H.E.S.S. observation of 3C 279 during optical and gamma-ray flares in 2017 and 2018

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H.E.S.S.

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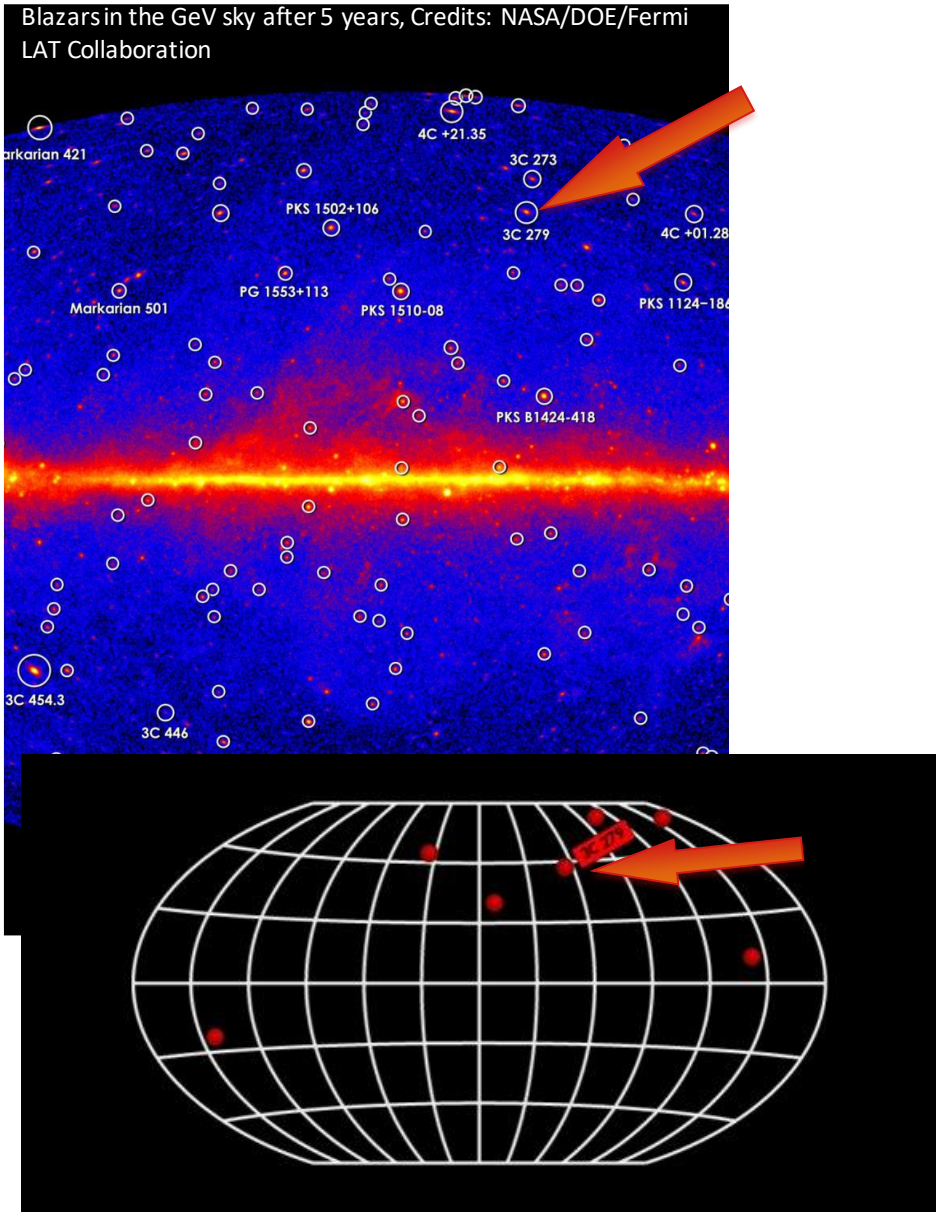
The H.E.S.S. experiment

- H.E.S.S. phase II
- In Khomas Highlands of Namibia @1800 m a.s.l.
- Hybrid array
- 4+1 telescopes
- 4x(12m) + 28m
- With CT5 access to E < 100 GeV

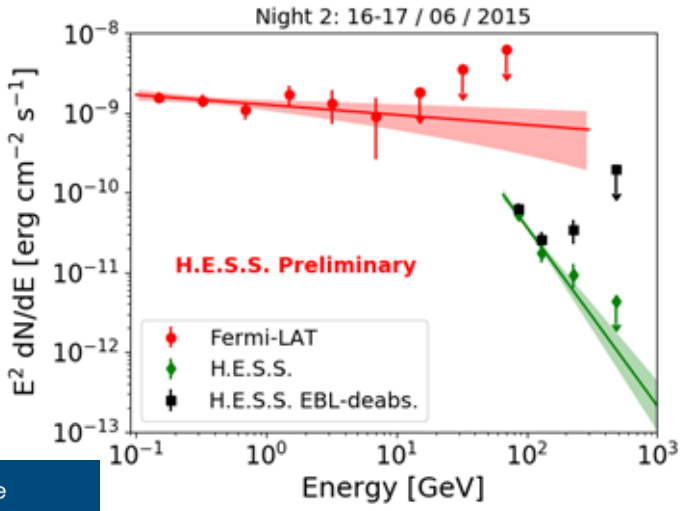
3C 279, an old friend

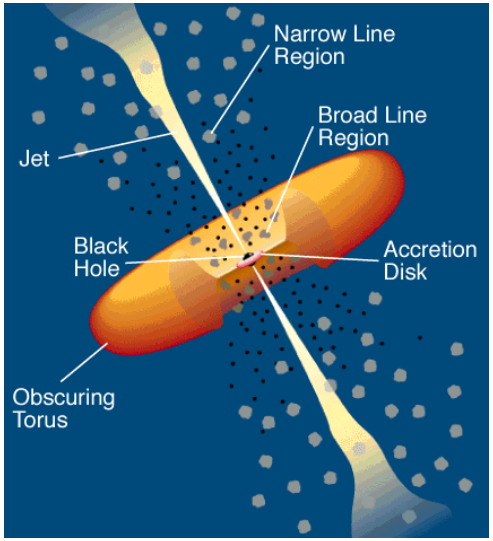
- Famous Flat Spectrum Radio Quasar
  - Ra = 194.05
  - Dec = -5.79
  - Redshift z = 0.536
- General Characteristics at High Energy
  - One of the brightest FSRQs in 3FGL Fermi-LAT catalogue
  - Very variable emission
  - Peak of gamma-ray energy spectrum at E ~ 1 GeV

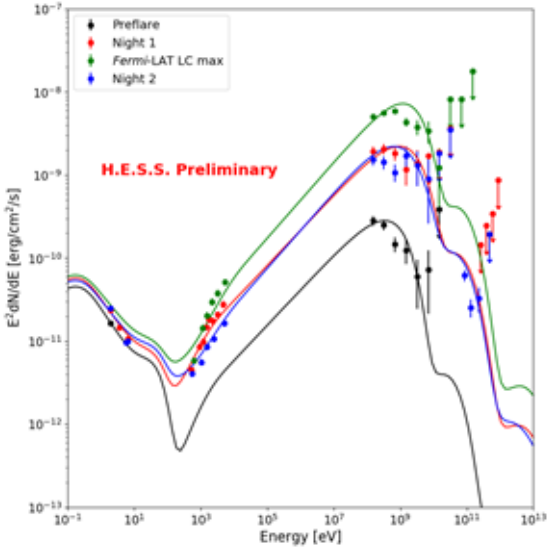


The previous episodes

- First detections at VHE in 2006 and 2007, in pre-LAT era
  - MAGIC Coll. (2008) and Aleksić et al. (2011).
- 2015 strongest flare in seen by Fermi-LAT and detection by H.E.S.S.
- Strictly simultaneous data
- Emission region outside the BLR and preference for a lepto-hadronic scenario

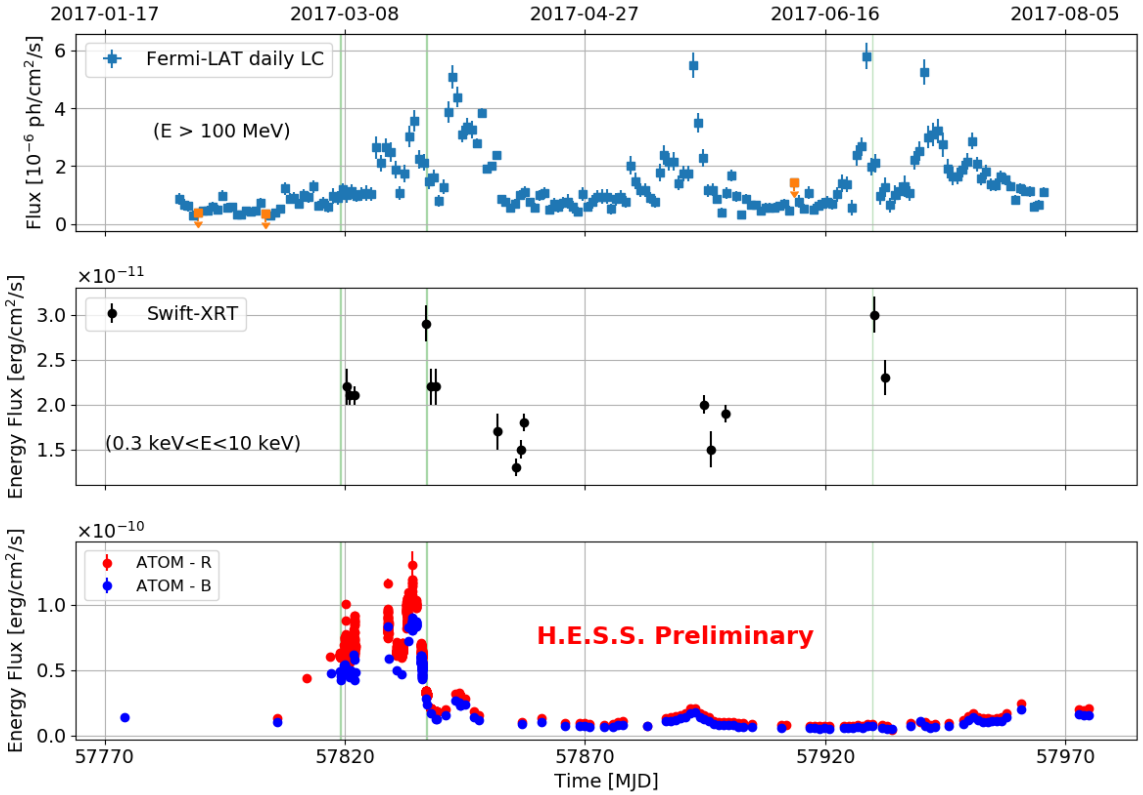






H.E.S.S. Collaboration, ICRC2017
(full paper in preparation)

Source recent activity (2017)

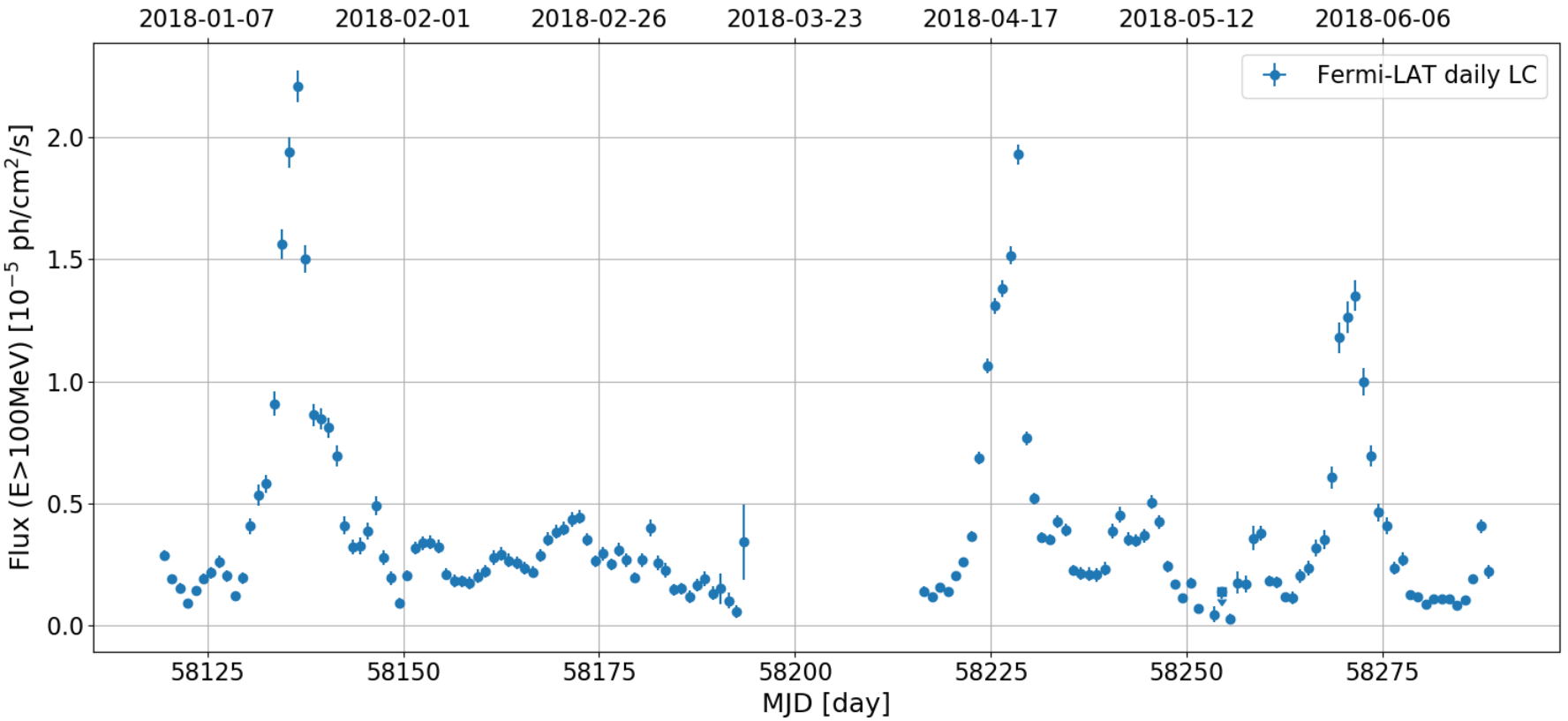


LAT
Swift-XRT
ATOM

ATel #10161
ATOM optical flux record

- 3C 279 active again in early 2017
  - Bright optical flaring activity (~20 times brighter)
  - Low level activity in gamma-ray band
  - No detection by H.E.S.S. close to optical peak

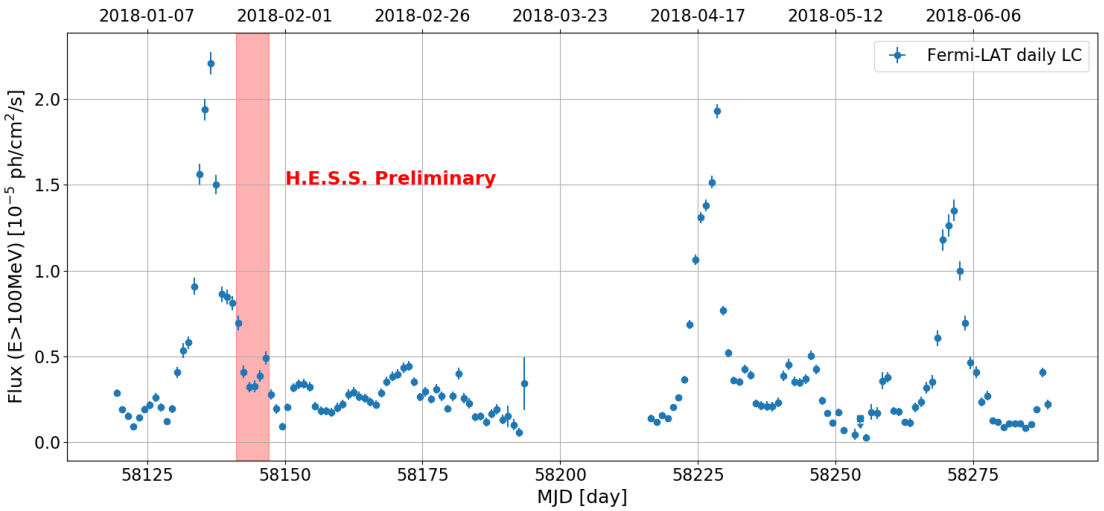
The 2018 flaring activity



- Source kept its high activity for the entire first half of 2018

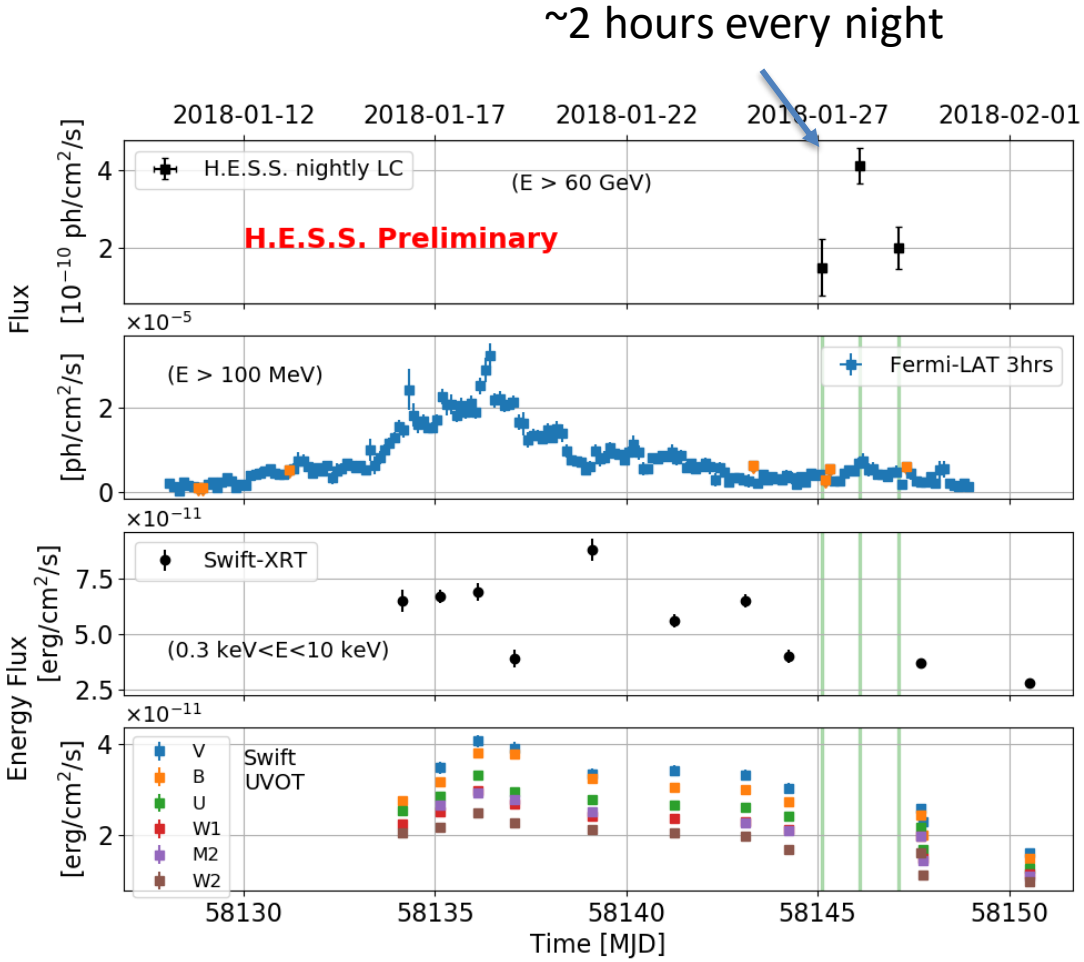
The 2018 flaring activity

- Source kept its high activity for the entire first half of 2018
- Focus on January observations
- Bad weather on site
- Persistence paid off
- Observation of a flare with H.E.S.S. after main peak
  - Not high flux in Fermi-LAT but hard photon index for the exact interval of the H.E.S.S. observations



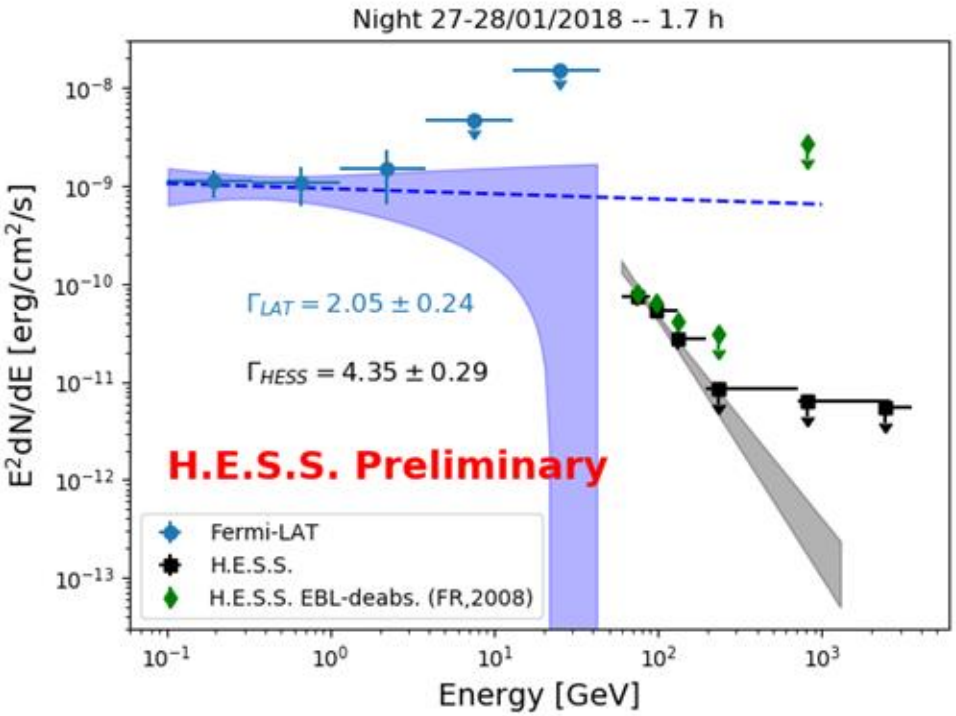
HESS flare in Jan 2018

- Strong flare detected by H.E.S.S. (more than factor 2 increase in flux)
- Brightening mirrored in the Fermi-LAT light curve with milder enhancement (flux up only by factor 1.5)
- Unfortunately no X-ray coverage for that night
- Analysis of ATOM optical data contemporaneous to HESS in process



HESS flare night in Jan 2018

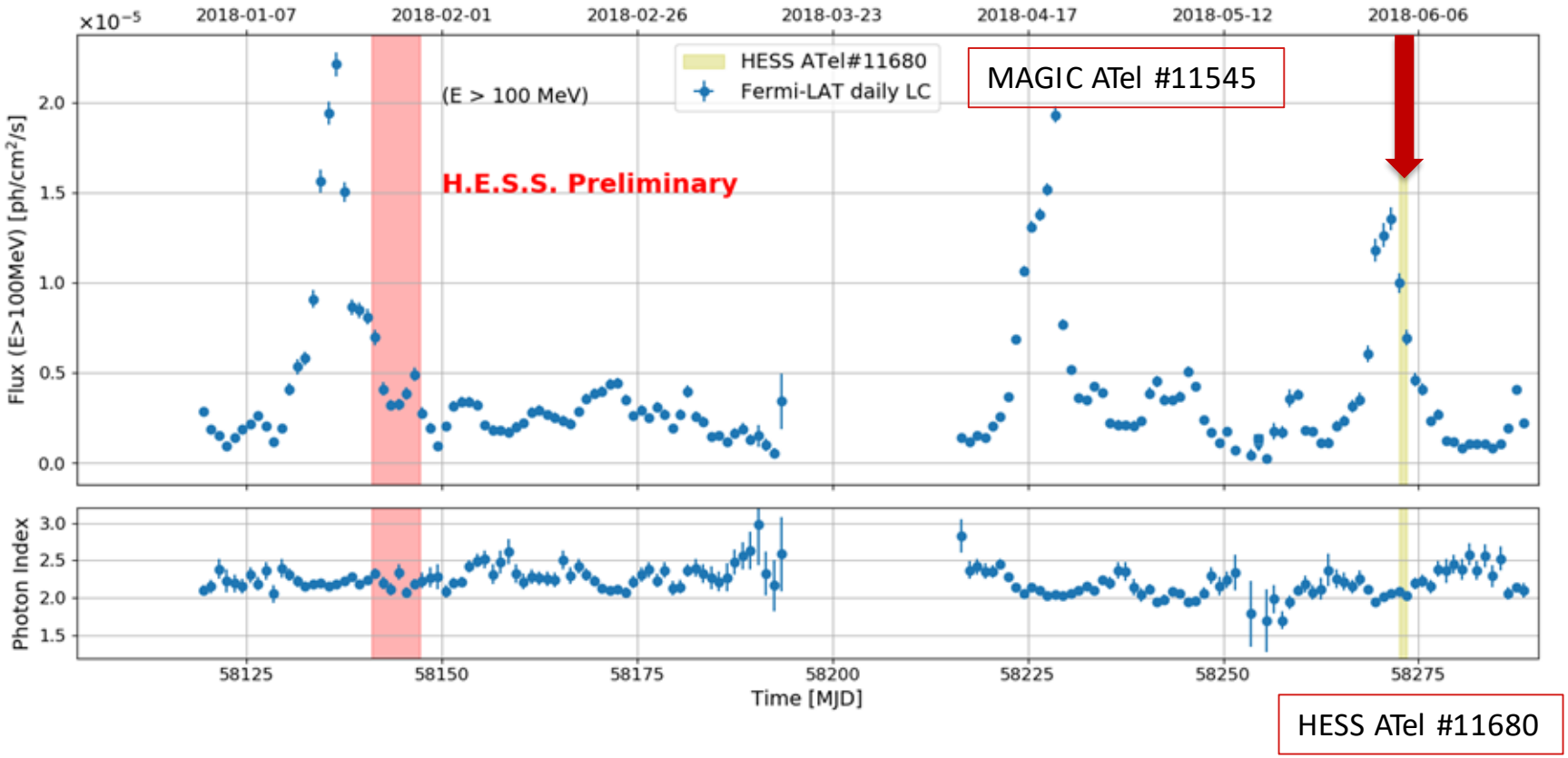
- Detection in single night:
- ~10 sigma in 1.7 h
- Spectrum similar to the 2015 one
- De-absorbed from EBL (using Fr. et al. 2008)
- Extrapolation from Fermi-LAT power-law function
- Internal absorption $\tau \sim 3.3$
  - (using Finke 2016)
- Similar value as in 2015
  - Distance of at least 0.1 pc from central BH



Conclusions

- Strong optical flare in the beginning of 2017 not mirrored at high energies (orphan flare?)
- Strong High Energy activity in the first half of 2018
- Detection of flare with H.E.S.S. after the peak of the Fermi-LAT emission in January 2018
- Results from spectral analysis similar to 2015 ones
- …

The rest of the 2018 dataset



- We have just started digging into the rich 2018 dataset

Stay tuned
and
thank you for your attention!

BACK-UP SLIDES

Finke model for internal absorption