# Multi-wavelength observations of flaring blazars with ATOM and Fermi-LAT

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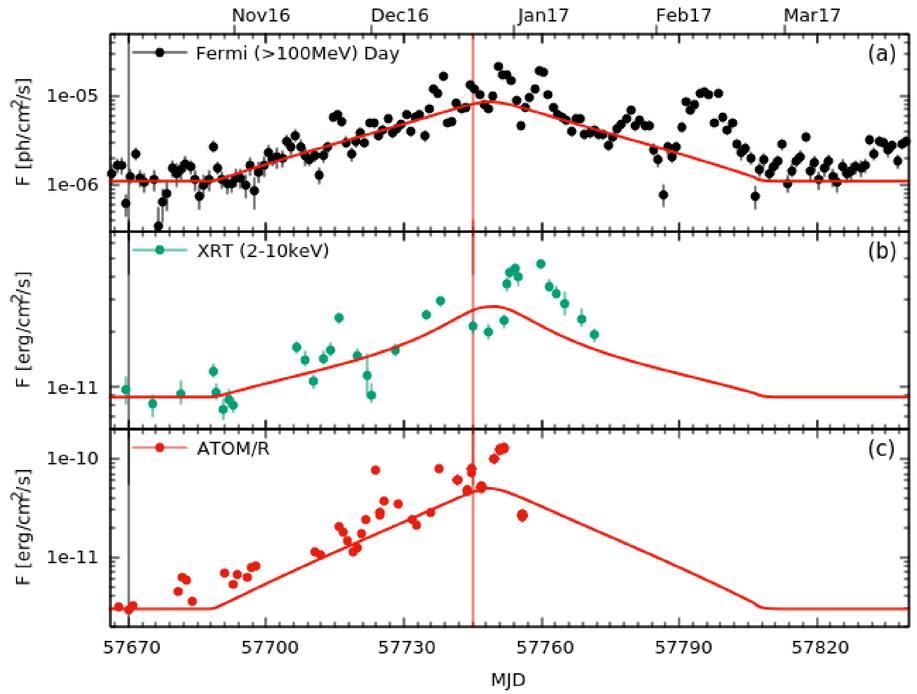
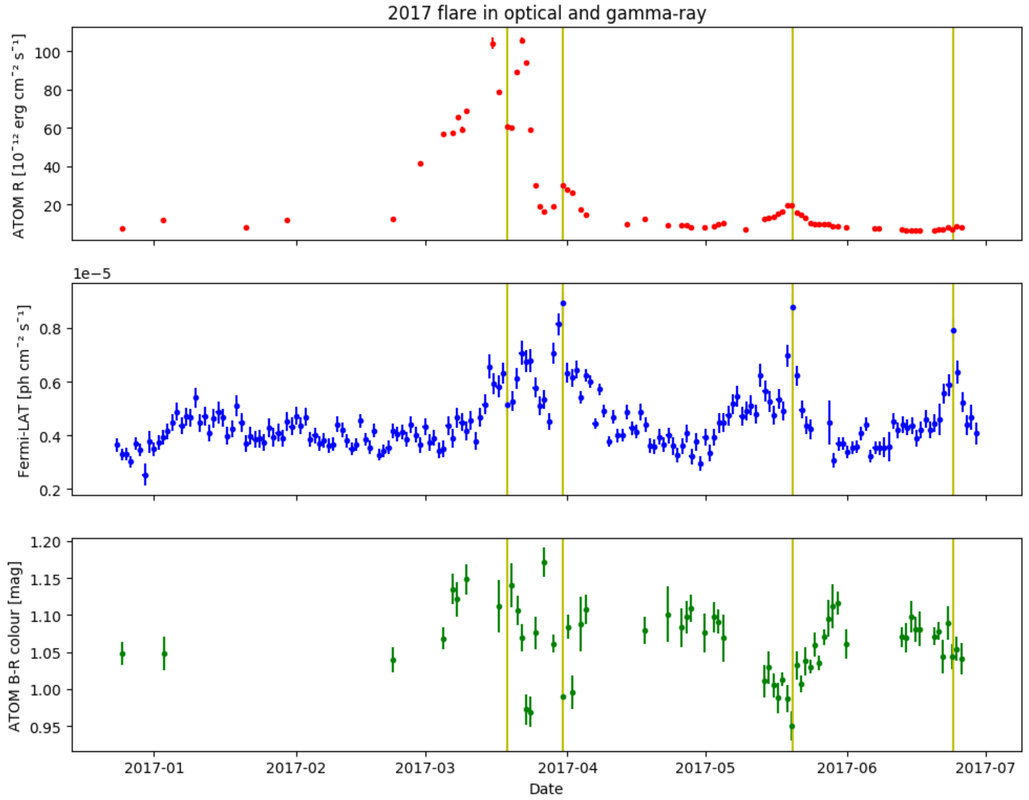
**We present multi-wavelength observations of two recent flaring events of the flat-spectrum radio quasars CTA 102 and 3C 279.**

## CTA 102




The vertical black and red lines correspond to the black and red curves in the SED on the following pages. The thick red curves are the result of applying a gas cloud ablation model.

## 3C 279



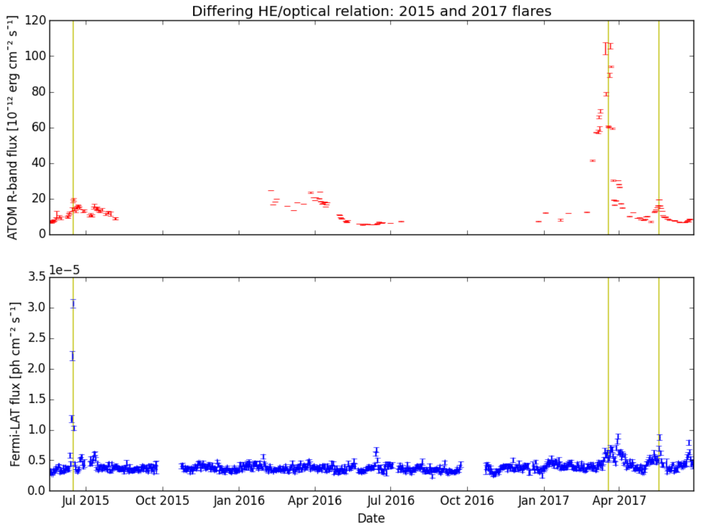

The vertical yellow lines serve comparison purposes.

# 3C 279

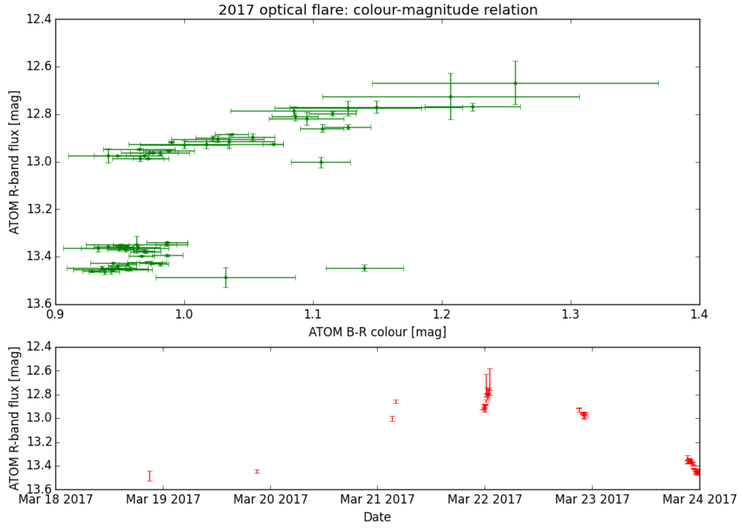
- redshift: 0.536
- black hole mass: $10^8 M_{\mathrm{Sun}}$
- very variable in optical
- flare seen with Fermi-LAT in June 2015 with only weak optical counterpart
- strong optical outburst in early 2017

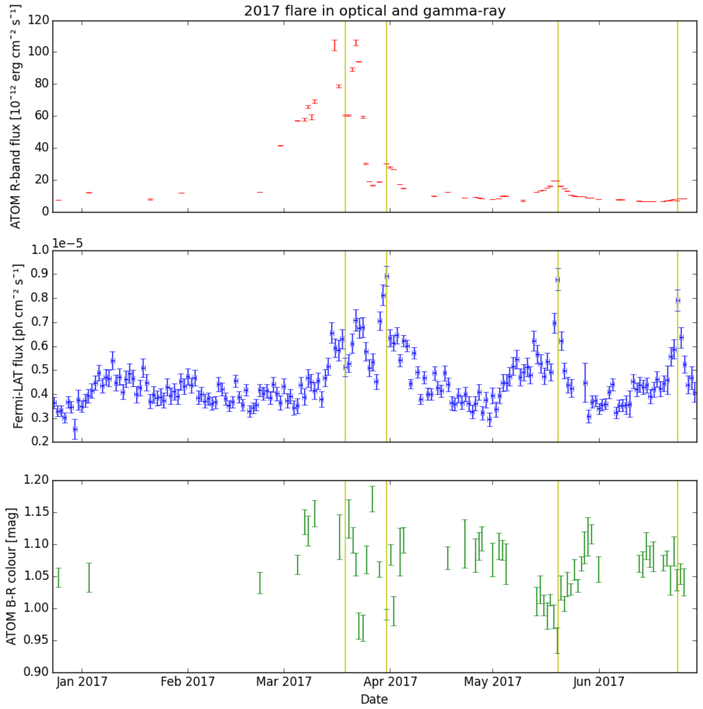
## ATOM

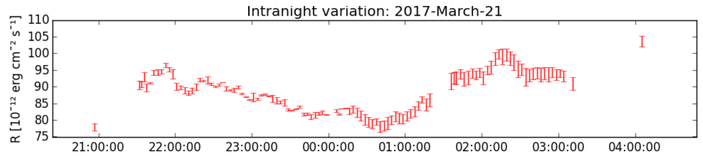
- 75cm optical telescope
- located at H.E.S.S. site in Namibia
- observing gamma-ray emitters since 2005
- monitors around 250 AGN
- also used as optical follow-up instrument

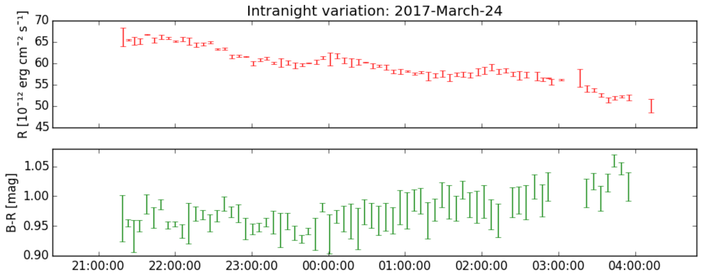



- 2015 flare shows extreme gamma-ray, 2017 extreme optical flux
- source shows significant intra-night variability during 2017 flare
- optical flare exhibits reddening over short timescales at its peak



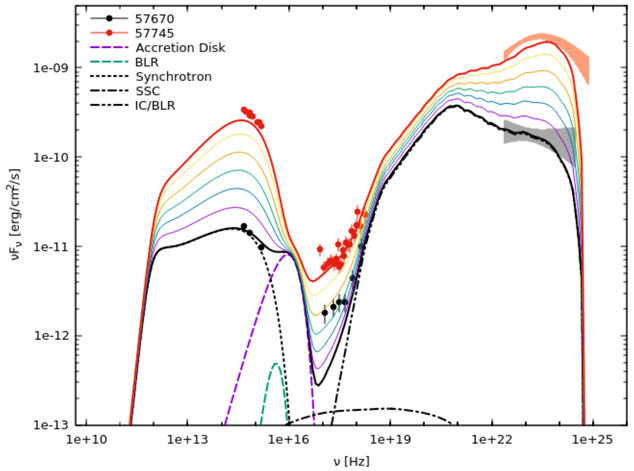



# CTA 102

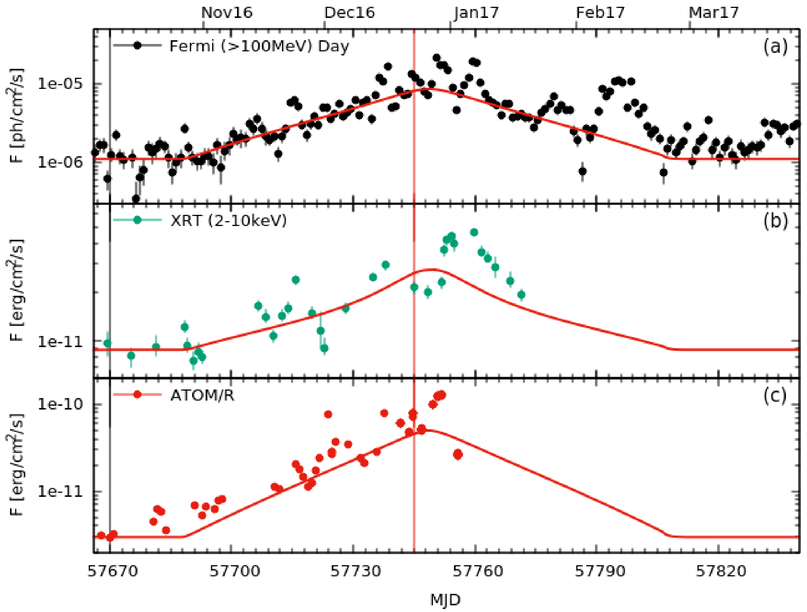
- redshift: 1.037
- black hole mass: $10^8 M_{\mathrm{Sun}}$
- active in optical and $\gamma$-ray since 2012
- prolonged activity phase in late 2016

## Gas cloud ablation

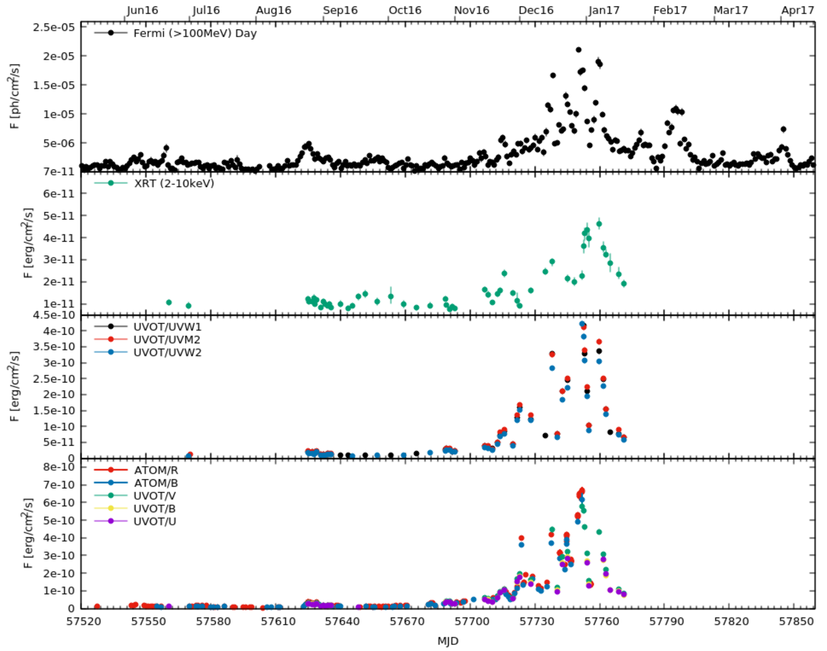



Two representative spectra of CTA 102 during the 2016 flare. The thick black and red solid lines show cloud ablation model spectra for the beginning and peak of the flare, while the thin solid lines (magenta, green, orange, yellow, blue) show the evolution of the model spectrum in roughly 10-day steps towards the maximum. The other lines give example curves of the composition of the spectrum. The models are based on the premise of gas cloud ablation.

- Blazar flares are potentially result of interaction between jet and obstacle.
- Gas clouds entering a jet will quickly be ablated and carried along.
- Depending on cloud parameters like size and velocity, the additional material might reach an internal shock located downstream.
- This could lead to pronounced and prolonged jet activity – as observed here.




Multi-wavelength lightcurve of the flare. The vertical black and red lines correspond to the black and red curves in the SED above. The thick red curves are the result of a gas cloud ablation model.




Multi-wavelength lightcurve of CTA 102 including Fermi-LAT, Swift-XRT, Swift-UVOT and ATOM

Further details on the model:

- Zacharias et al., *Cloud ablation by the relativistic jet and the extended flare in CTA 102 in 2016 and 2017*, accepted for publication in ApJ, arXiv:1711.06117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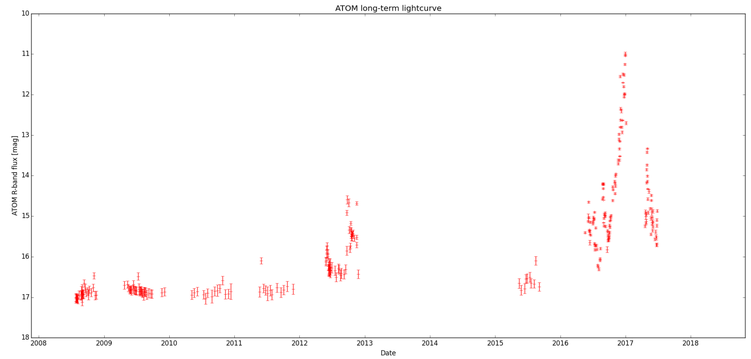


For comparison: Optical long-term lightcurve of CTA 102.