



Leibniz-Institut für
Astrophysik Potsdam

Still alive & kicking: a significant outburst in changing-look AGN Mrk 1018

Brogan et al. 2023 (under review)

Collaborators:

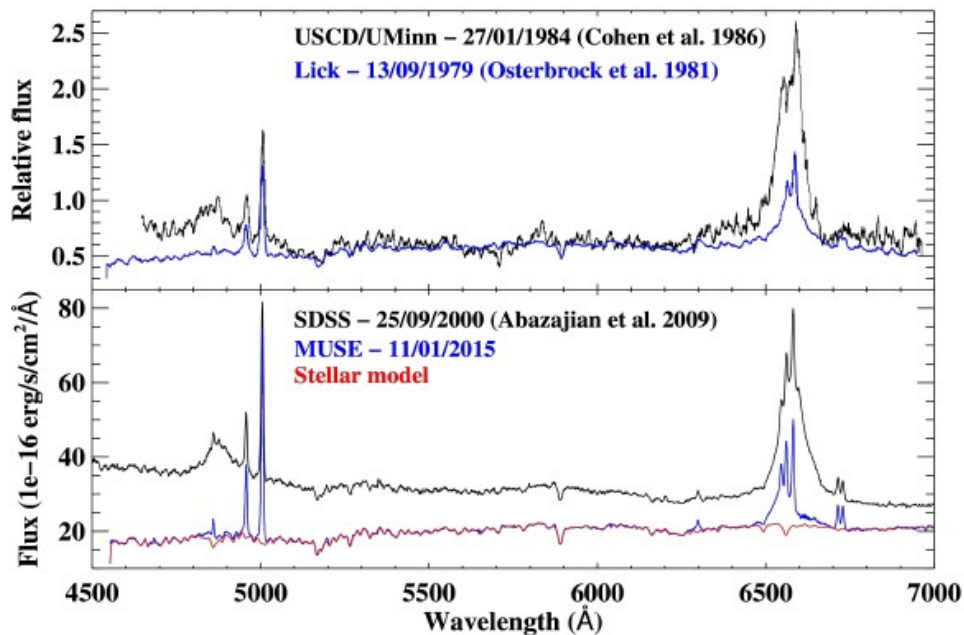
M. Krumpke, **D. Homan**, T. Urrutia, T. Granzer, **H. Winkler**, M. Schramm, S. Vaughan, R. McElroy, J. Neuman, M. Gaspari, S. Croom, F. Combes, M. Perez Torres, A. Coil

and others...



Background

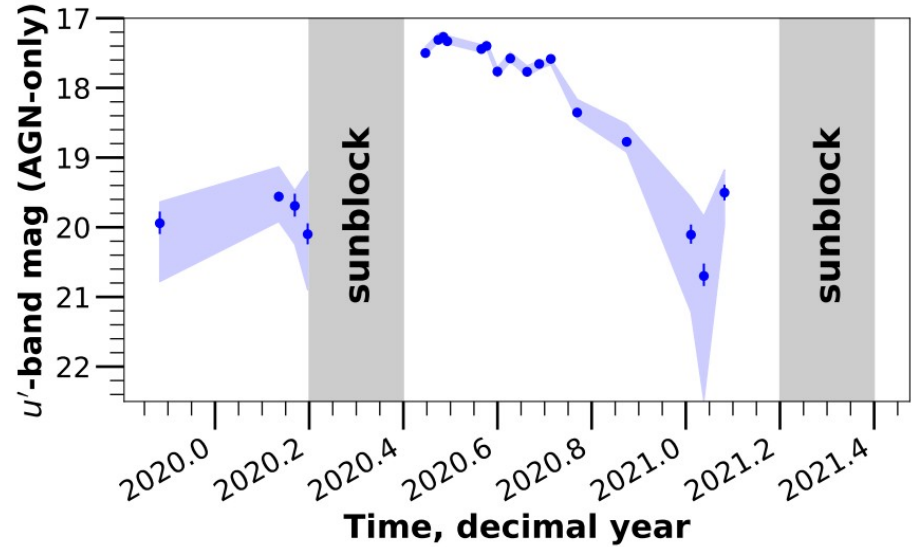
- Dramatic flux changes observed in increasing numbers of AGN
- Appearance/disappearance of optical broad lines
- Occurred in Mrk 1018 *at least* twice
- 2015 change found **mid-transition**
- Can follow in detail settling into new state with monitoring programme



McElroy et al. 2016

2020 Outburst

- Most significant in current faint state
- Host-subtracted u' -band light curve
- Equatorial object \rightarrow sunblock
- Multi-wavelength follow-ups challenging during pandemic
- Comparison of data as close to before and after



Multi-wavelength Dataset

Optical photometry:

- STELLA
- ATLAS forced photometry server

Optical spectra:

- VLT
- LBT

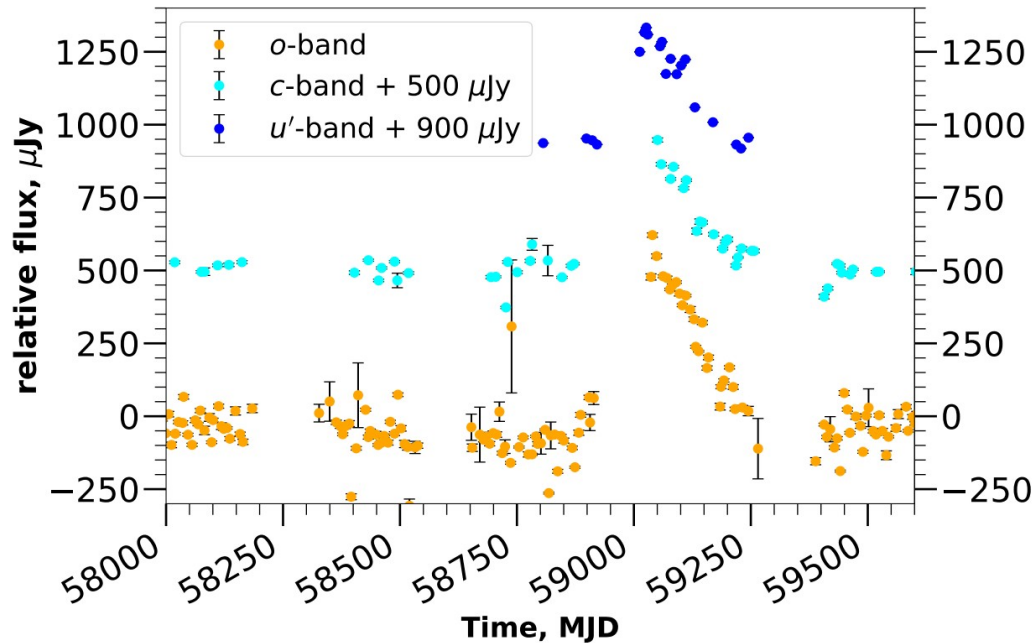
X-ray & UV:

- XMM-Newton

IR photometry:

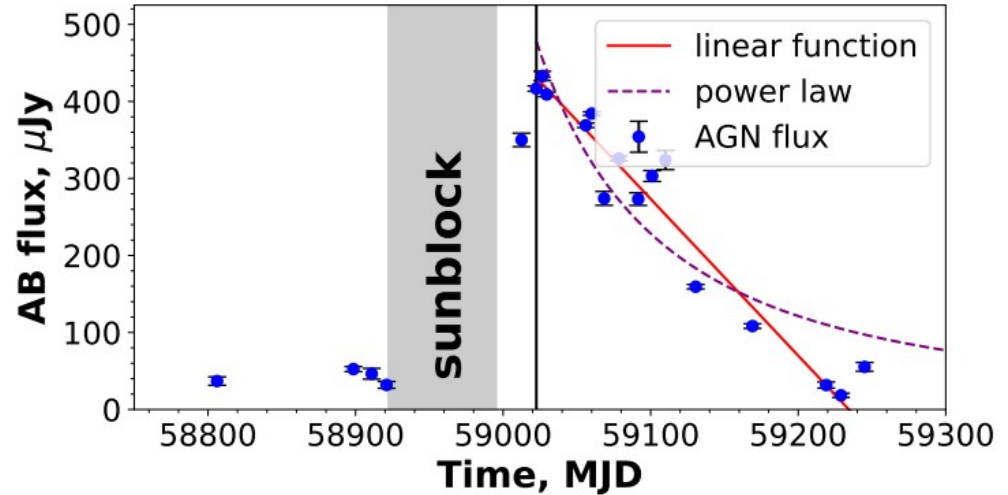
- WISE

Optical photometry overview



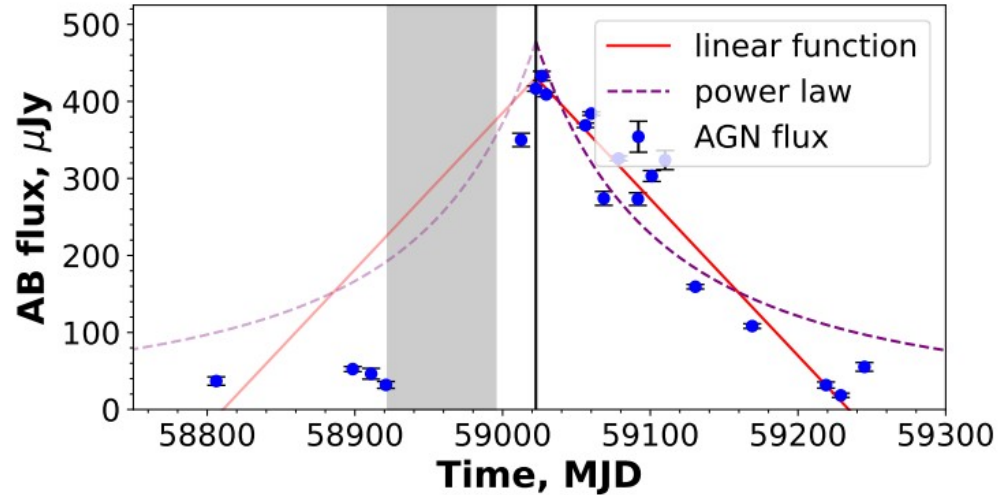
Optical light curves

- Short, strong outburst \rightarrow TDE
- TDE: characteristic power-law decline
- Best-fit for decline is linear in all 3 bands



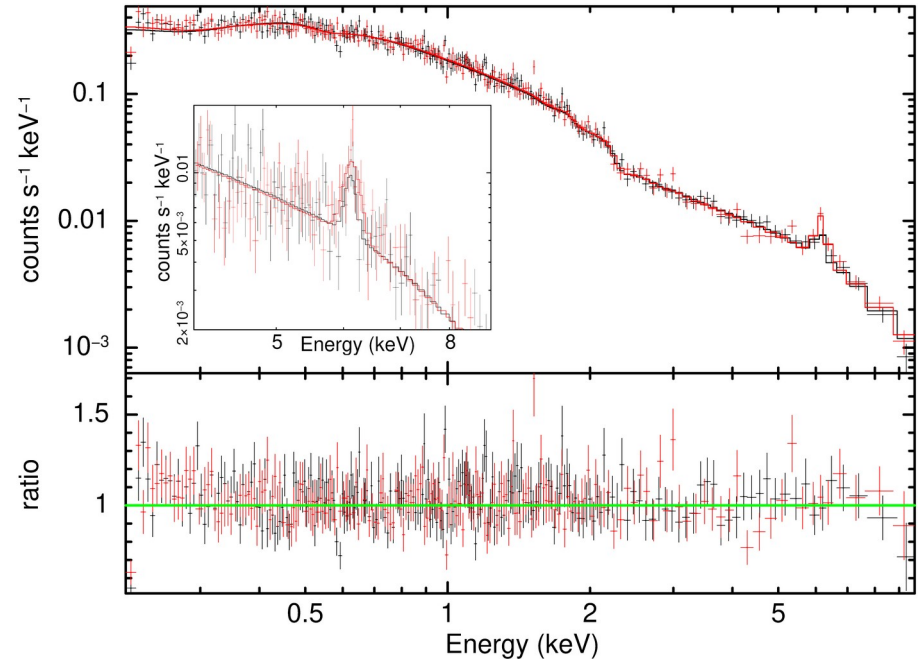
Optical light curves

- Short, strong outburst \rightarrow TDE
- TDE: characteristic power-law decline
- Best-fit for decline is linear in all 3 bands
- Outburst is asymmetric in all 3 bands
- Swifter rise than decline



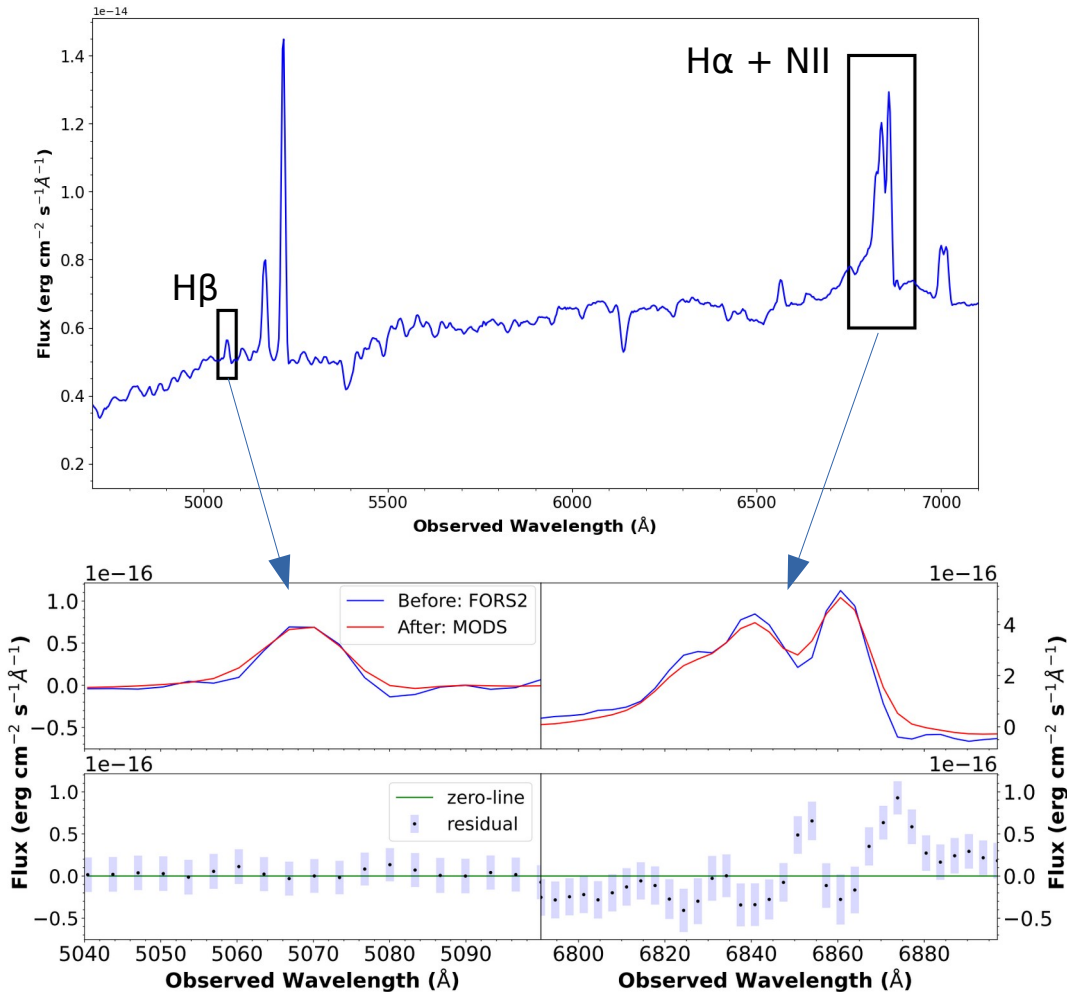
XMM-Newton Data

- 17 months before (black) and 7 months after (red) observed peak
- Primary X-ray components consistent within 2σ in both spectra
- Fe-line strength doubled in post-outburst obs. with 3σ confidence
- UV data shows increase of ~ 0.6 mags after outburst with 11σ confidence



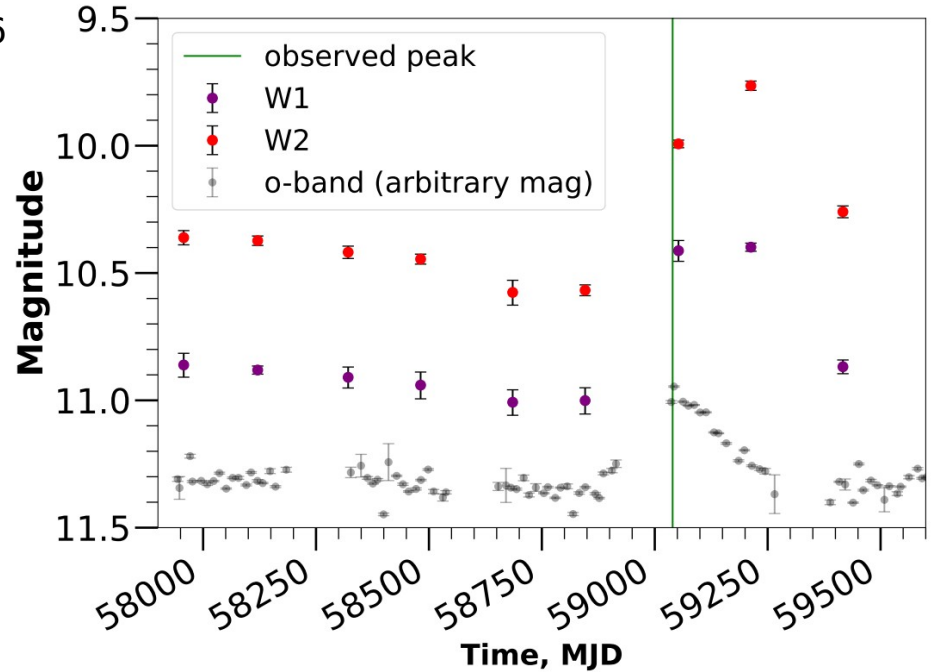
Optical Spectra Comparison

- VLT spectrum: 8 months pre-outburst
- LBT spectrum: 17 months post-outburst
- Consistent to within 2σ before and after
- BLR calculated to be of the order of 10 light days from the SMBH
- Short period to catch response
- No lasting effects



Infra-red light curve

- Precise timings unclear due to low cadence (6 months)
- Data point ~13 days after observed peak shows an increase
- Dust sublimation radius calculated at ~100 light days
- Quick response could be due to reaction of dust in line of sight



Conclusions

- Brief intense outburst (unlikely TDE)
- Primary X-ray flux reacts quickly - no lasting effect
- Fe line time lag
- BLR reacts quickly - no lasting effect
- Fast IR response likely due to torus orientation

We will:

- Continue to monitor for further variability and to detect any pattern
- Must have multi-wavelength follow-ups in place
- *Forthcoming paper*: long-term evolution of Mrk 1018

Thank you!

