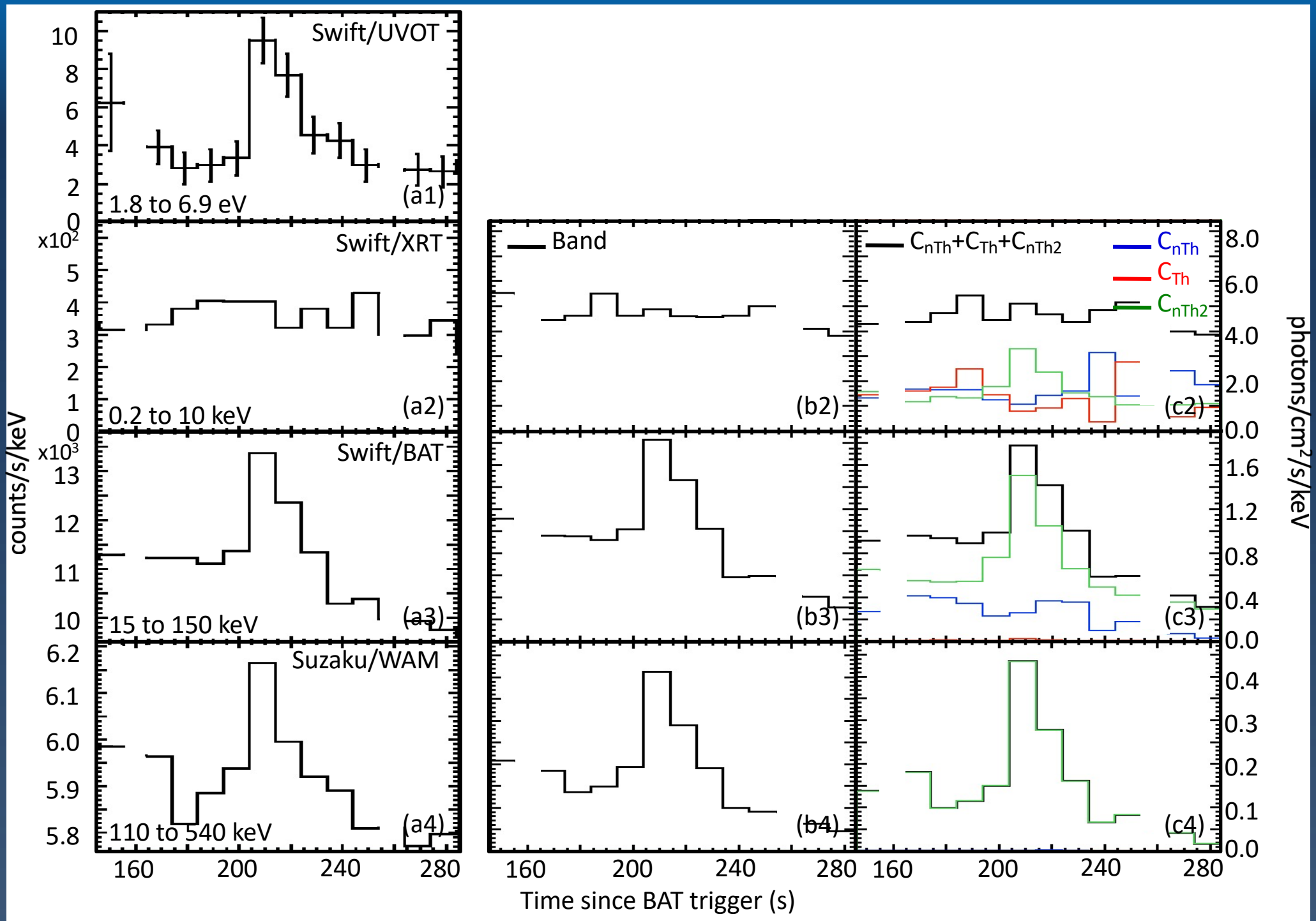

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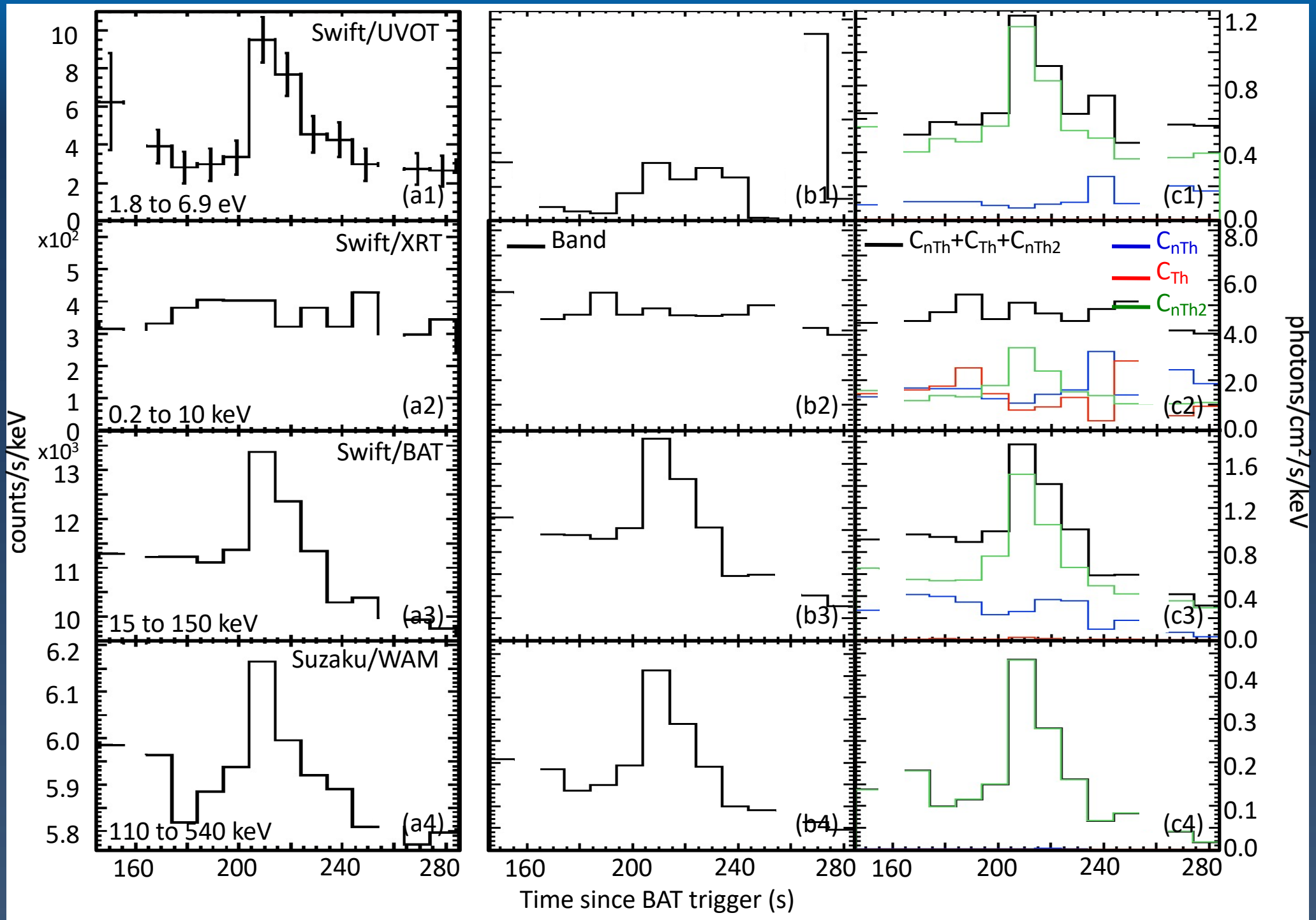

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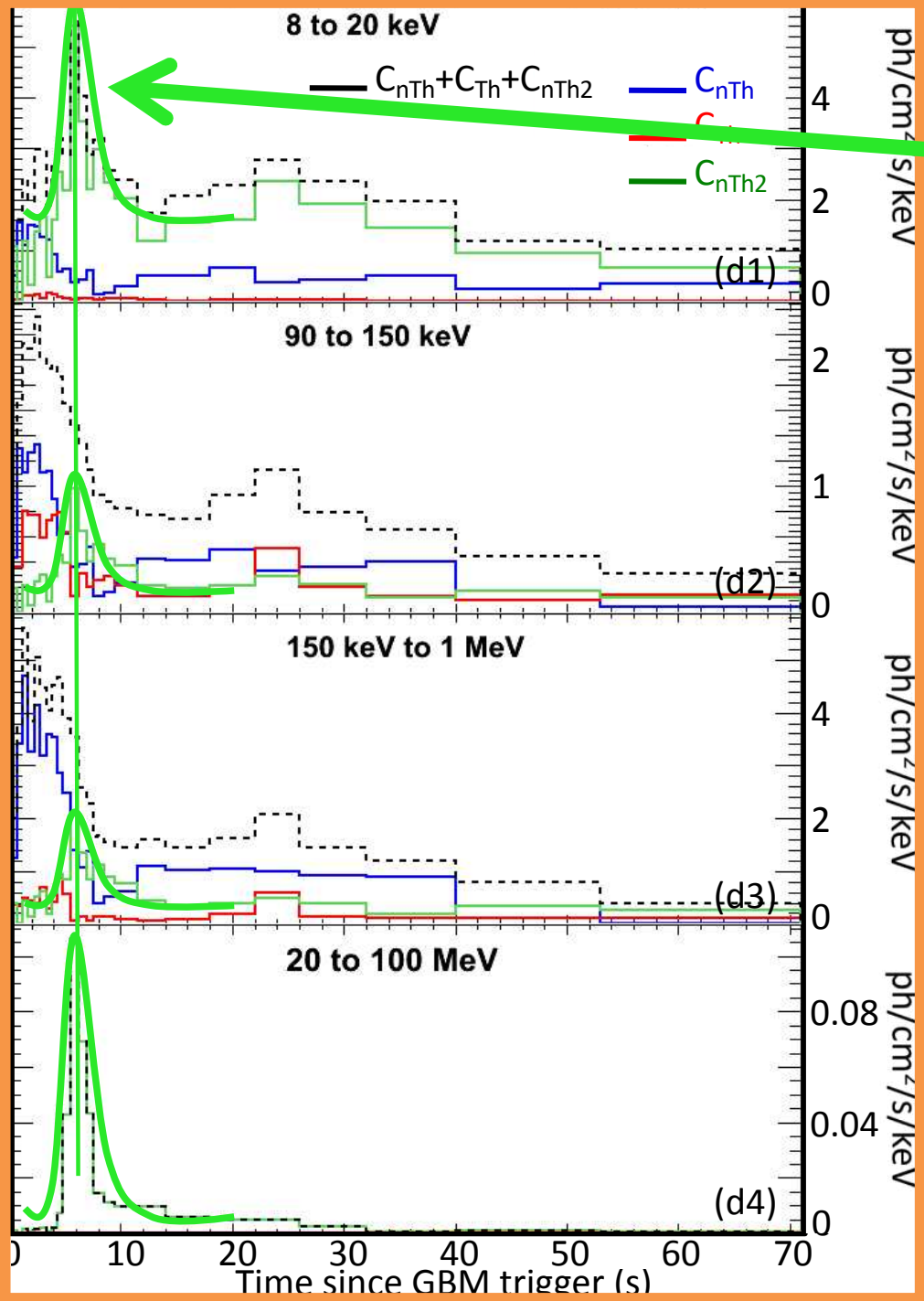
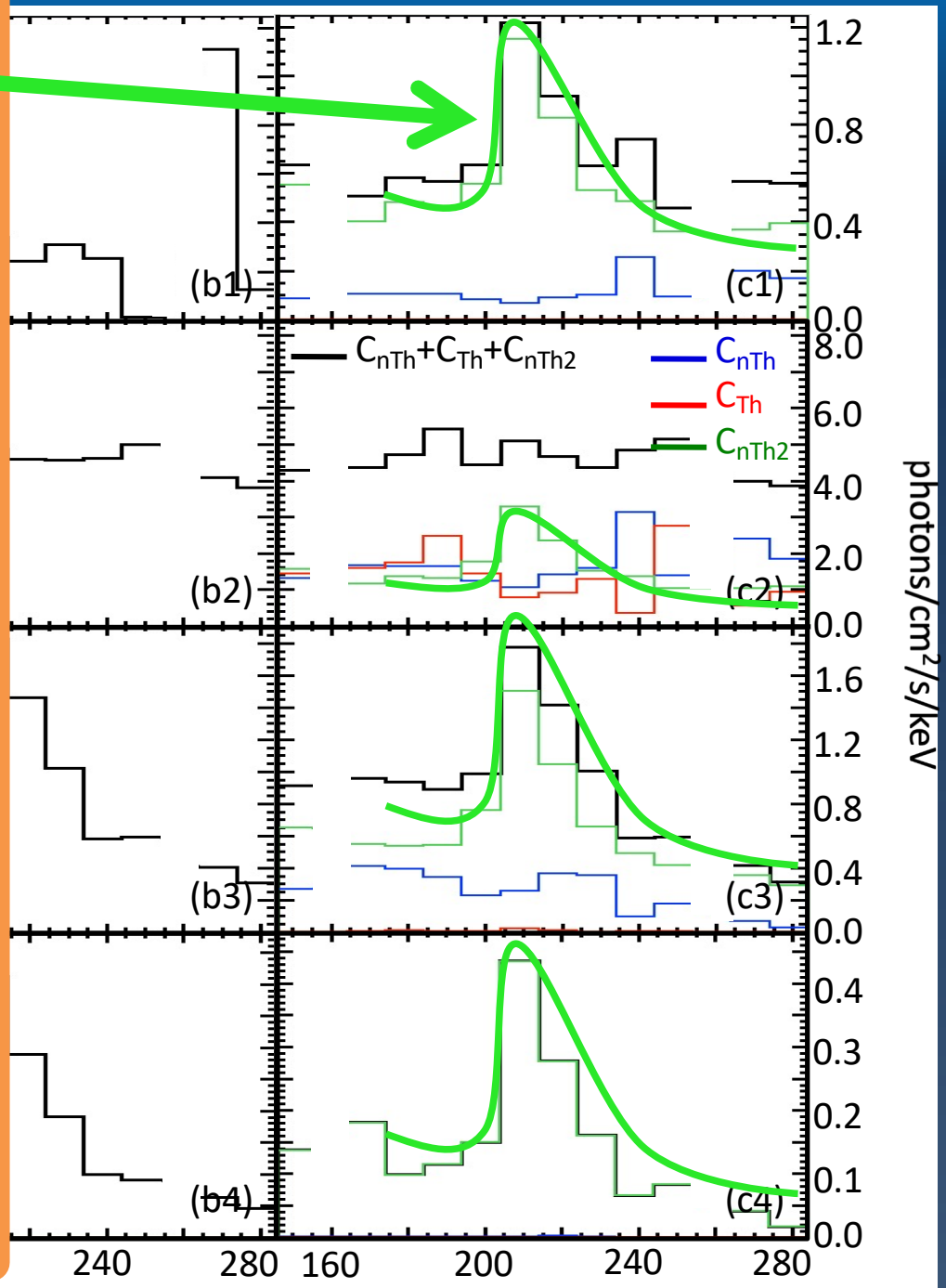
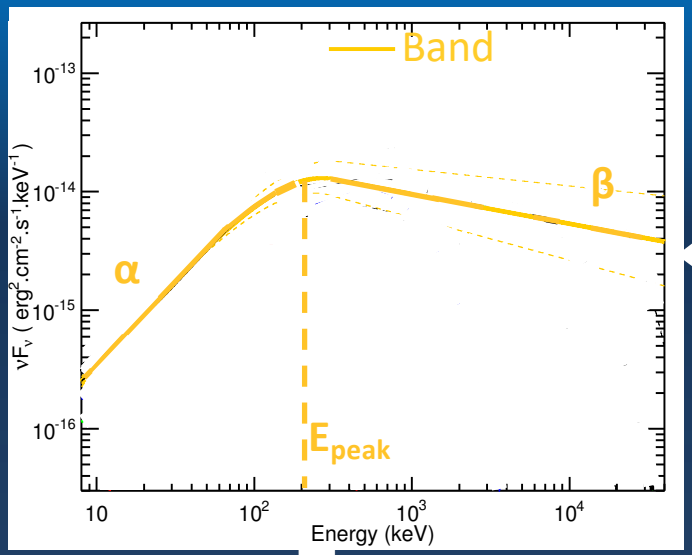
is the Model?

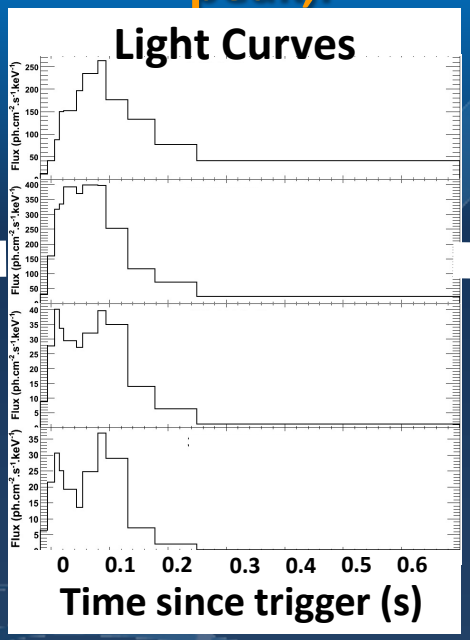


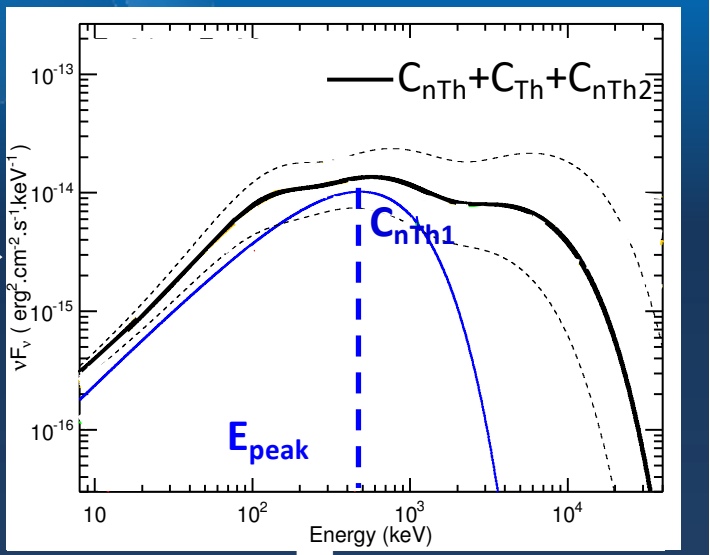


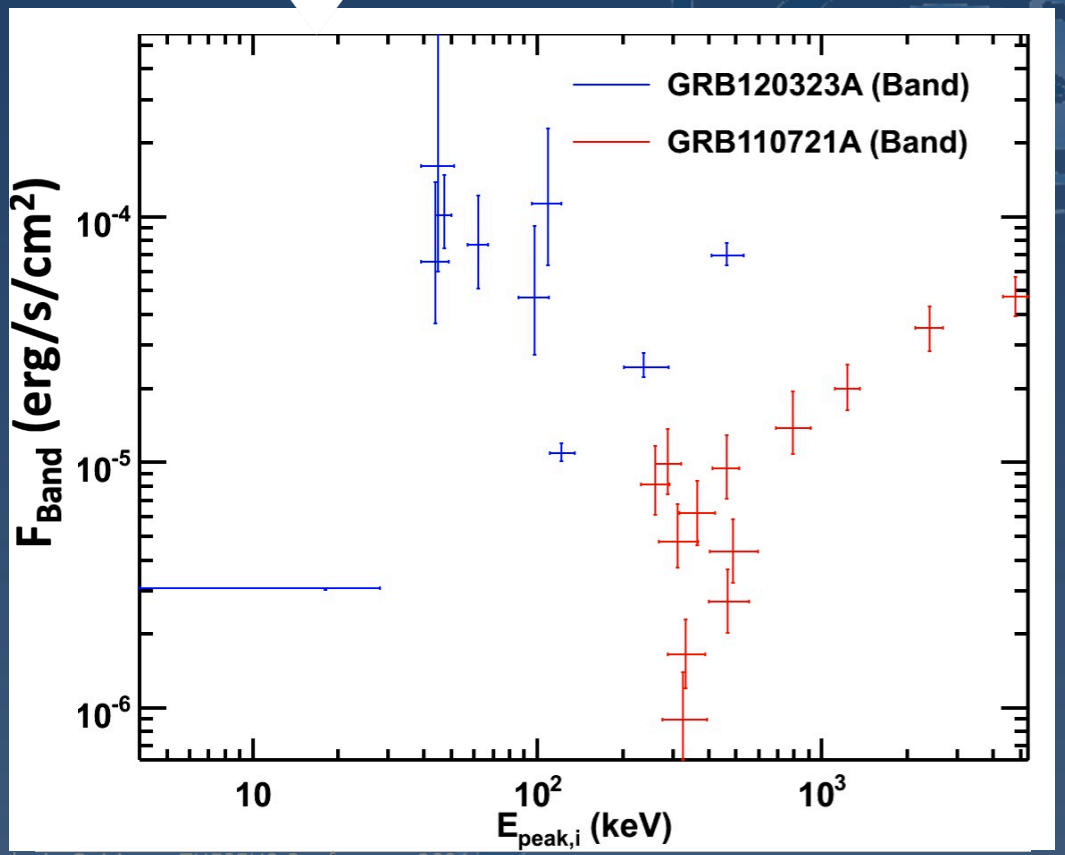
(Guiriec et al., 2016b)

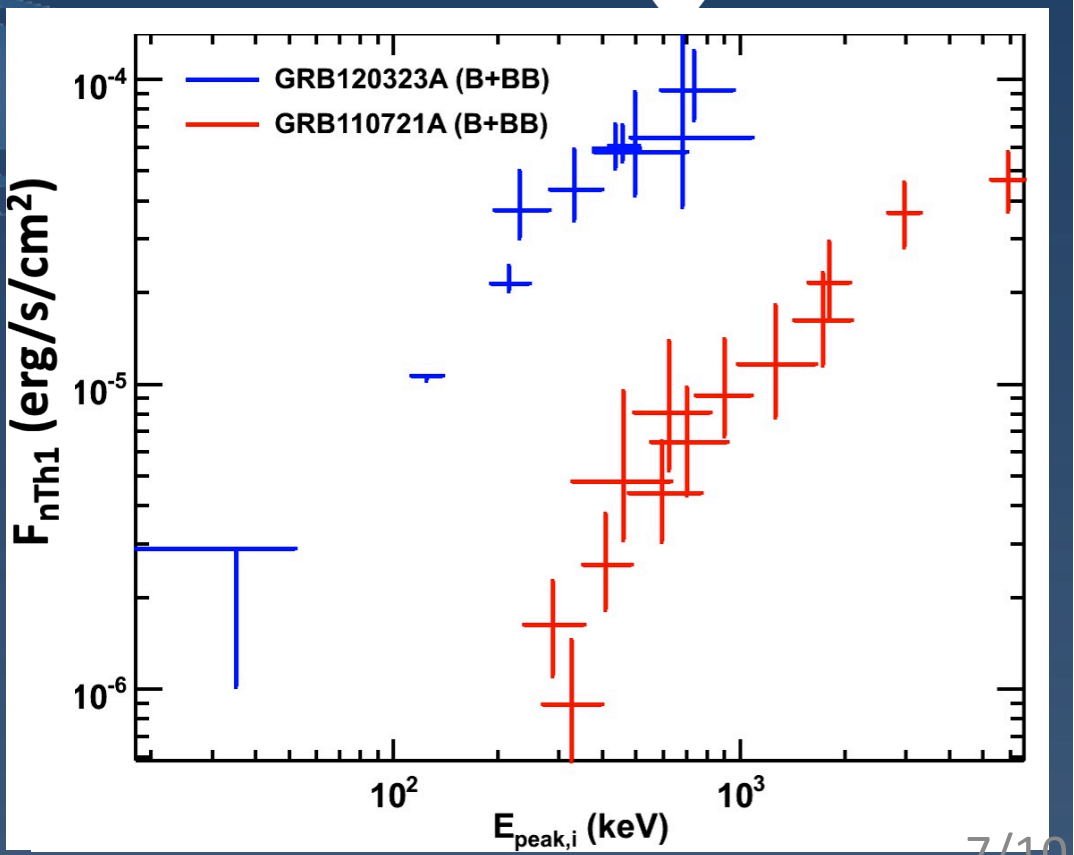
The F_i^{nTh1} -$E_{peak,i}^{nTh1}$ Relation



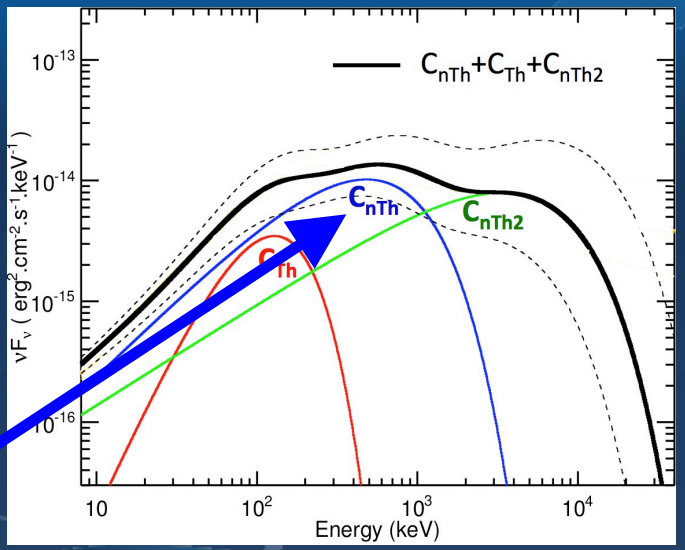


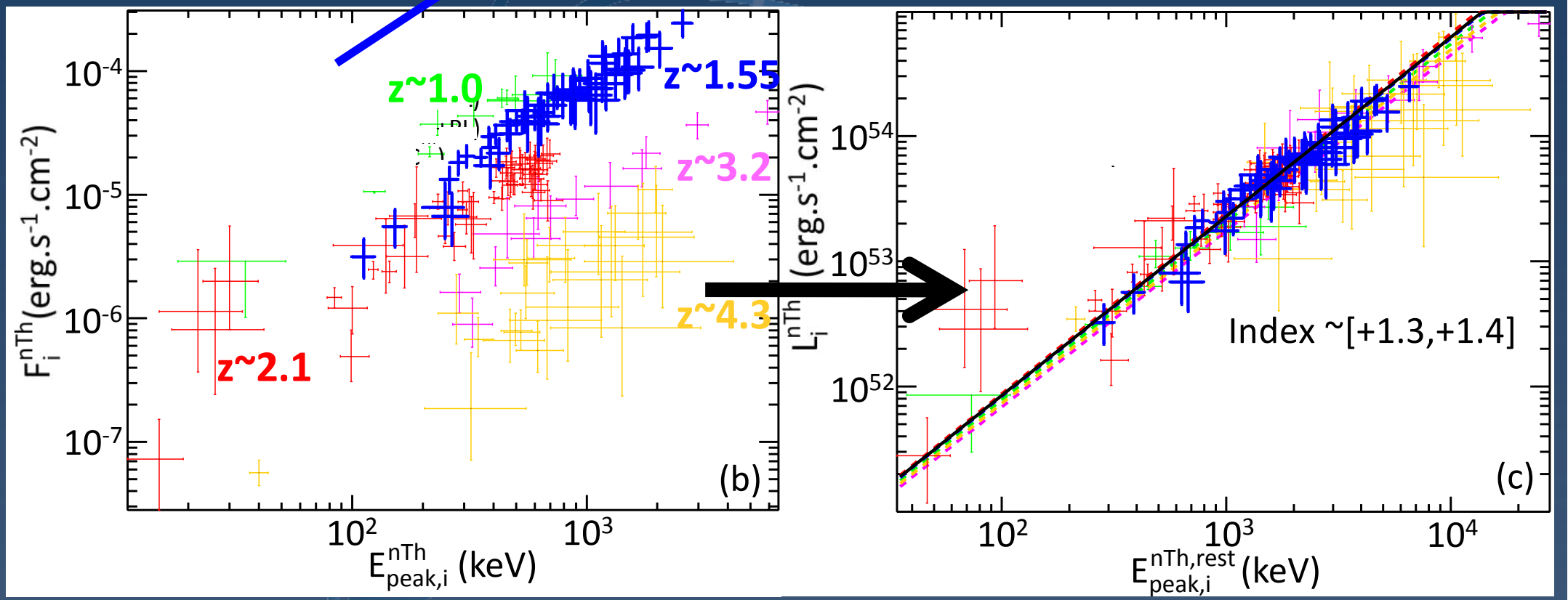






A Strong Correlation: the L_i^{nTh1}-$E_{peak,i}^{nTh1,rest}$ Relation





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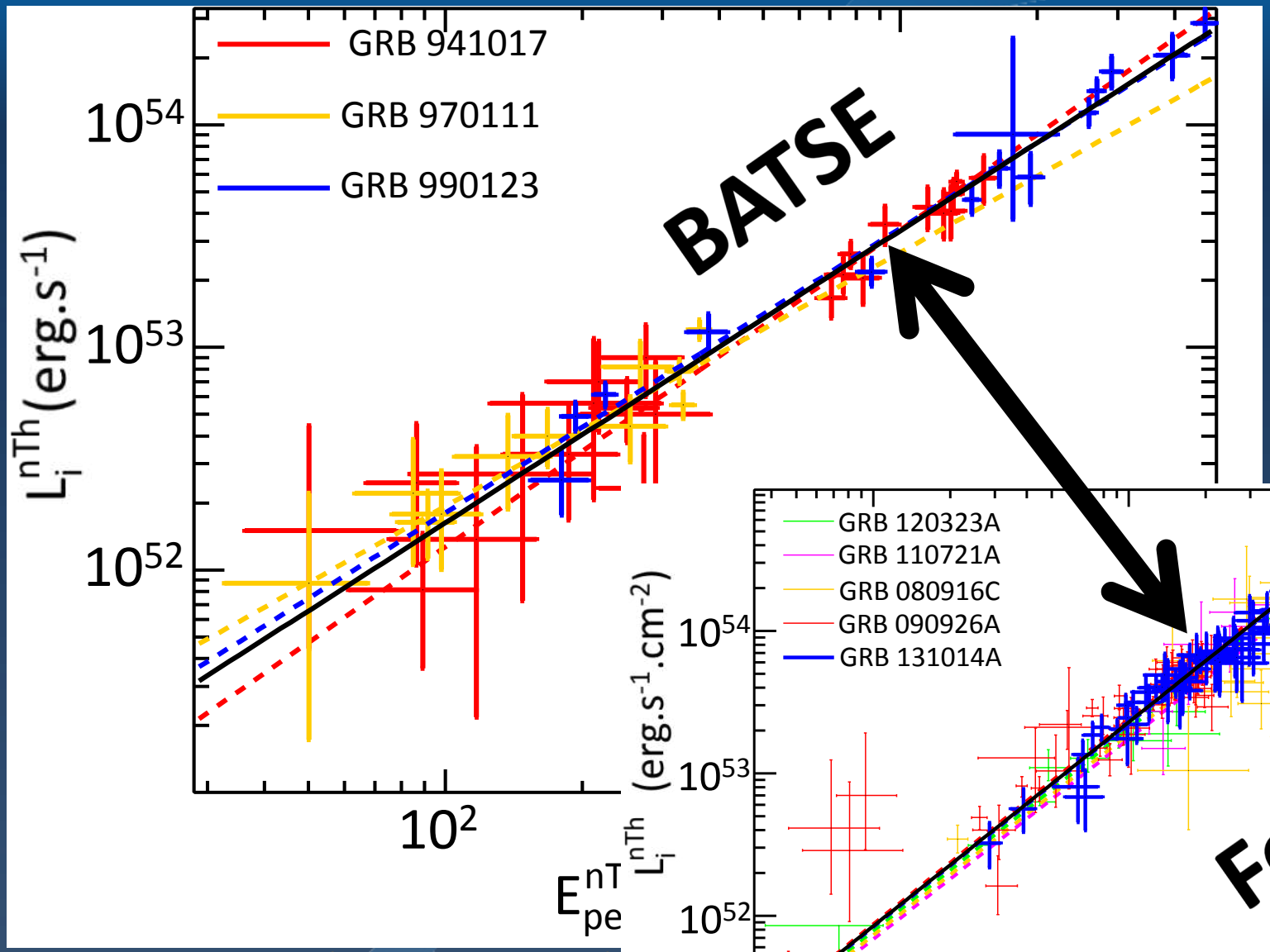

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Summary in a Few Figures

Gamow Explorer & THESEUS

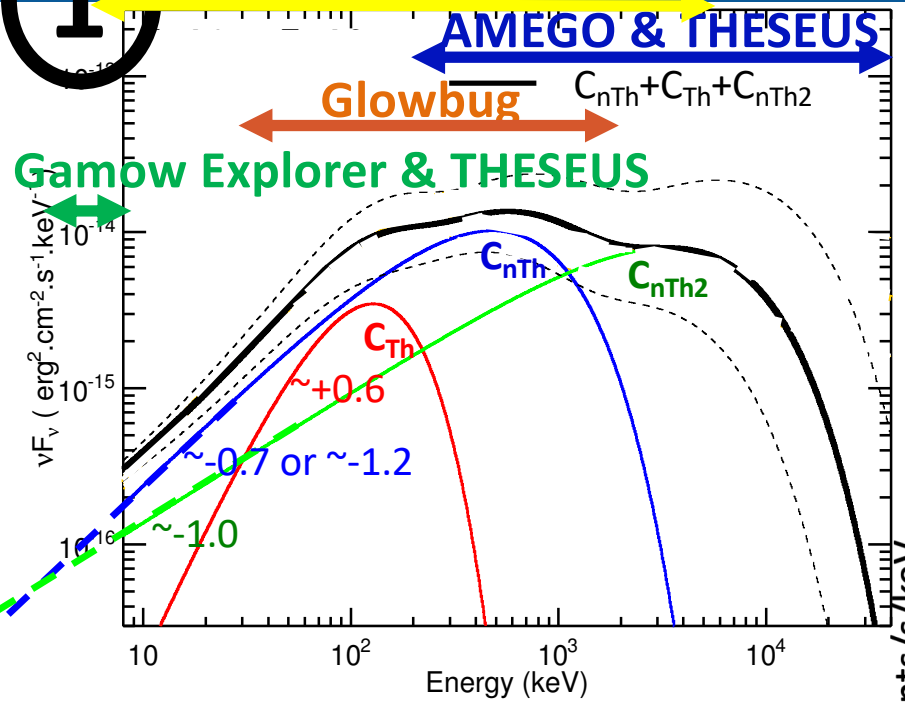
1

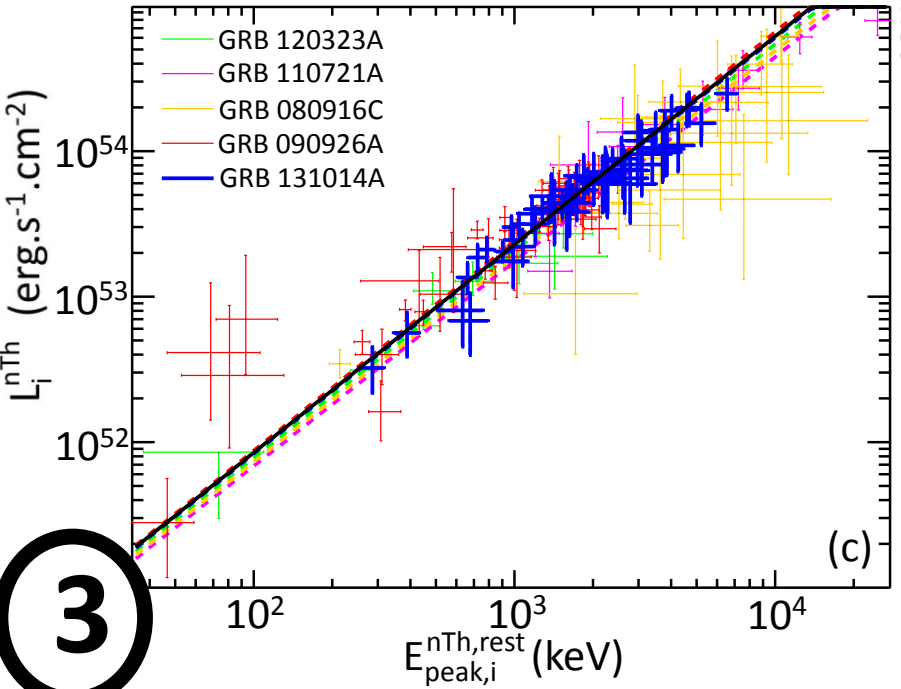
SVOM

AMEGO & THESEUS

Glowbug

Gamow Explorer & THESEUS





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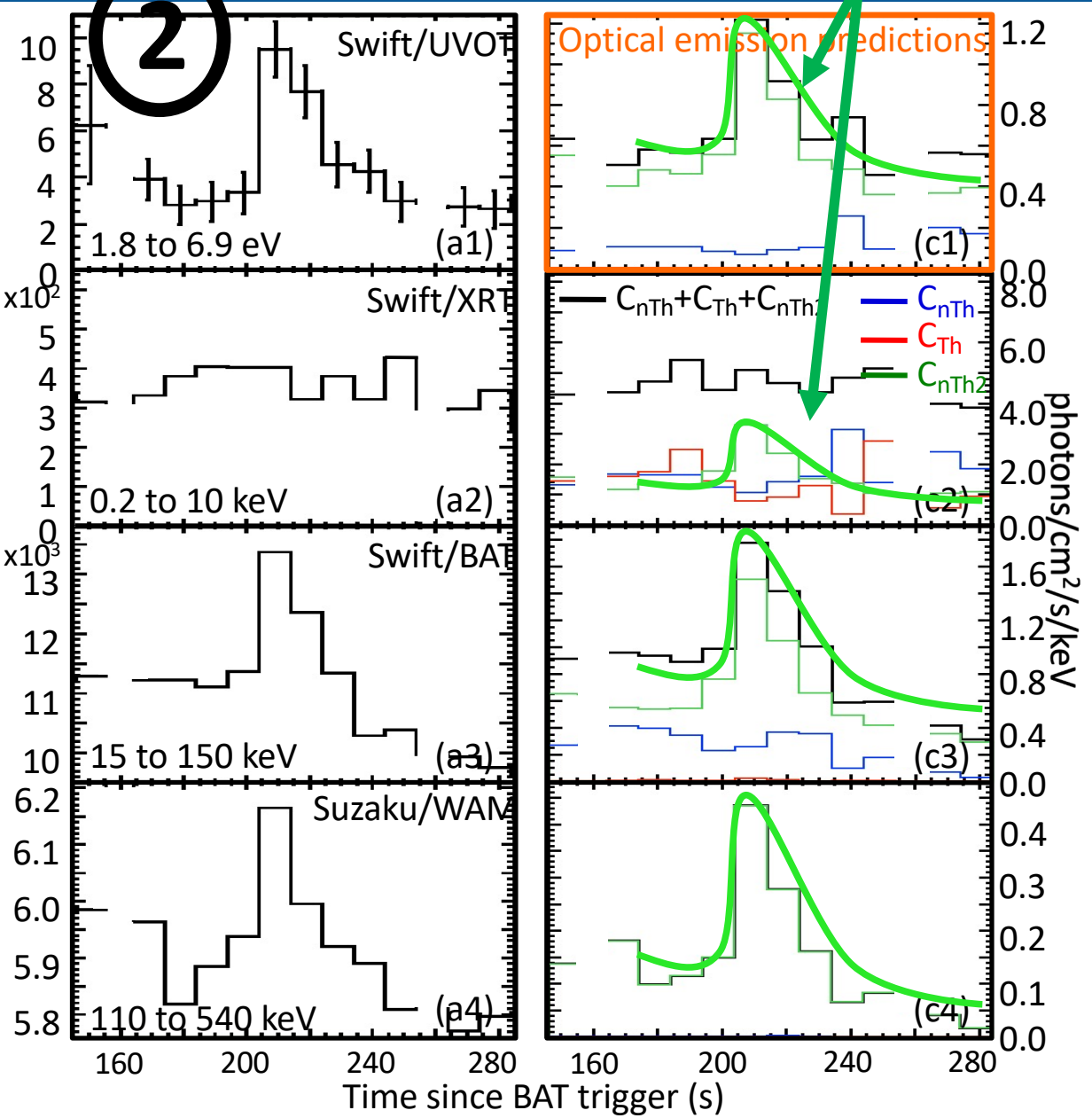
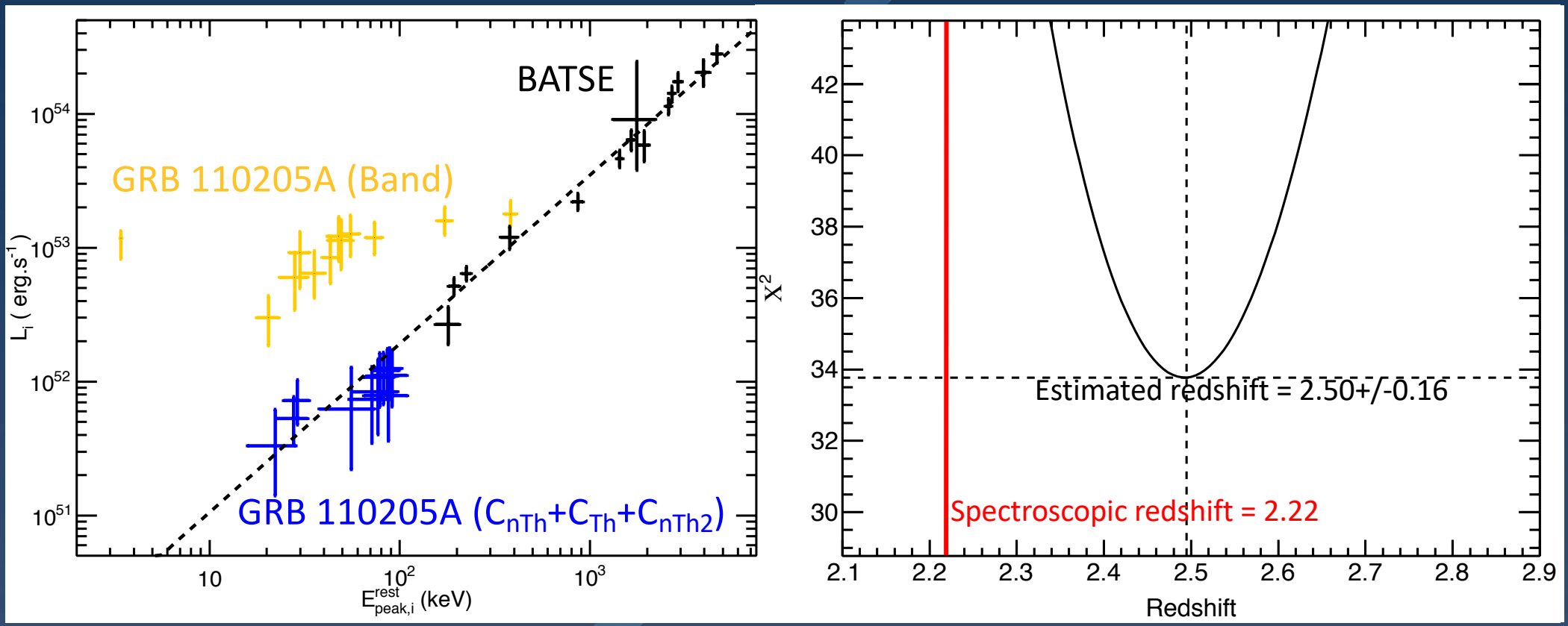


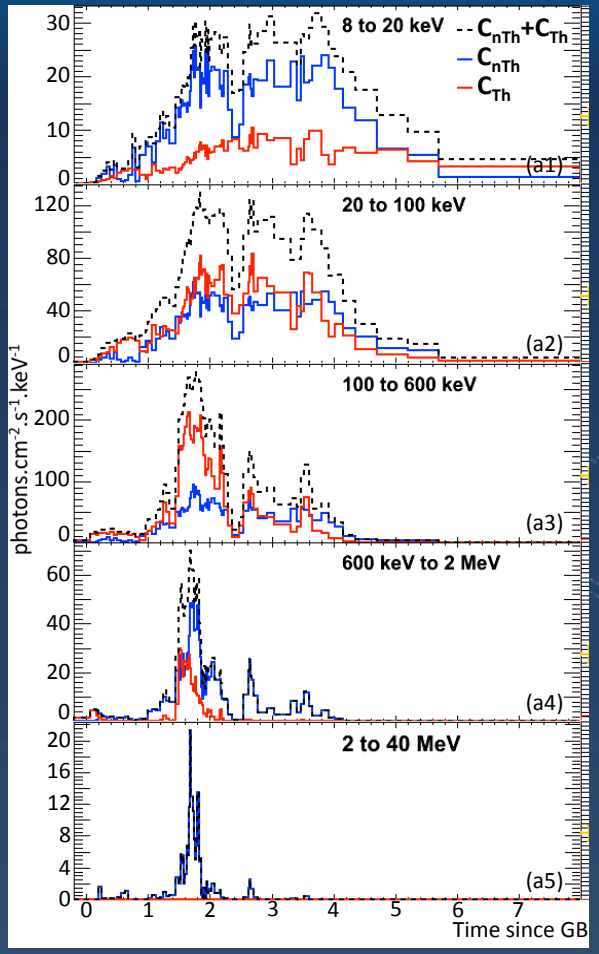
Backup Slides

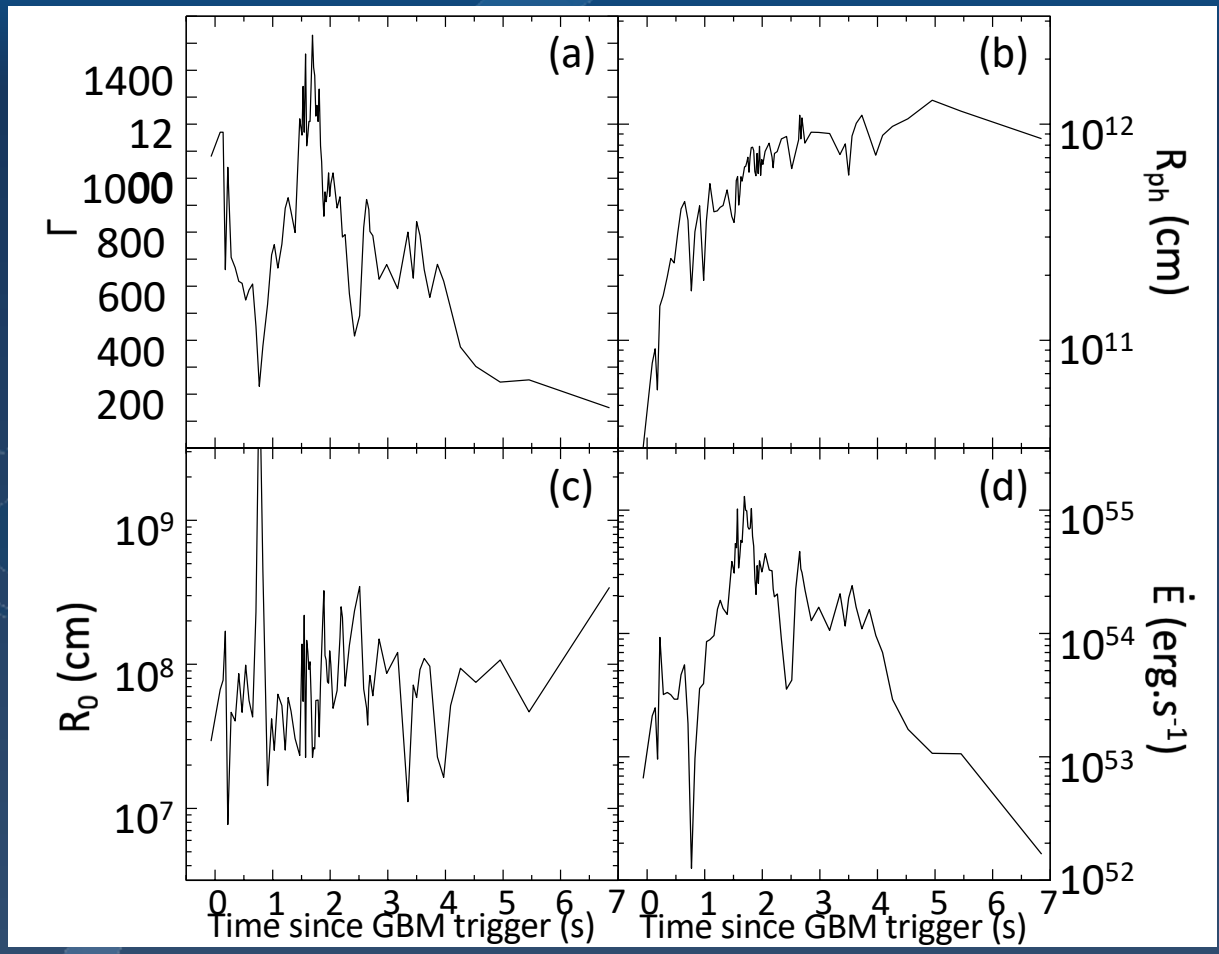
L_i^{nTh}-$E_{peak,i}^{nTh,rest}$ Relation and Redshift Estimation



(Guiriec et al., 2016b)

GRB 131014A: a Laboratory to Study thermal and Non-Thermal Emission





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