GRB 250407A: the COLIBRÍ PhD project

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Enjoy the Universe with COLIBRÍ (workshop), OHP, December 1-4, 2025

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General information

Project page.

Proposal presented in May 2025.
Final light curve shared on the 14th of October.

Trigger: *Fermi-GBM (RA, Dec = 110.75876, 36.79827, from Swift/XRT)*

COLIBRÍ GCN: (J.G. Ducoin and Camila, GCN 40117)

Redshift: $z = 1.36$ (GTC)

Follow-up: KAIT = 20.1 +/- 0.3 (clear filters: GCN 40116 and 40135), COLIBRÍ = 19.96 +/- 0.03 (i), Swift, LCO (r,i,g; fading in r), EP-WXT, SVOM, …
- Observed for 18 nights with COLIBRÍ

Slide 8 of this presentation.

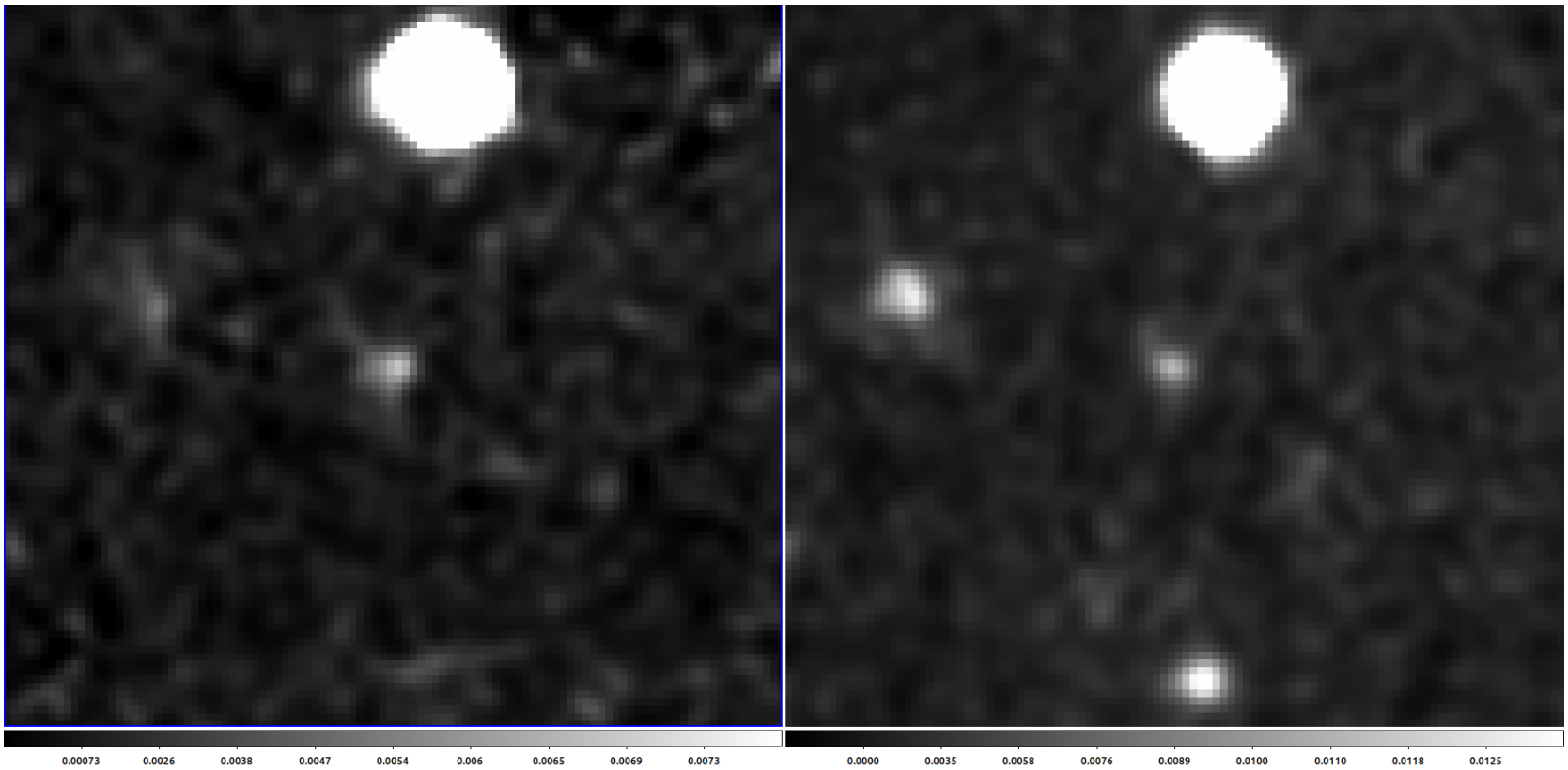
LCO, EP and GTC contacted.

But COLIBRÍ has 18 nights of observation which translate to 30 points – we can start to work on our light curve.

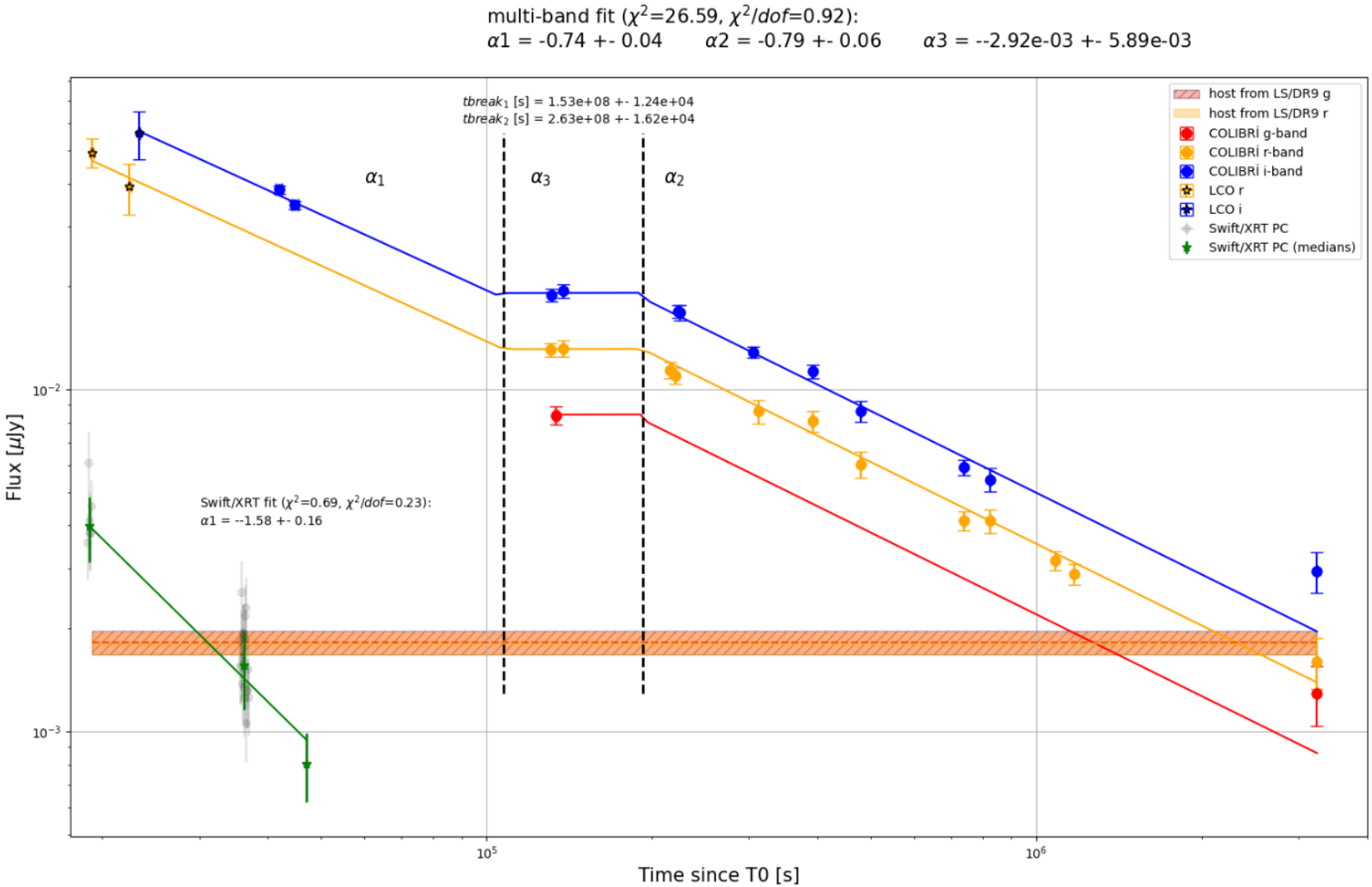
COLIBRÍ data reduction

Every observation was analized again offline. The results are compatible with the ones provided on a daily base from the shifters.
GCN observations were included in the light curve. A multi-band fit was performed (scipy.curve_fit).

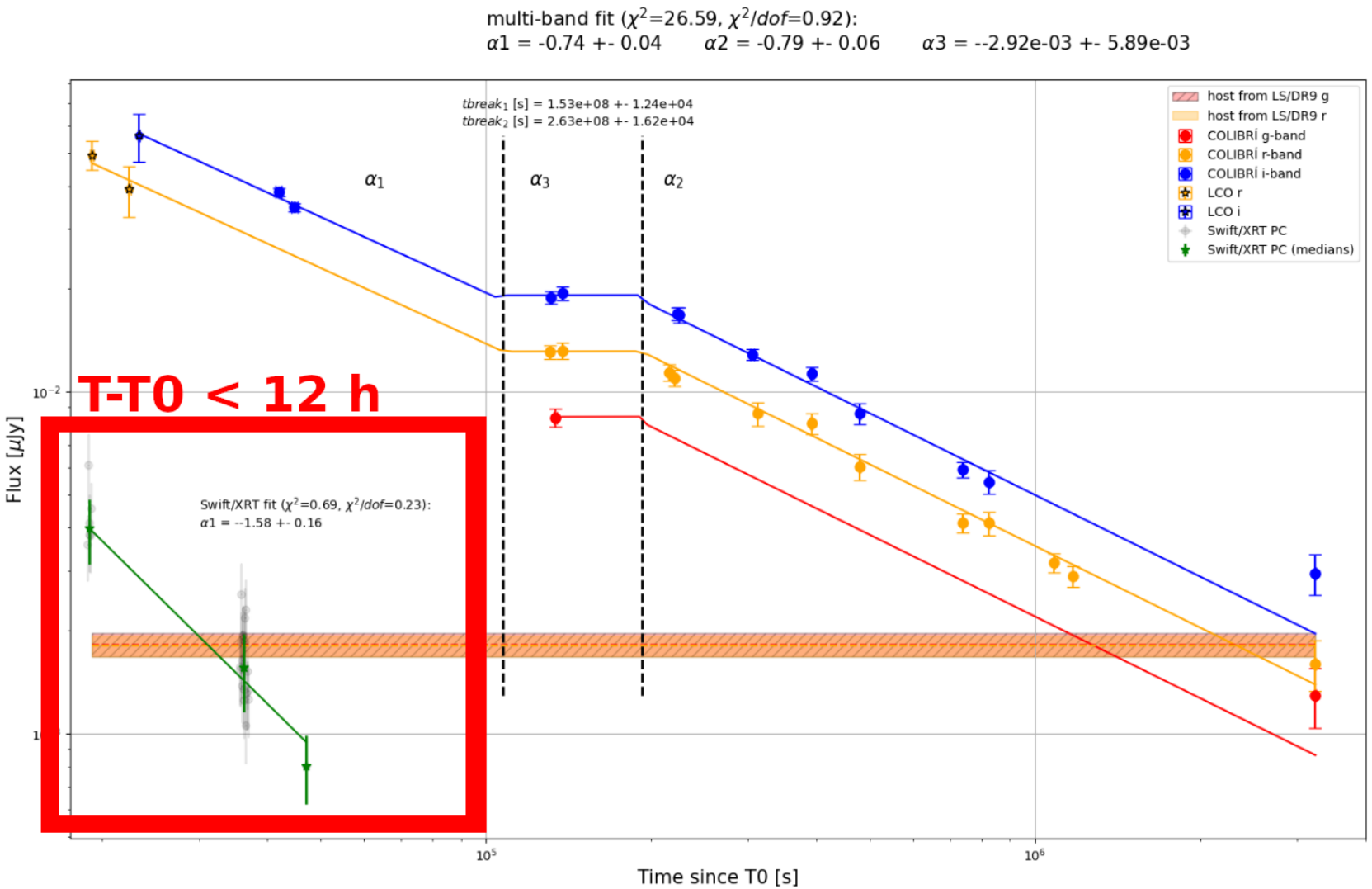
The host photometry was obtained from Legacy Survey in g-filter (left) and r-filter (right).



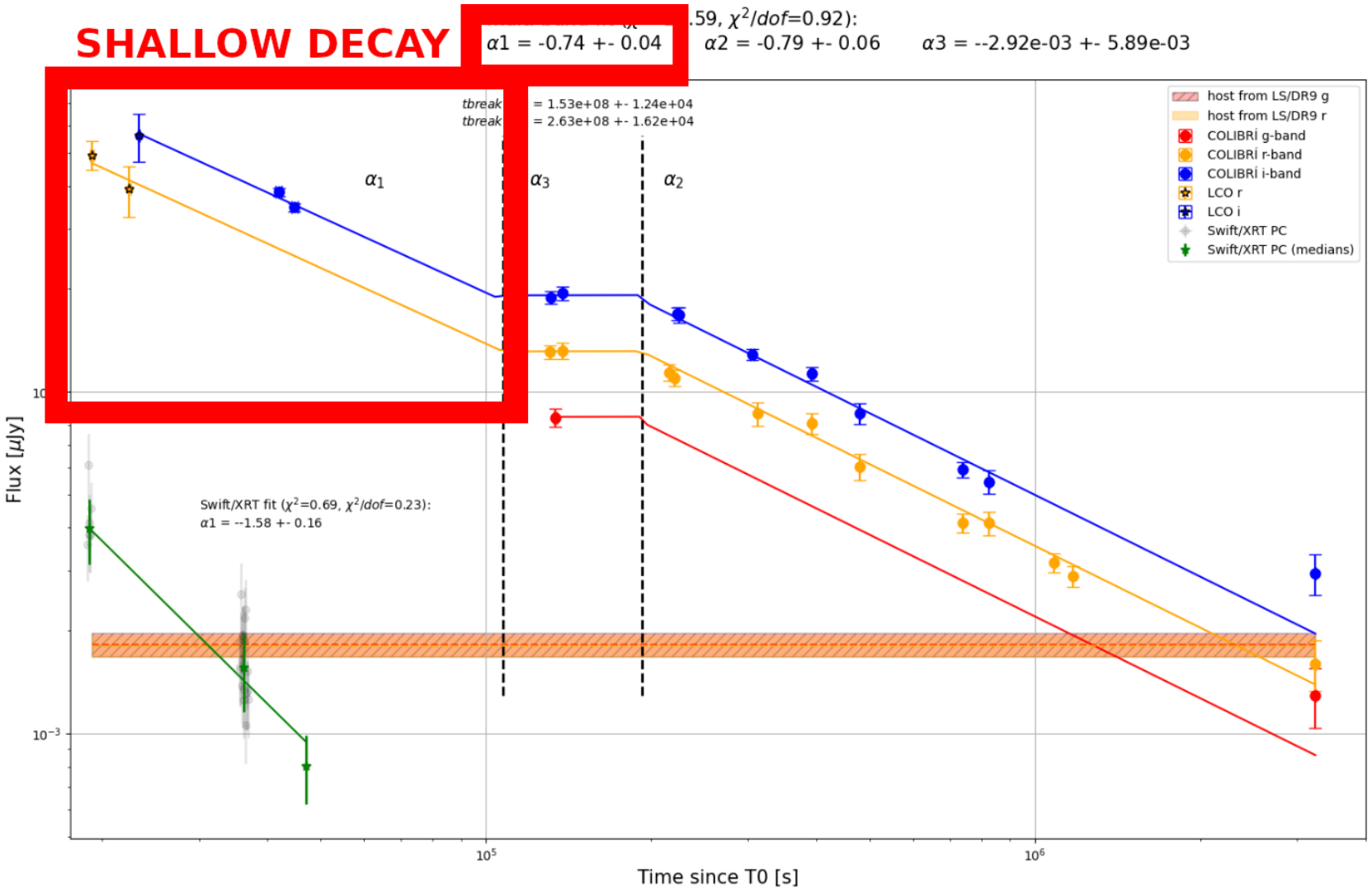
COLIBRÍ light curve with GCN data



COLIBRÍ light curve with GCN data



COLIBRÍ light curve with GCN data



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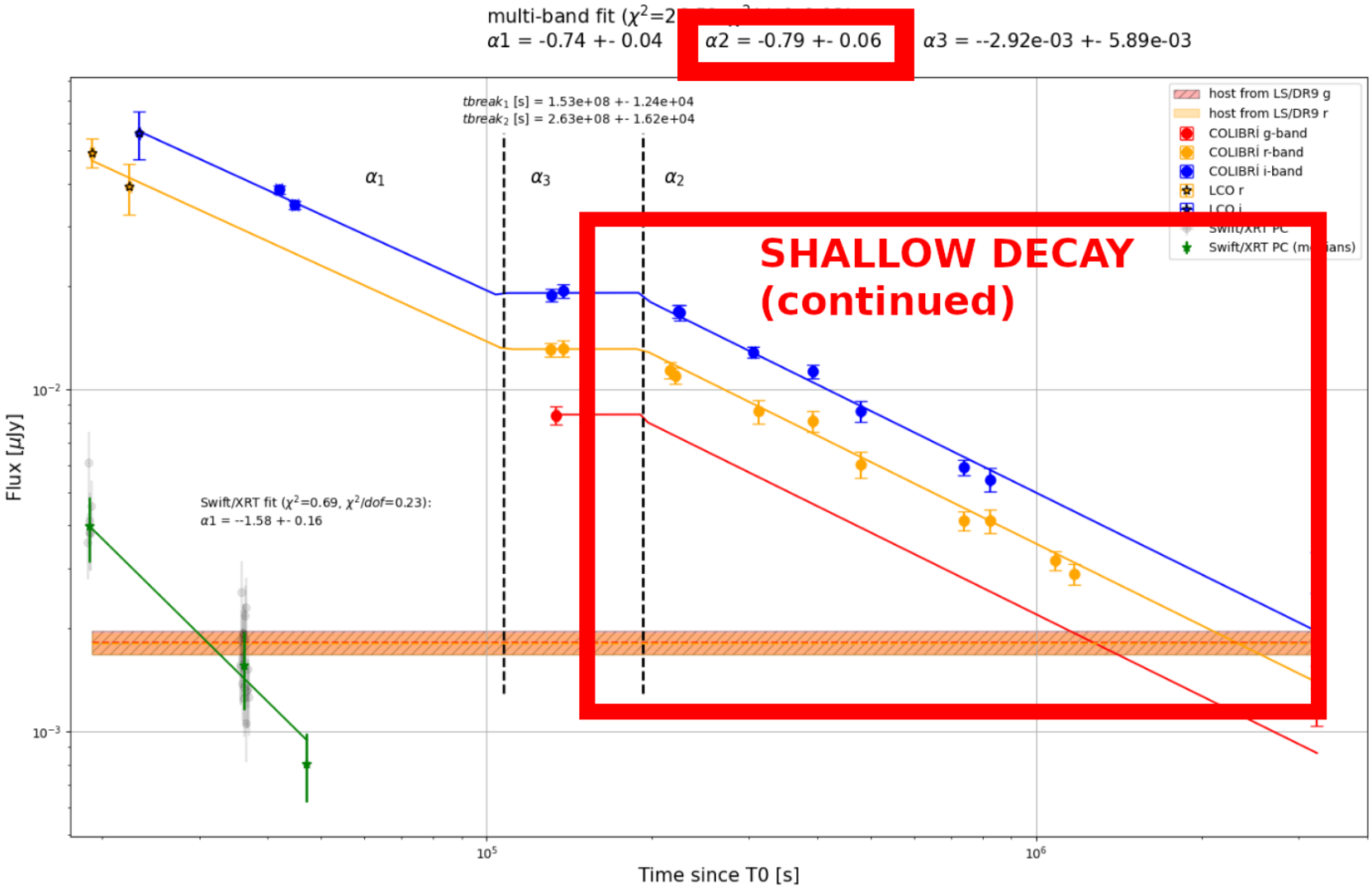

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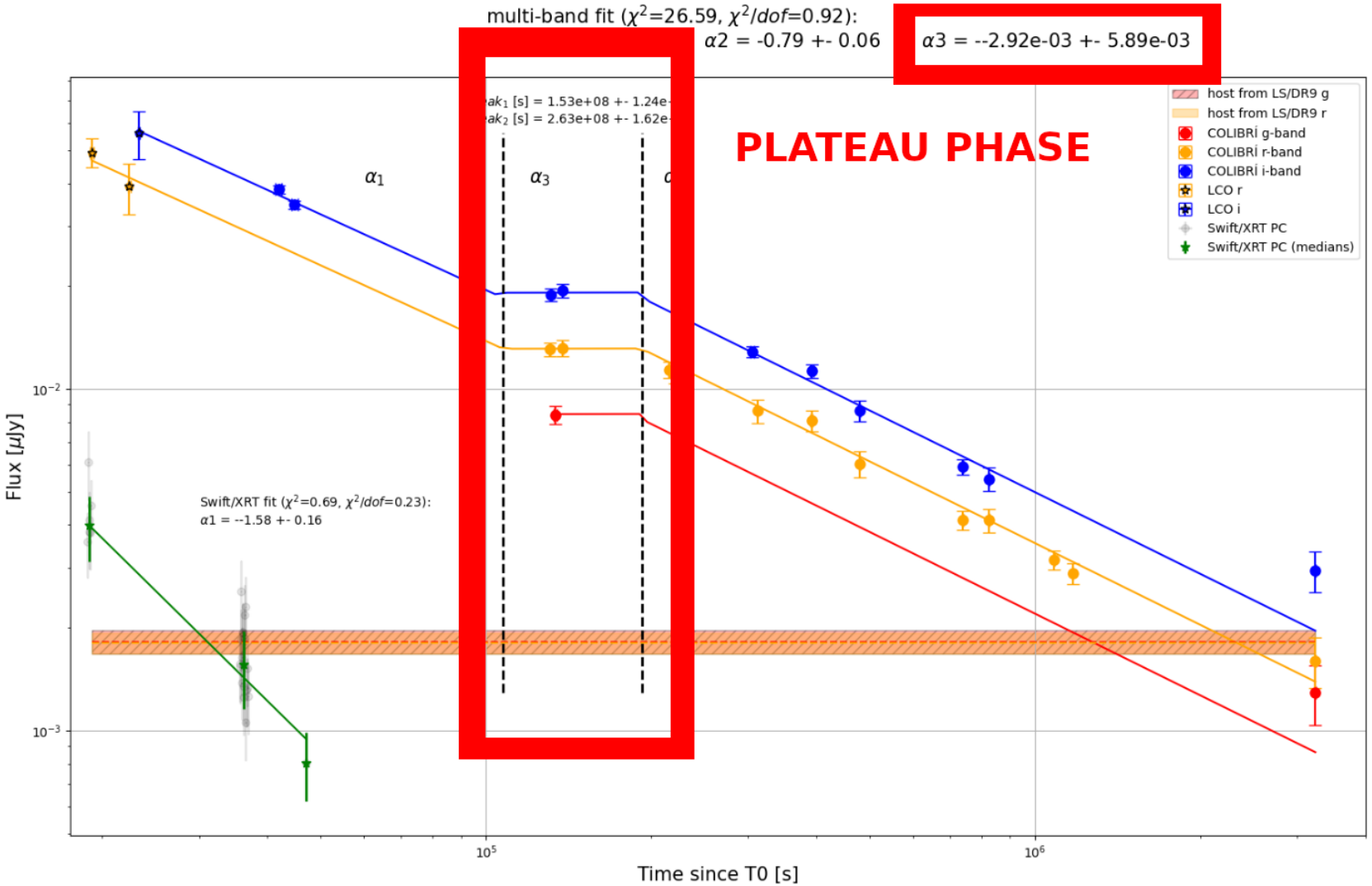

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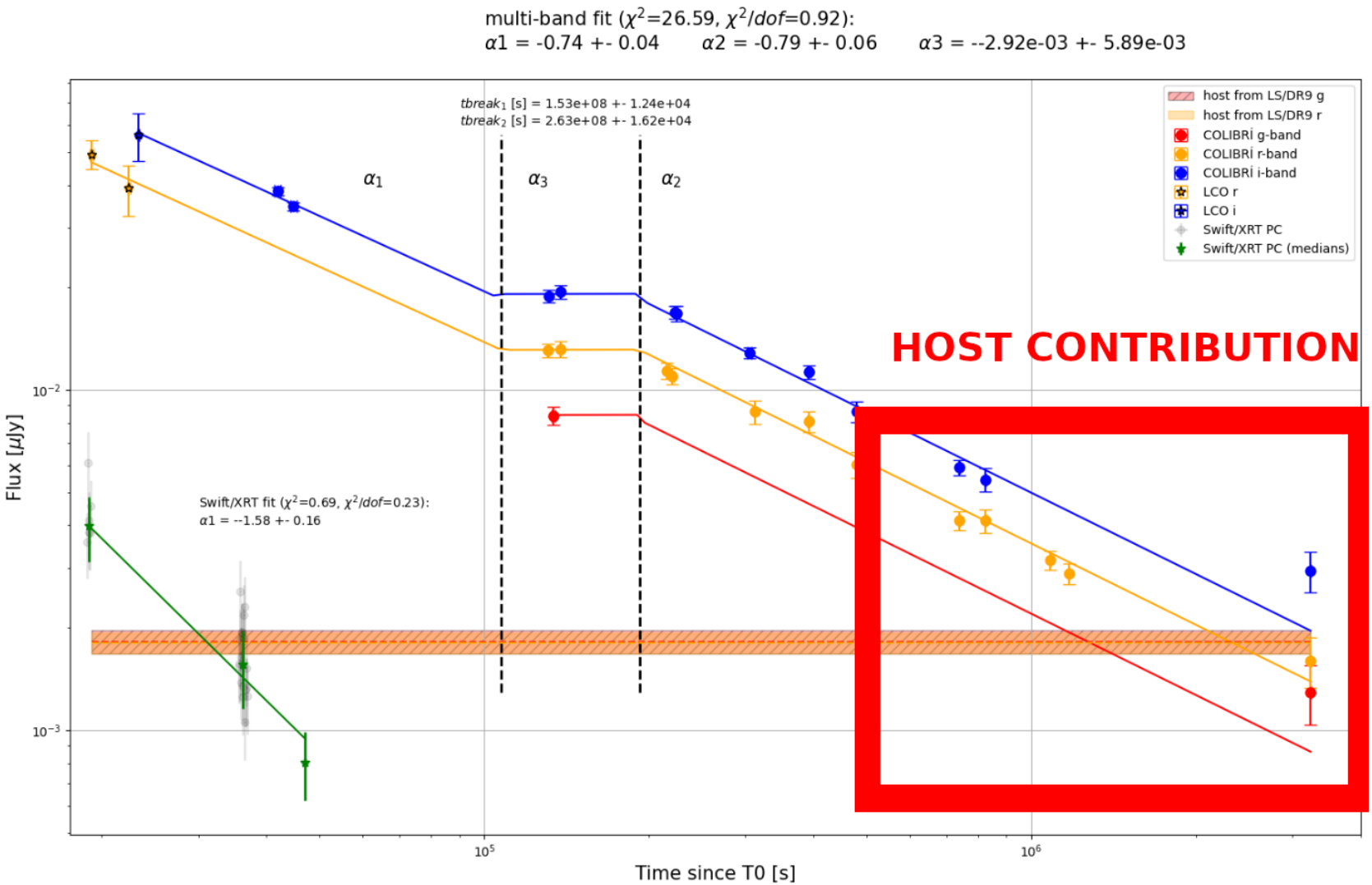

COLIBRÍ light curve with GCN data - summary

Interesting points from the light curve.

- missing XRT data at later times, they stop at about 12h after the burst.
- shallow decay: spectral index bigger than -2.
- continued shallow decay (no achromatic jet break!): light fades out in the last days with the same intensity of the first days.
- plateau phase common to all filters.
- the host enters the photometry of the last points. Subtraction needed.

Host photometry

Host photometry is needed both for template subtraction of late-time COLIBRÍ observations and the fit of the SED to study galaxy properties.

Unfrotunately, LS photometry (g=23.25 +/- 0.09, r=23.28 +/- 0.09) and PS-DR2 (g=23.60 +/- 0.24, r = 23.59 +/- 0.29) are not quite compatible.

To obtain precise host photometry in all filters,
we required COLIBRÍ to revisit the field for 2h/night/filter, reaching depths of 24 (g, r) and 23.5 (i).

Alternatively, GTC is available for the scan.

Summary and outlook

A project on GRB 250407A was started. This allows for the implementation of unused data from different collaborations.

Done

- data reduction
- GCN data collection
- GCN experiment contacted.
- light curve fit
- estimate of the host with LS' available frames

To do:

- Precise host photometry in all filters
- galaxy-subtracted light curve fit.
- theoretical interpretations
- paper drafting

IMPORTANT: this is a PhD project that needs to see publication before next year's defense.
In other words: **could we please get the visits of the host by the end of this year?**

Thank you :)