

dr hab Alex Markowitz

Properties of accretion flows & circumnuclear accreting/outflowing gas in Active Galactic Nuclei, via variability & spectroscopy (mostly X-rays)

Current pursuit: X-ray-Detected SMBH transients with eROSITA

Work with German eROSITA consortium as an External Collaborator to identify extragalactic X-ray nuclear transients from eROSITA's all-sky X-ray surveys

Ongoing bilateral NCN/DFG grant

GOAL: Identify new accretion ignition or shutdown events at SMBHs: observational constraints on AGN duty cycles



(image credit: DLR)

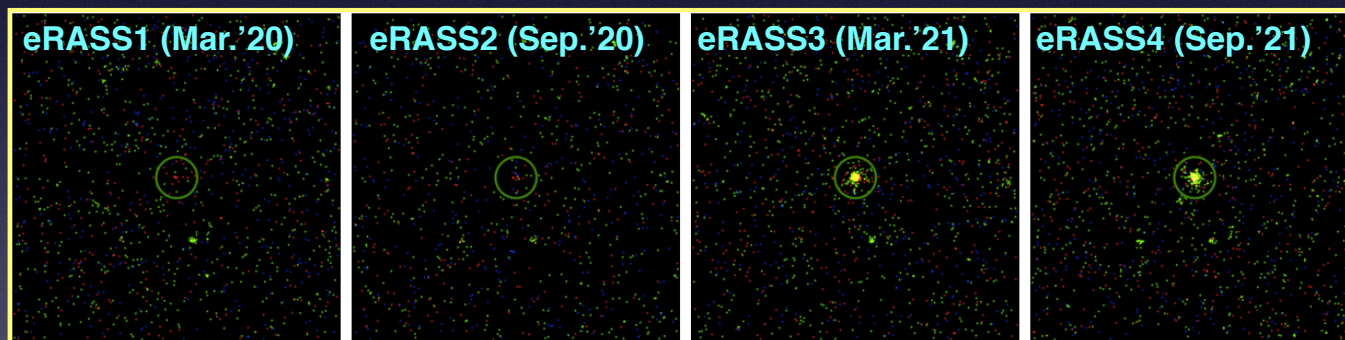
The origins of X-ray-Detected SMBH Transients with eROSITA

Changing-State/Changing-Look AGN: extreme variations in global accretion rate → extreme variations in X-ray, optical continuum/line fluxes

Flares in RQ AGN (thermal/magnetic instabilities in disk?)

Changing-Obscuration AGN (probe circumnuclear gas structure)

Stellar TDEs in quiescent or active galaxies



Dedicated multi- λ followup campaigns for selected individual targets → track response/formation of flow components to extreme changes in accretion

X-ray (eRASS, XMM, Swift, NICER): corona

Opt./UV photometry (LCO, Swift): accretion disk

Opt. spectroscopy (SALT, SAAO, VLT): Broad Line Region

Updates during 2023:

D. Homan et al., (2023, A&A, 672, A167): Published, & A. Malyali et al., in prep.

J2344-35: a TDE in an AGN:

X-ray characteristics of a TDE: ultra-soft spectrum; rapid flux decay

Optical spectral characteristics of an AGN: Broad Balmer lines.

Currently exploring if X-ray flux variations are quasi-periodic (disk precession?)

Z. Liu et al., (2023, A&A, 669, A75): Published

J0456-20: Partial-repeating TDE in a quiescent galaxy.

Variations in formation & rapid destruction of X-ray corona

S. Krishnan et al., A&A, submitted

J0408-38: ~Year-long flare in a Seyfert AGN

Sudden increase in accretion due to disk instability

Spikes in optical disk emission, Comptonized X-ray, He II $\lambda 4868$ BLR emission

A. Markowitz et al., A&A, accepted, December 2023; arXiv:2401.08768

J0458-52: Variable-obscuration Seyfert:

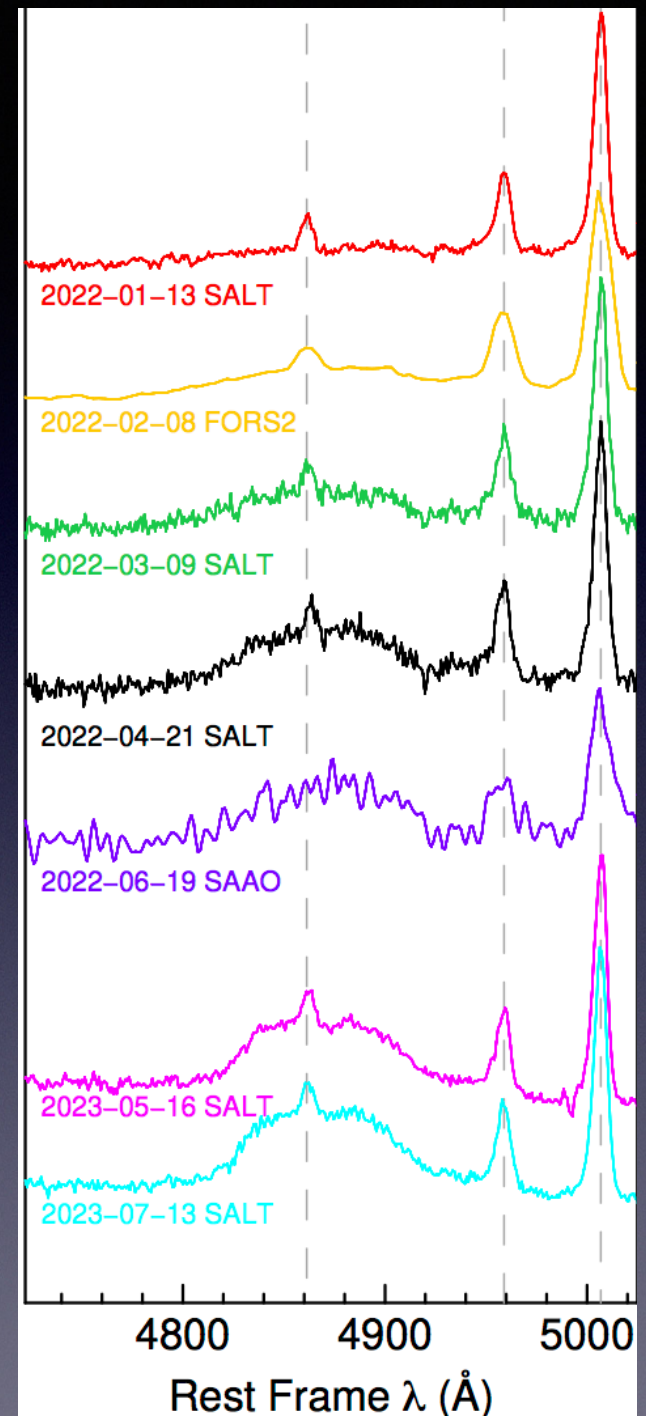
Dust-free clouds or disk wind residing in outer BLR

Plans for 2024:

A. Markowitz et al., in prep.: Seyfert with BLR “breathing” during recovery from sudden luminosity dip

Broad H β emission: BLR moves outward by 2.6 as L_{UV} increases by 8

Consistent with statistical $R_{BLR} \propto \sqrt{L}$ relation



Summary & Outlook

Work in progress for individual transient events:

Continue follow-up monitoring programs, constrain response timescales, track BLR/disk/corona evolution

The origins of extreme X-ray variability events span many categories: Disk instabilities, disk winds, TDE-like accretion

Work in progress for the sample:

Quantifying the broad ranges of responses in X-ray, Balmer line profiles/ intensities, optical continuum

Look for more forthcoming papers (soon)!



(image credit: DLR)

2023 service, mentoring, etc:

PhD students at CAMK:

S. Krishnan (Thesis defended, June) & T. Saha (Thesis submitted, November)

New observing proposals as PI: SALT, XMM-Newton

Member of

- Rada Naukowa CAMK
- Komisja ds nagród
- Komisja ds konkursów