



BL Lacertae in Outburst: Multiwavelength Light Curves

Chang et al.(2025)

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SWIFAR

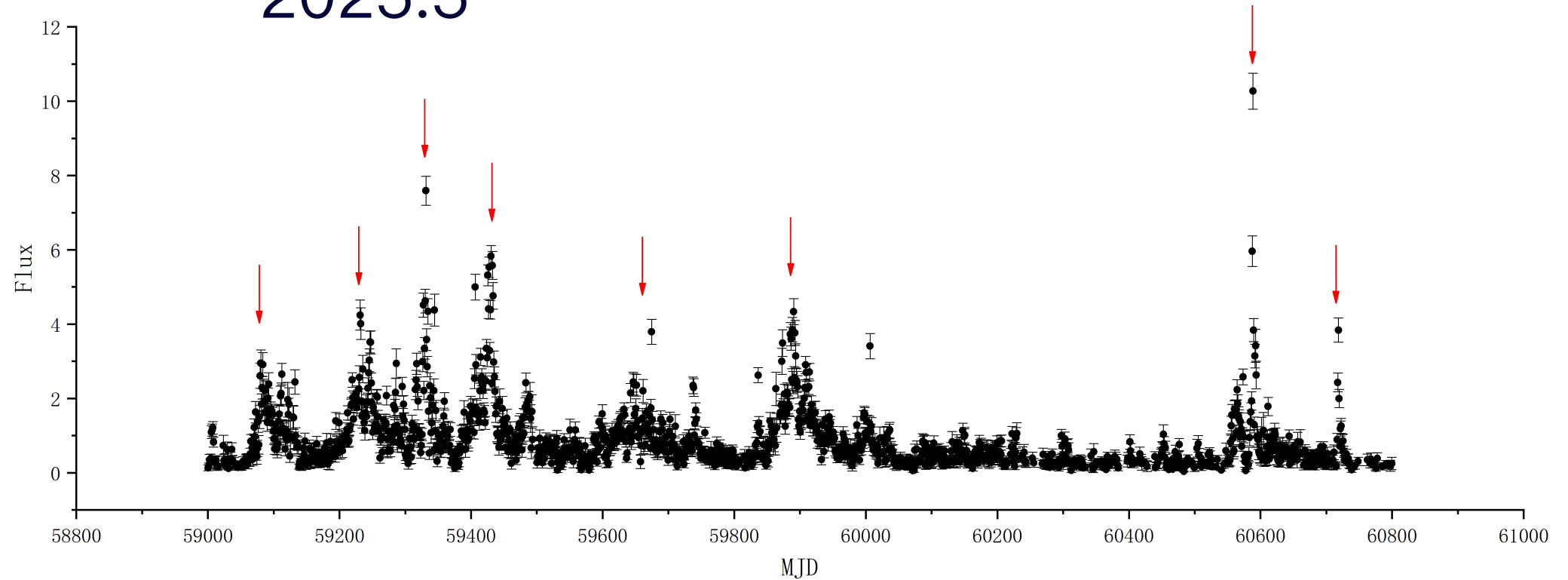
2025-10-9

Introduction

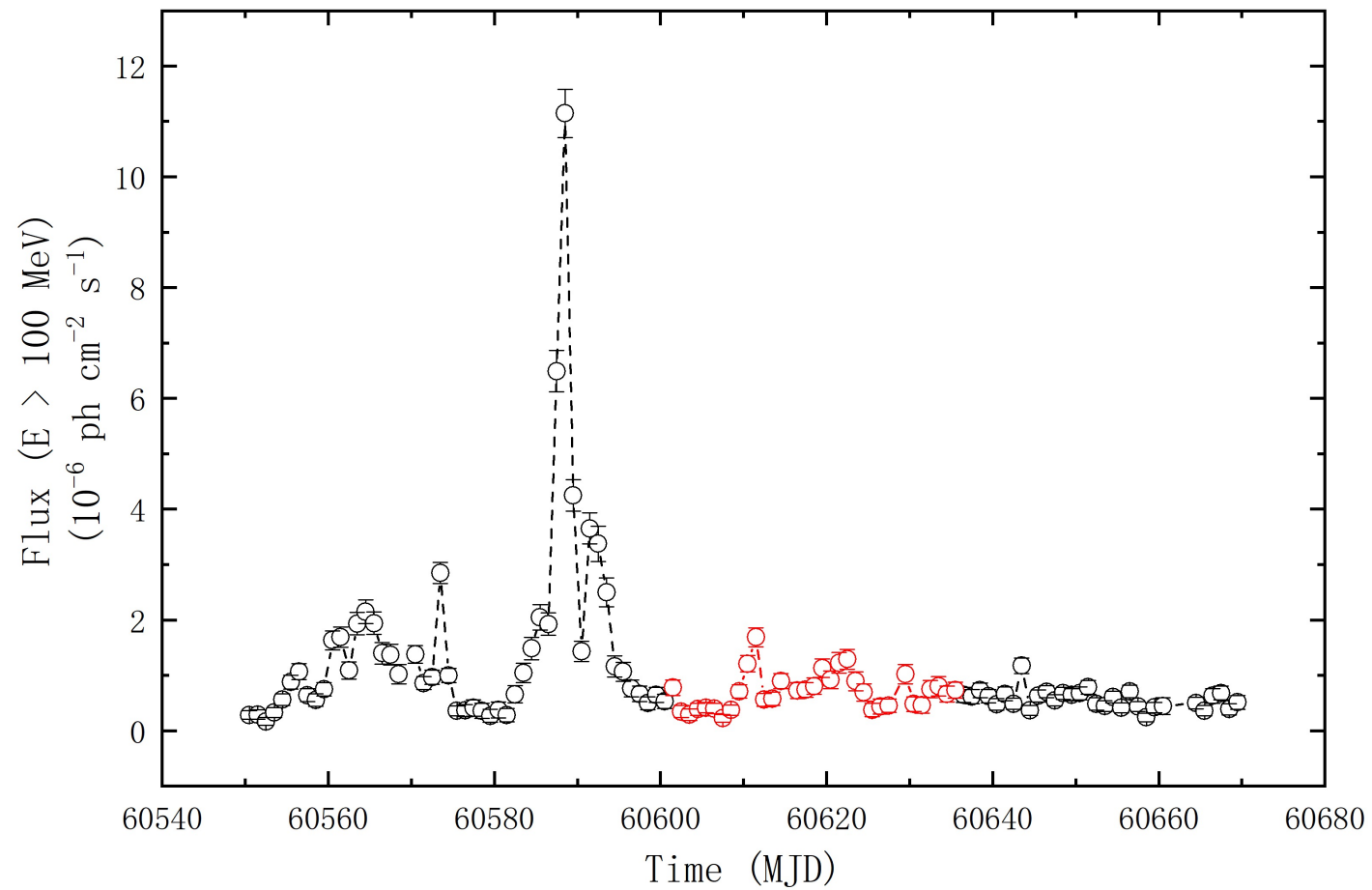
- Multi-band light curve data reduction
- Analysis: IDV, QPO, DCF, SED

Introduction

- BL Lacertae from 2020.5 to 2025.5



Introduction



Introduction

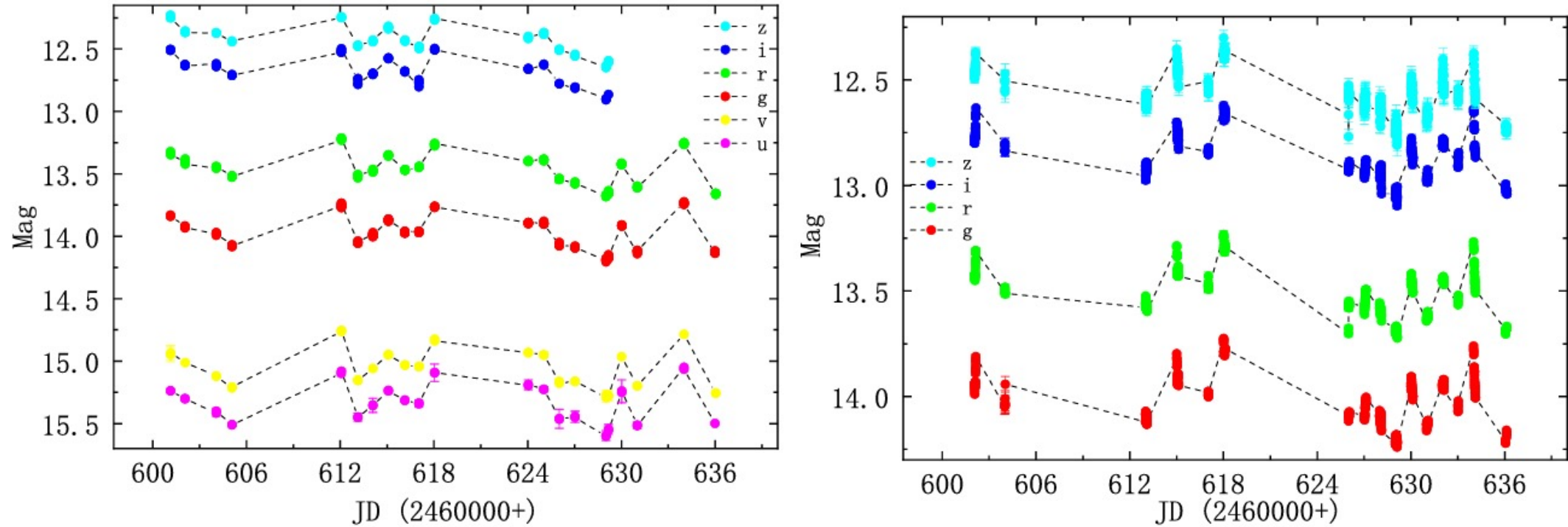


Figure 1. 1.6m and 50cm Light curves of BL Lacertae observed in 2024.

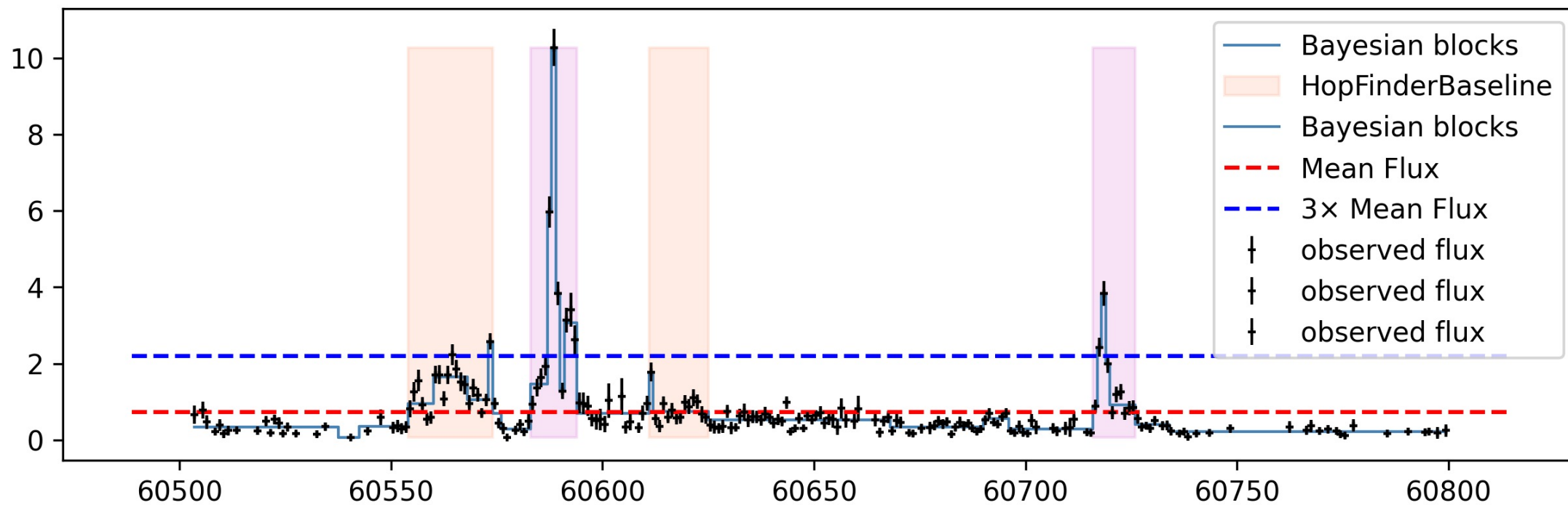
Fermi Data Reduction

- **gtselect** — Filter photon event data by time, energy, and spatial coordinates.
- **gtmktime** — Use spacecraft data to generate a valid observation time (GTI) file.
- **gtbin** — Bin event data in space/energy to create count maps or count cubes.
- **gtltcube** — Calculate exposure time in different directions to generate a livetime cube.
- **gtsrcmaps** — Convolve the source model with exposure data to produce model count maps.
- **likelihood** — Perform likelihood fitting of sources and background to obtain flux and other parameters.

Fermi Data Reduction

- **gtselect** — Filter photon event data by time, energy, and spatial coordinates.
- **gtmktime** — Use spacecraft data to generate a valid observation time (GTI) file.
- **gtbin** — Bin photon events by time or space (e.g., for light curves or energy spectra).
- **gtltcube** — Calculate exposure time in different directions to generate a livetime cube.
- **gtexpmap** — Use livetime data to compute an exposure map (photon detection sensitivity distribution).
- **gtdiffrsp** — Calculate and add background model response information for each event.
- **gtlike** — Perform likelihood analysis to estimate physical parameters of sources and background.
- **likelihood** — Statistically evaluate the agreement between the model and observations, outputting the final analysis results.

Selection of Flare Timescale



Index	Start Time	Peak Time	End Time
1	60583.00006	60588.50006	60594.00006
2	60716.00006	60718.50006	60726.00006

Swift Data Reduction

- **uvotsource image**

```
uvotsource \ image=sw00012345678uuu_sk.img.gz\srcreg=source.reg \  
bkgreg=background.reg \outfile=uvot_bl_Tacertae.txt \ sigma=3.0
```

- **xrtpipeline**

```
xrtpipeline \ indir=/path/to/xrt/rawdata/ \outdir=/path/to/xrt/processed/ \ srcra=330.68038 \  
\srcdec=42.27778 \ createexpomap=yes \ clobber=yes
```

- **Spectral Analysis**

```
data source_binned20.pi
```

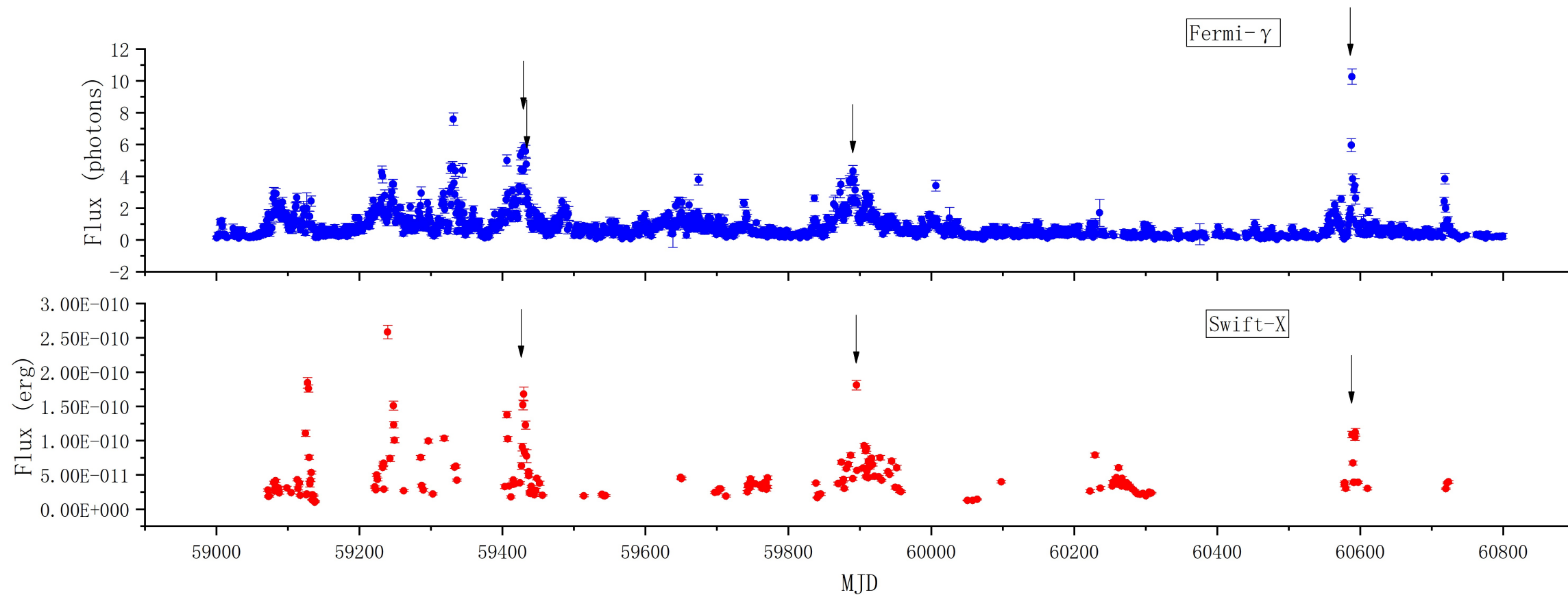
```
ignore **-0.3 10.0-**
```

```
ignore bad
```

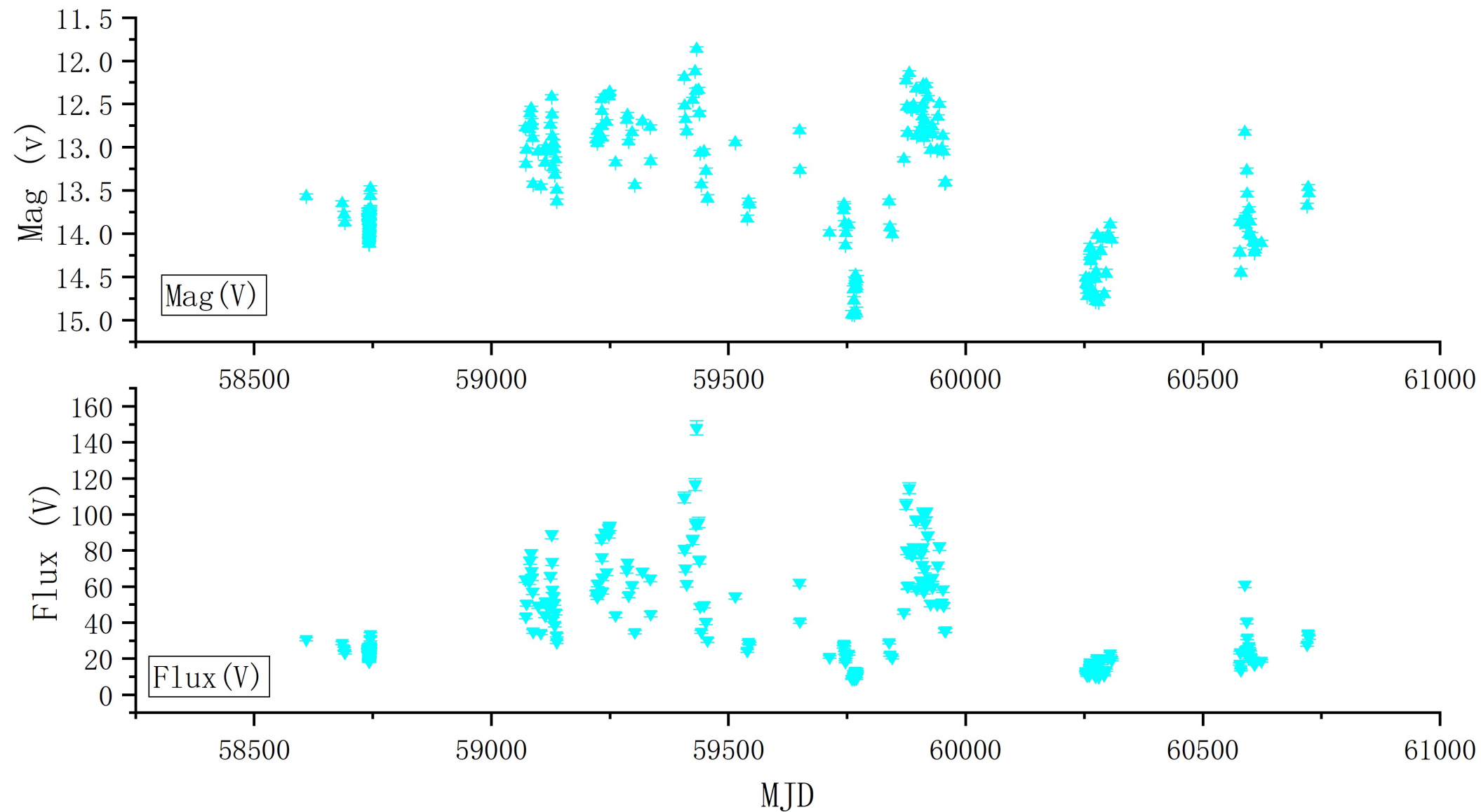
```
model ztbabs * tbabs * powerlaw
```

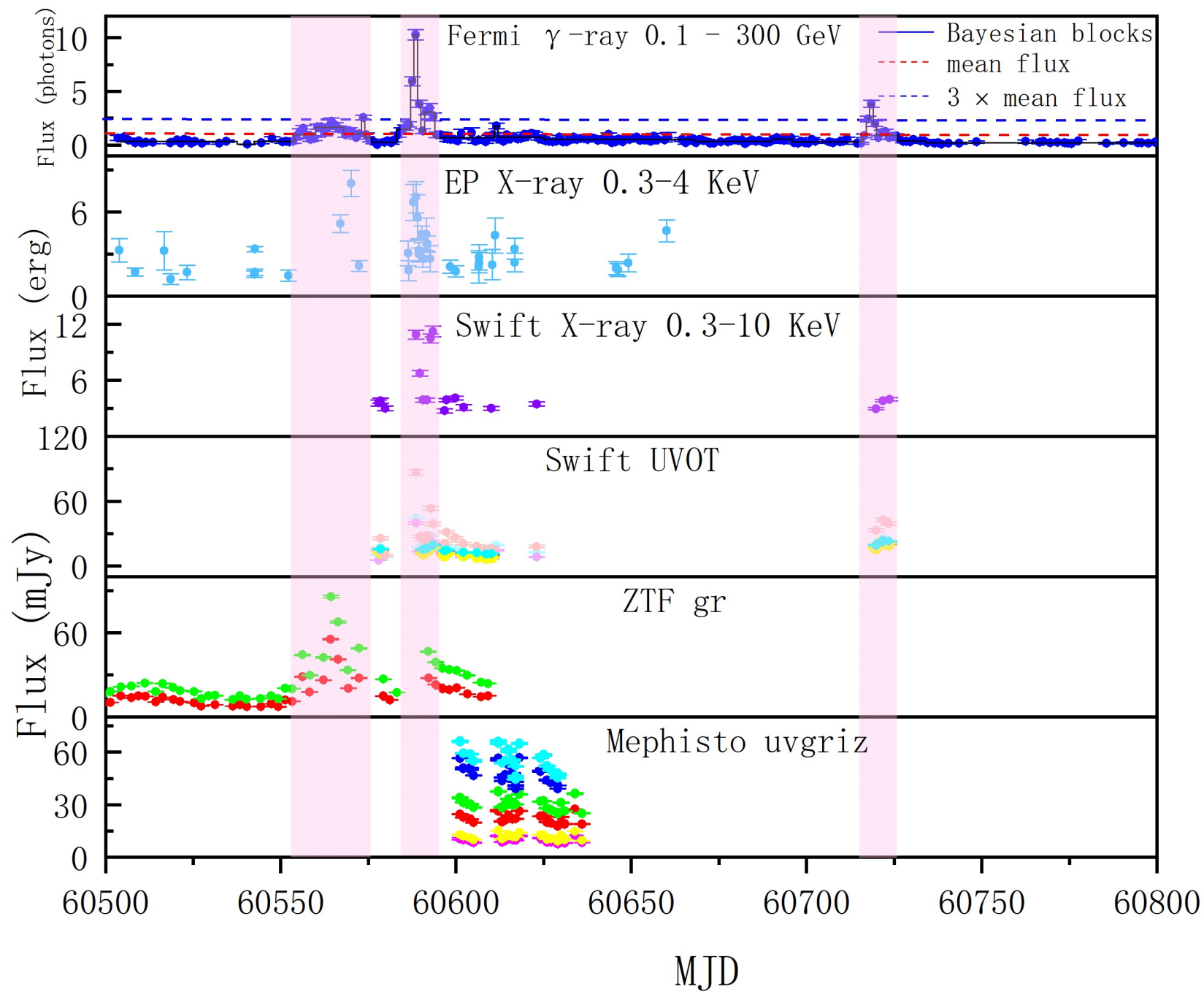
```
fit
```

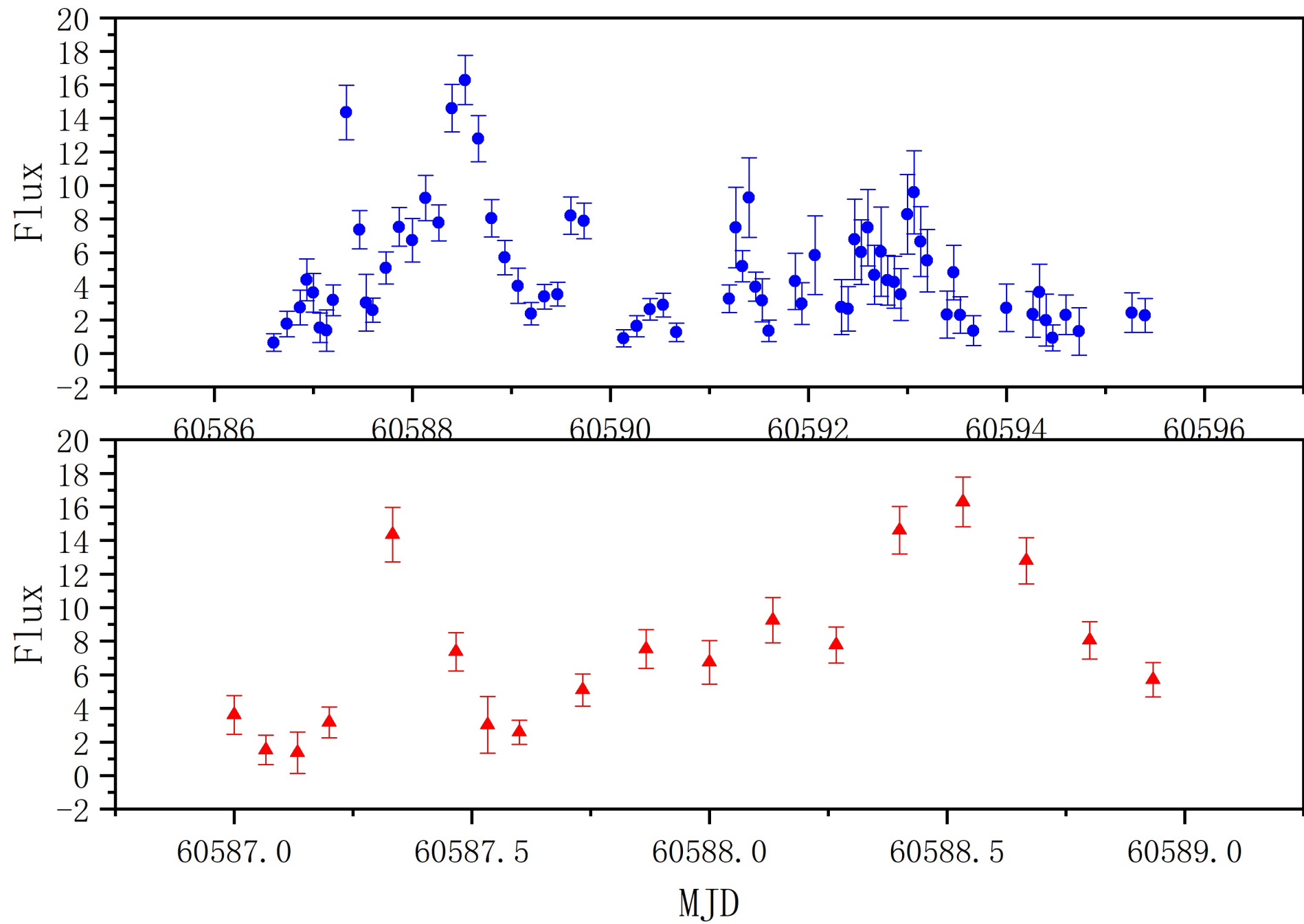
Swift Data Reduction (X-ray)

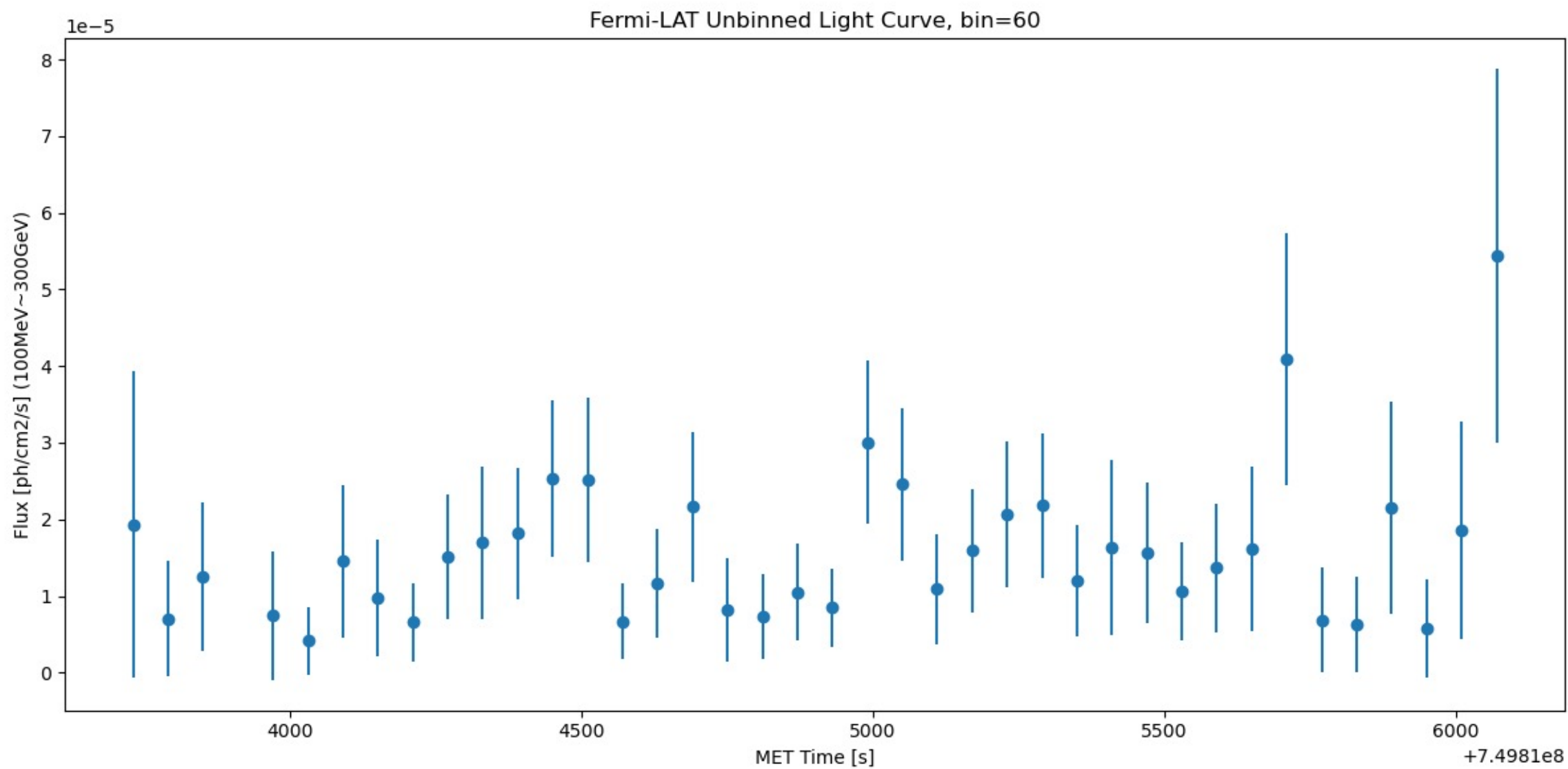


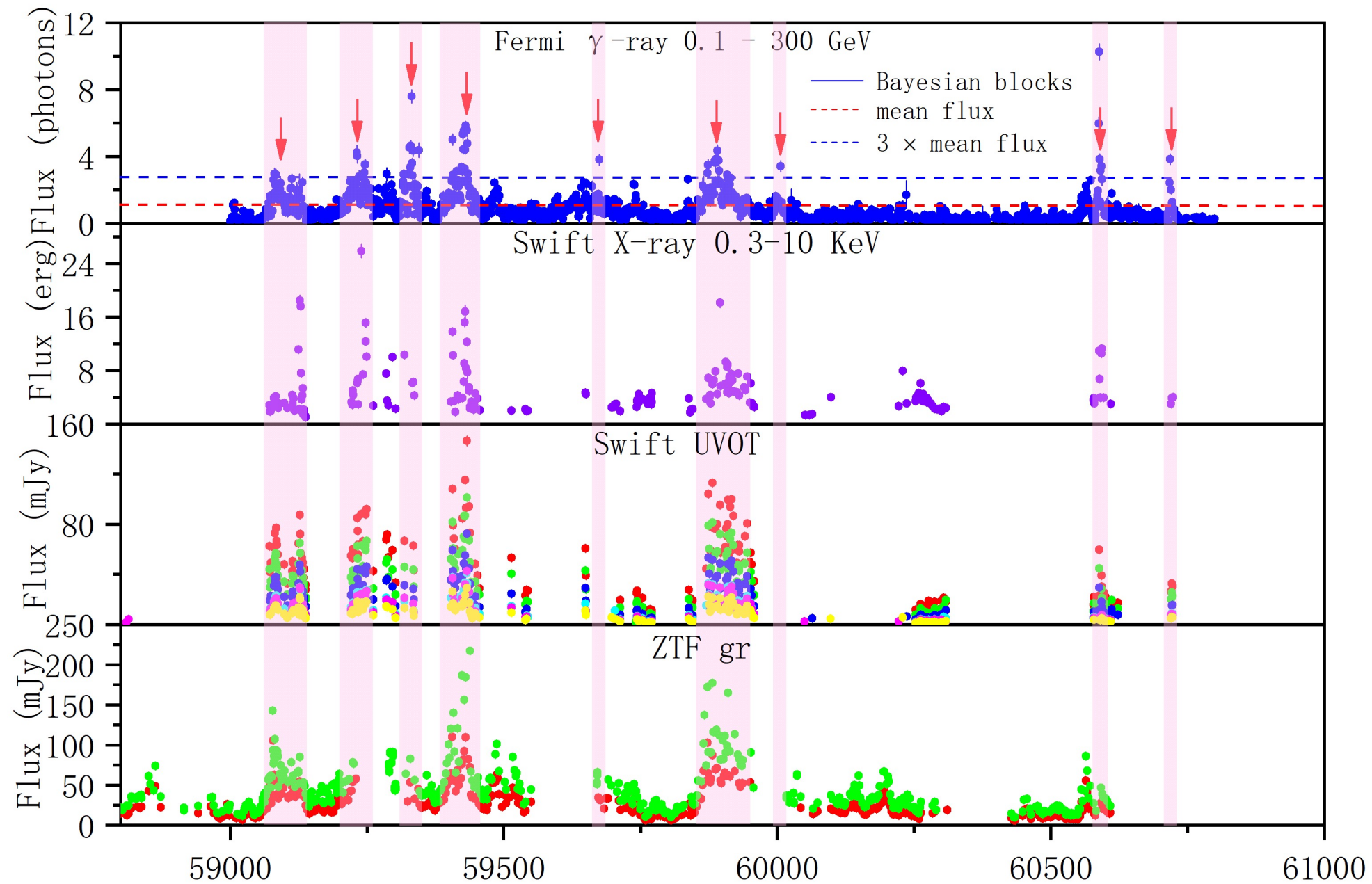
Swift Data Reduction (UVOT-V)

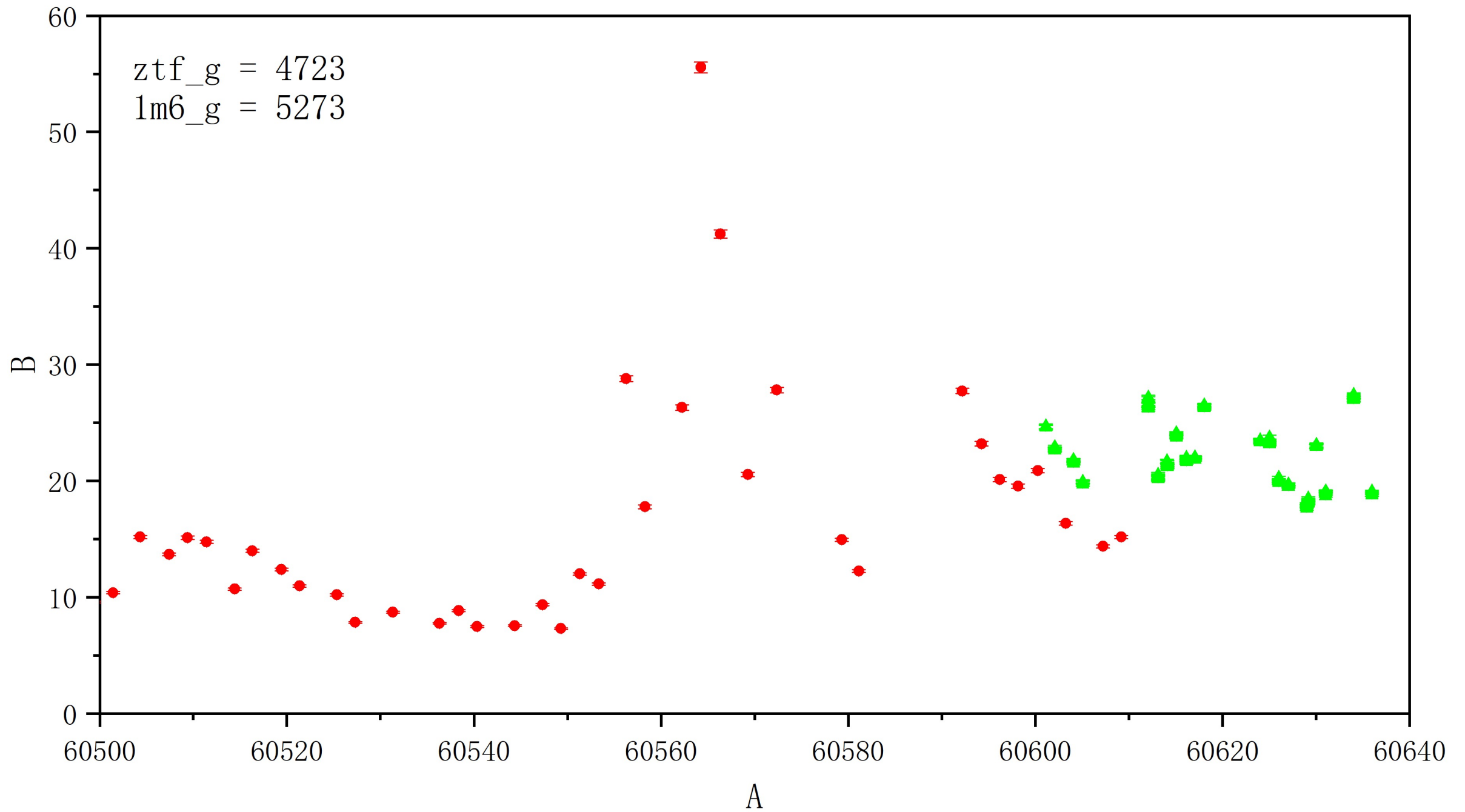


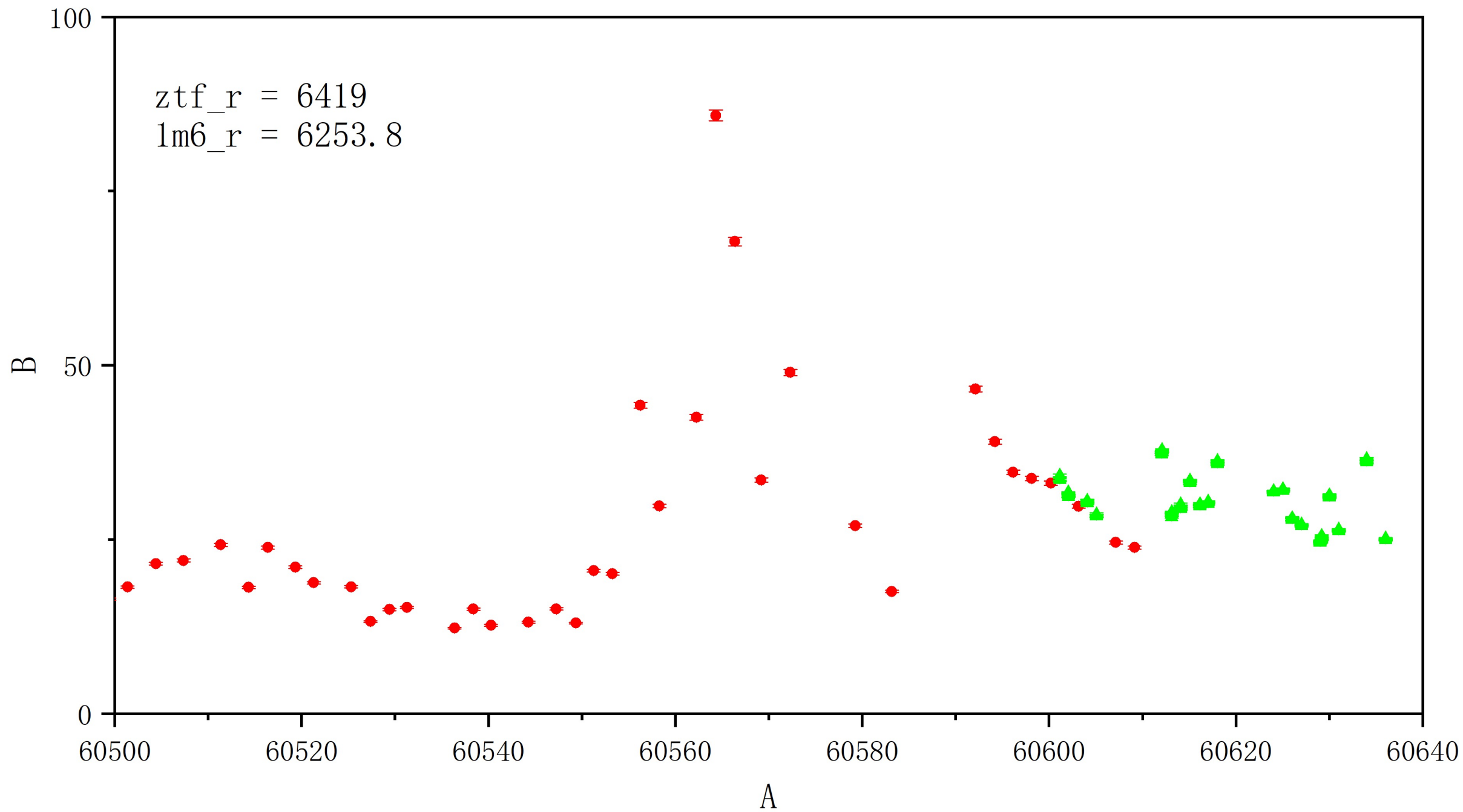












Thanks!