

A Multi-Wavelength Exploration of Narrow-Line Seyfert 1 Galaxies

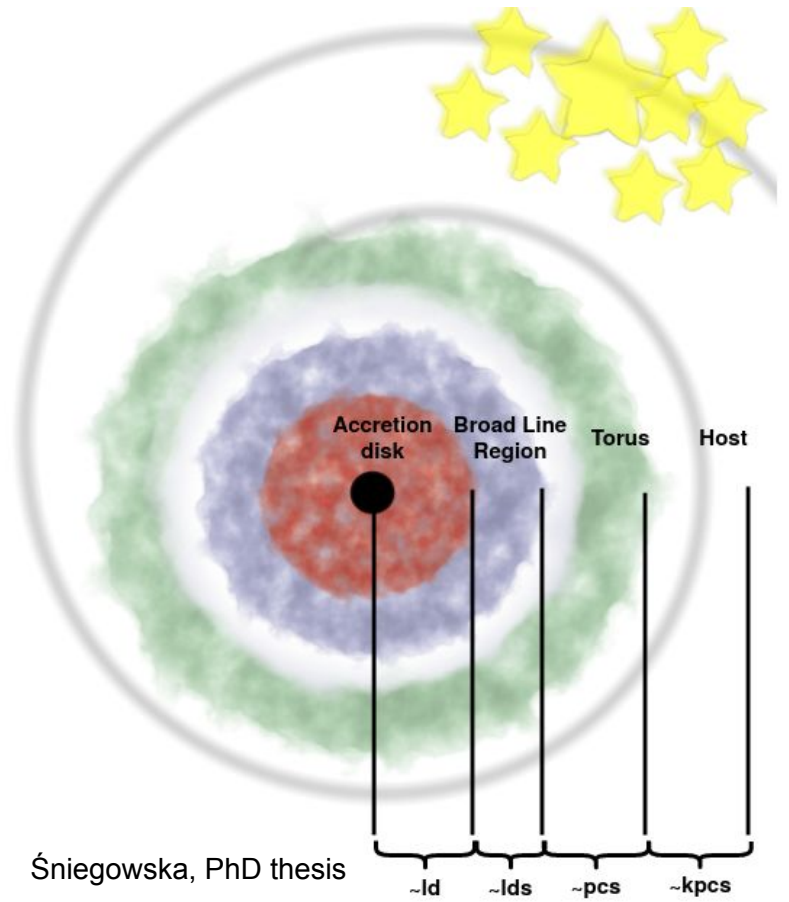
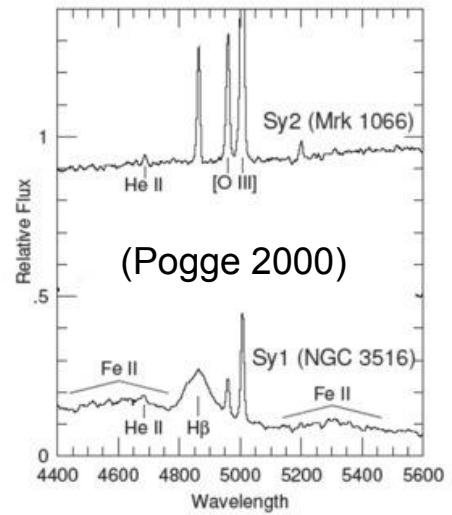
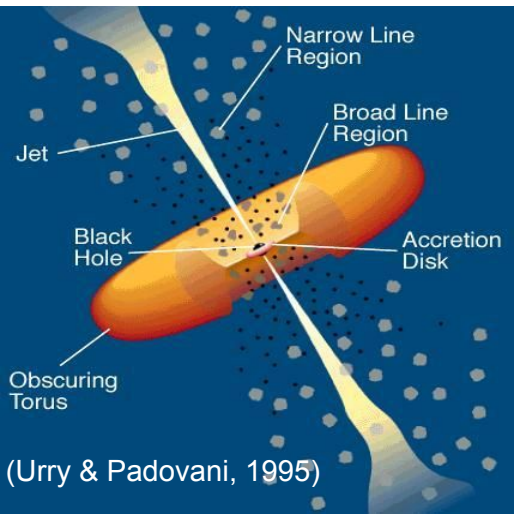
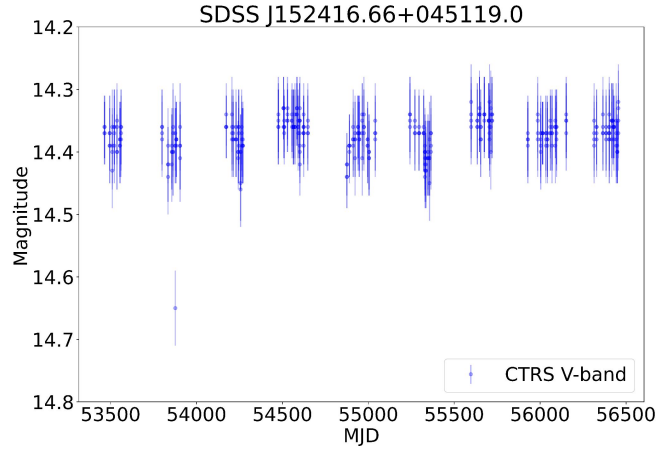
Marzena Śniegowska

with Biswaraj Palit, Agata Róžańska, ..., ... (please, join us! :))

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Fast Active Galactic Nuclei introduction

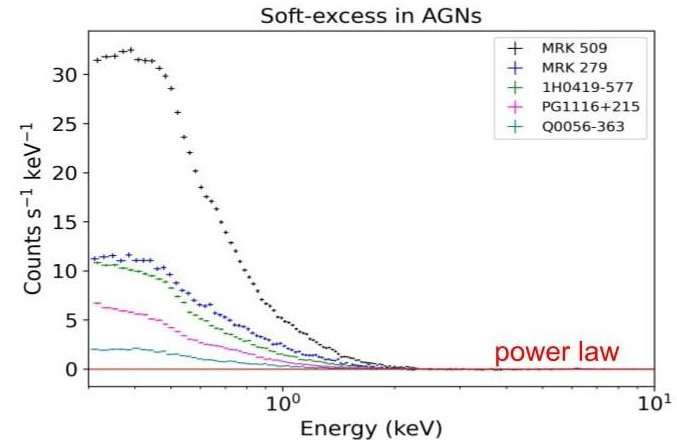
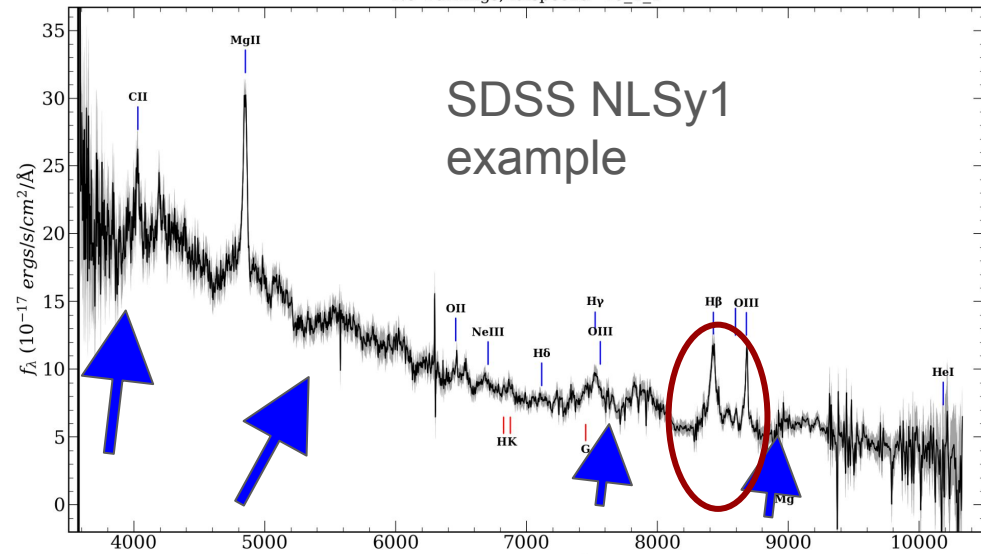


Śniegowska, PhD thesis

NLSy1 galaxies

The most important features of NLSy1s:

- ★ **FWHM (Balmer lines) < 2000 km/s (Osterbrock & Pogge 1985; Goodrich 1989)**
- ★ **Strong Fe II emission (optical/UV) (Véron-Cetty et al. 2001)**
- ★ Stronger [OIII] line asymmetries (Schmidt et al. 2018)
- ★ Lower-luminosity AGN
- ★ Strong soft excess (Pounds et al. 1995, Done et al. 2007)
- ★ Stronger X-ray variability (Boller et al. 1996, Ding et al. 2022)
- ★ Peculiar H β lags (Du et al. 2015, 2016; Wang et al. 2014)



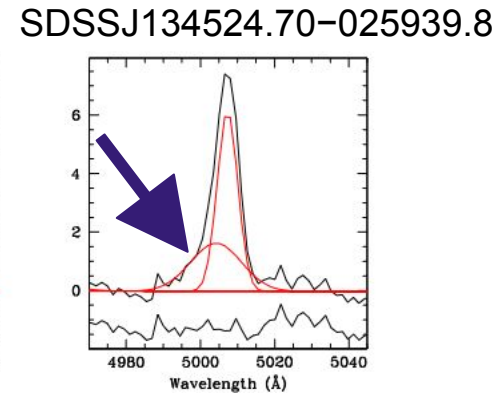
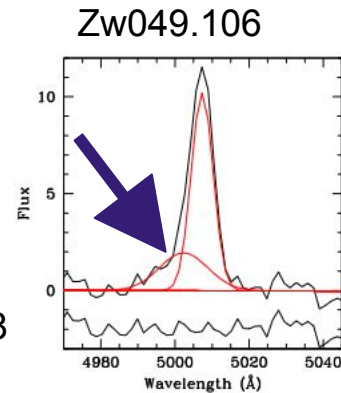
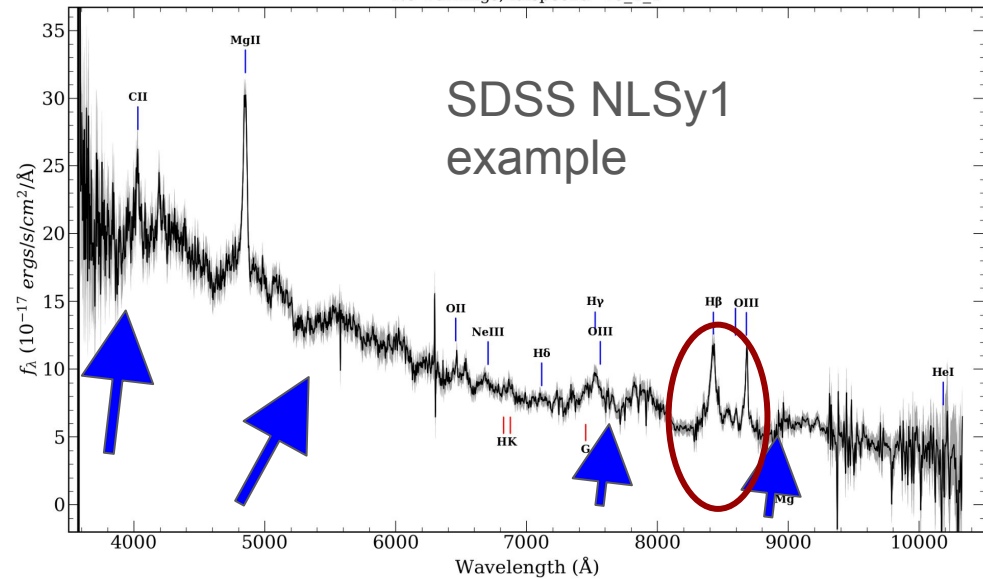
credits: Biswaraj Palit

NLSy1 galaxies

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Schmidt et al. 2018

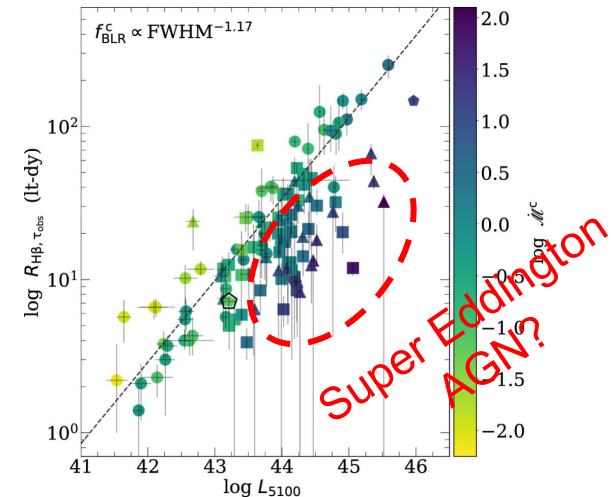
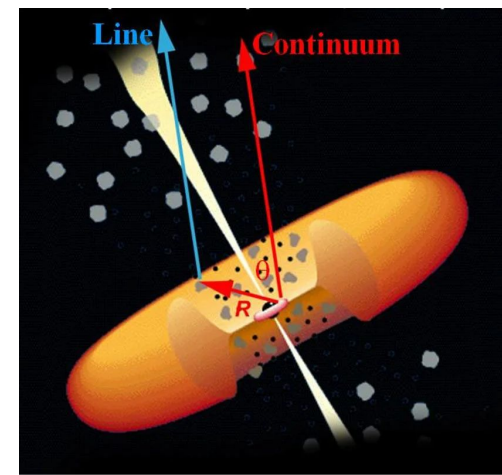


NLSy1 galaxies

Credits: Shai Kaspi

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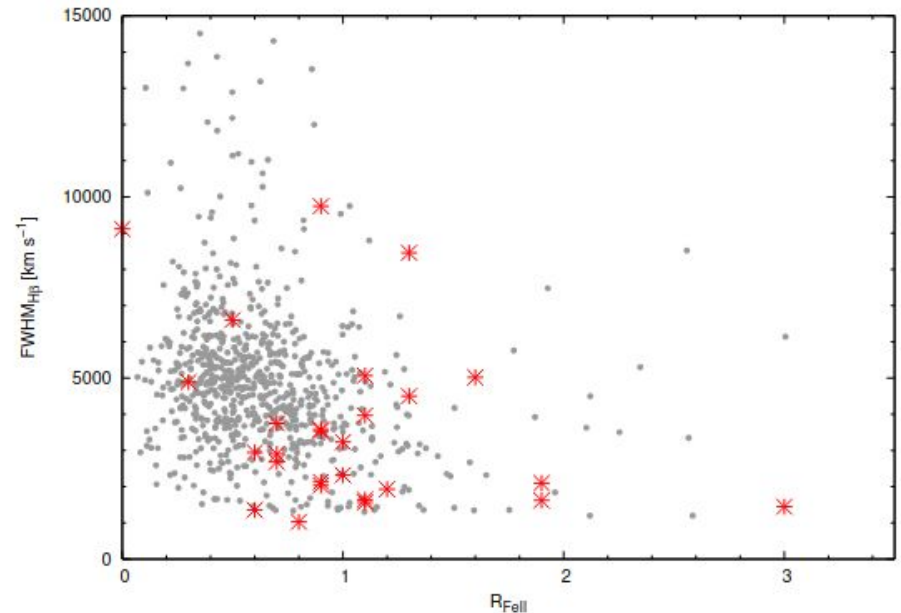
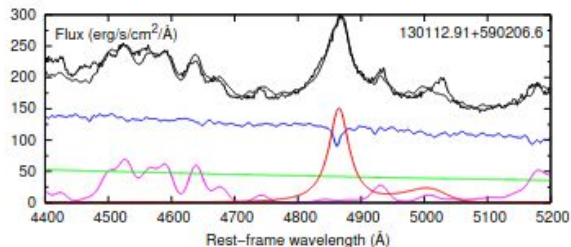
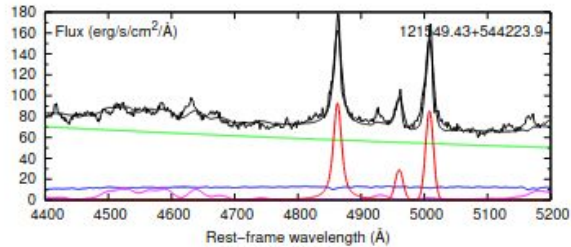
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- ★ **Peculiar H β lags (Du et al. 2015, 2016; Wang et al. 2014)**



plot from Martínez-Aldama et al. 2019

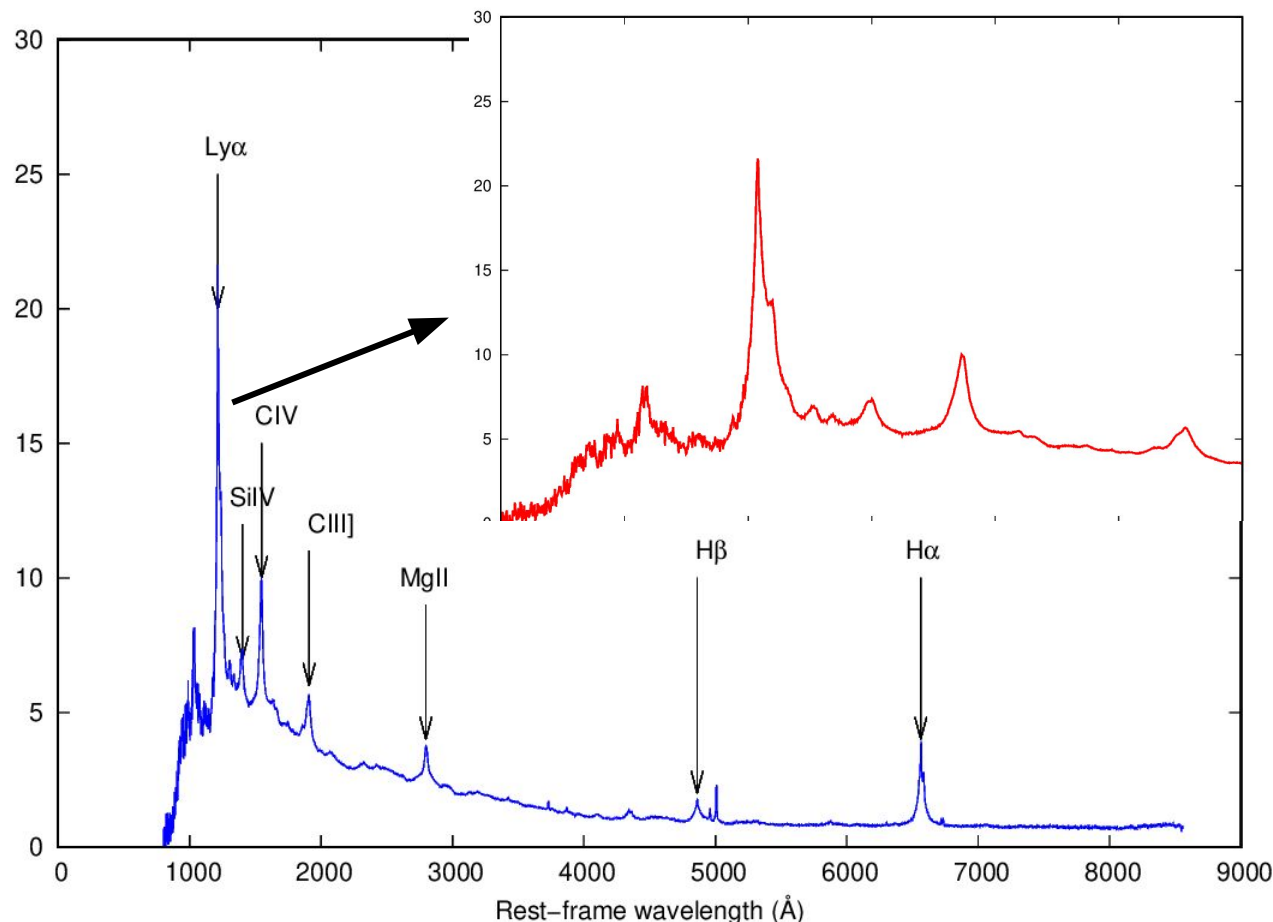
What can be done with NLSy1? 1. Refitting the SDSS outliers

- ★ After detailed refitting of sources Flux FeII/ Flux H β > 1.3 (27 objects), they shifted towards left



plots from Śniegowska et al. 2017

What can be done with NLSy1? 2. Going to UV



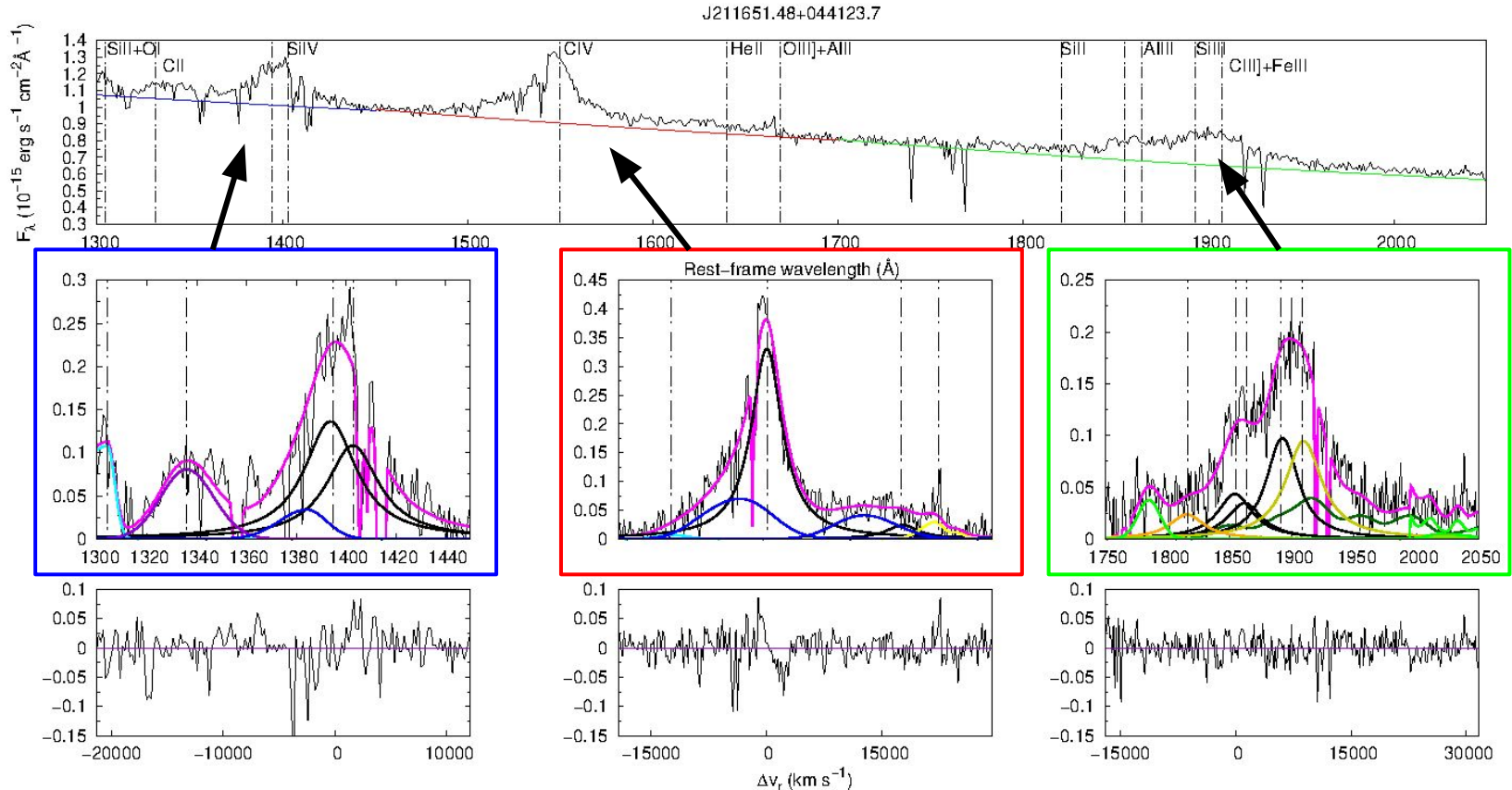
Criteria:

- ★ $2.16 < z < 2.42$
- ★ $A_{\text{III}\lambda 1860} / \text{SiIII}\lambda 1892 > 0.5$
- ★ $\text{CIII}\lambda 1909 / \text{SiIII}\lambda 1892 < 1.0$
- ★ Avoiding absorption in spectra

23 objects from SDSS

composite spectrum: *Vanden Berk+ 2001*

What can be done with NLSy1? 2. Going to UV

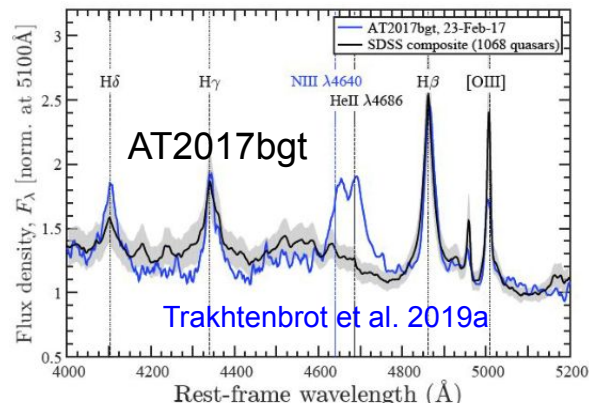
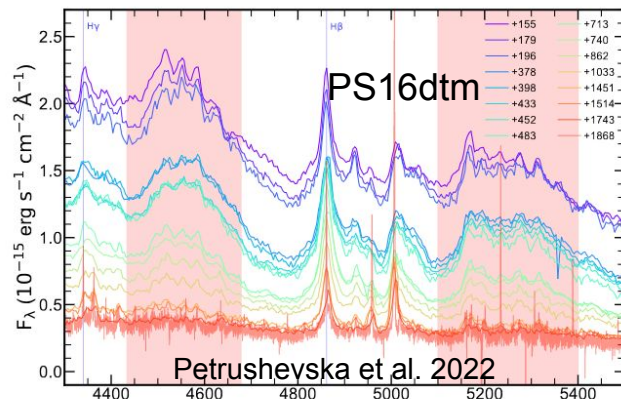
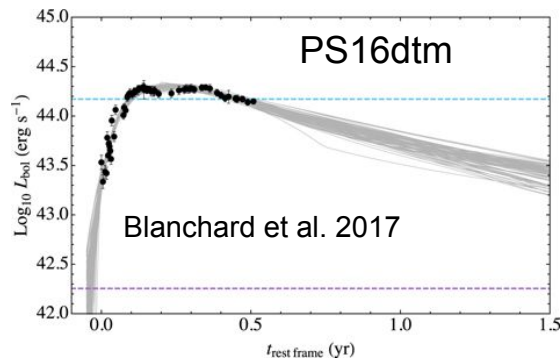
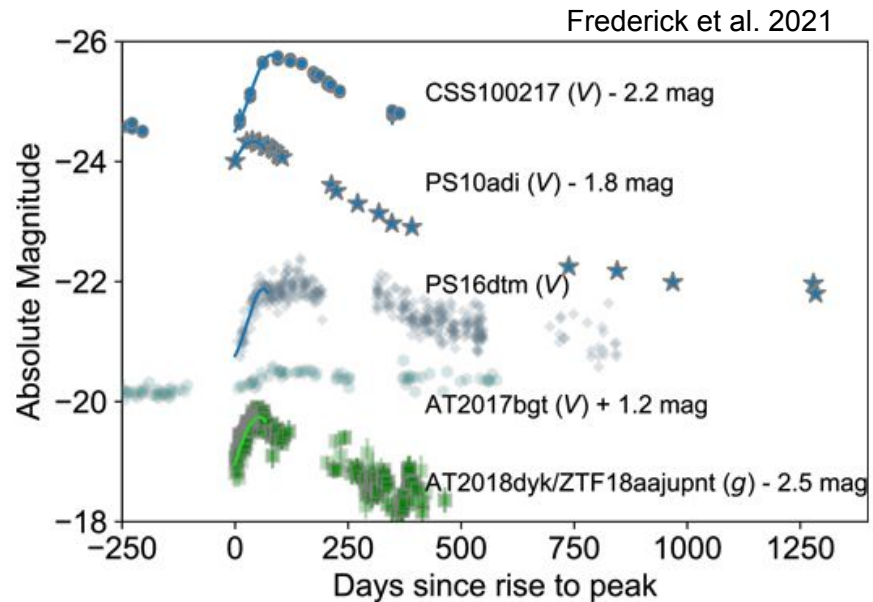


plot from Śniegowska et al. 2021

What can be done with NLSy1?

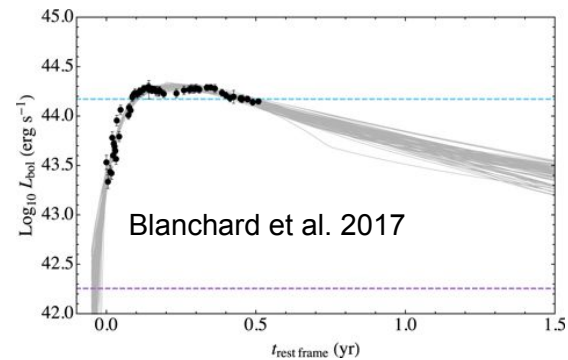
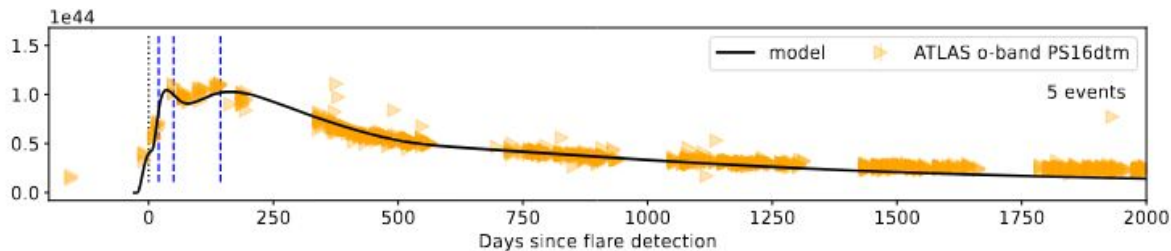
3. NLSy1-related flares

- ★ CSS100217 accompanied by broad H α and was interpreted either as a Type IIIn SN (Drake et al. 2011) or a TDE (Saxton et al. 2018)
- ★ PS16dtm - a nuclear outburst in a NLSy1 (Blanchard et al. 2017, Petrushevskaya et al. 2022)
- ★ AT2017bgt - Broad Bowen Fluorescence lines (Trakhtenbrot et al. 2019a)
- ★ ZTF18aajupnt/AT2018dyk (Frederick et al. 2019) - first LINER changing look to a NLSy1

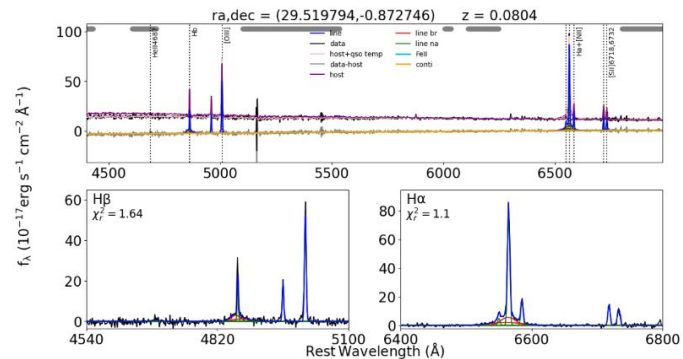
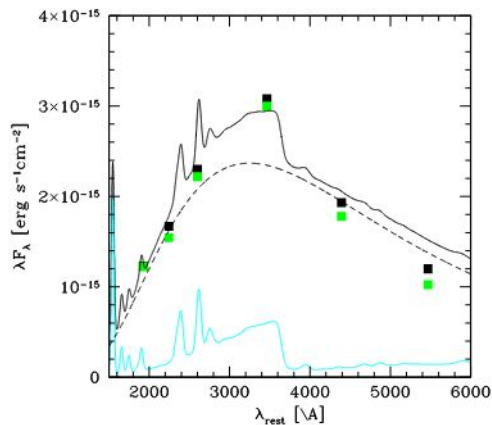


What can be done with NLSy1?

3. NLSy1-related flares - case study



- ★ The modelling of the accretion event light curve, including viscous spreading, constrains the disrupted mass to $\sim 0.3 - 0.4 M_{\odot}$



Śniegowska et al. submitted

[Data](#)

Our latest data release, [DR19](#) is now live! This is the first big data release for SDSS-V and contains spectra and data products from [Black Hole Mapper](#) and [Milky Way Mapper](#), as well as a preview tile of the Helix Nebula from [Local Volume Mapper](#). We are also releasing new [Value Added Catalogs](#), [tutorials](#) that show you how to work with the DR19 data, and our new visualisation webapp, [Zora](#). Find out more about DR19 on the [DR19 webpages](#), and in the [DR19 paper](#).

If you are looking for previous data releases from SDSS-IV, then these are all still available! You can find them on our [completed surveys](#) page, and at the [SDSS-IV webpages](#). Completed surveys include the SDSS [Imaging and Legacy Survey](#), [Supernova Survey](#), [SEGUE1/2](#), [MARVELS](#), [\(e\)BOSS](#), [APOGEE-1/2](#), [MaNGA](#) and [MaStar](#).

Our next data release will be DR20, and is currently scheduled for 2026.

Credits: <https://www.sdss.org/>

General summer project plan

- ★ look for extreme changes (photometry and spectroscopy) between DRs
- ★ examine more subtle changes (Fell, FWHM of broad lines)
- ★ **multiwavelength observations?**

SDSS DR17 **22656** NLSy1s -> quality cut (~3000 sources)



General summer project plan

★ multiwavelength observations?

SDSS DR17 **22656** NLSy1s -> quality cut (~**3000** sources) -> the LOw-Frequency ARray crossmatch - LOFAR DR2 (~**400** sources) (but DR3 already available!)



General project plan

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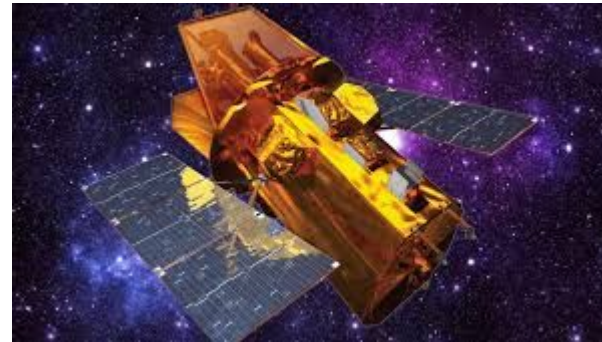
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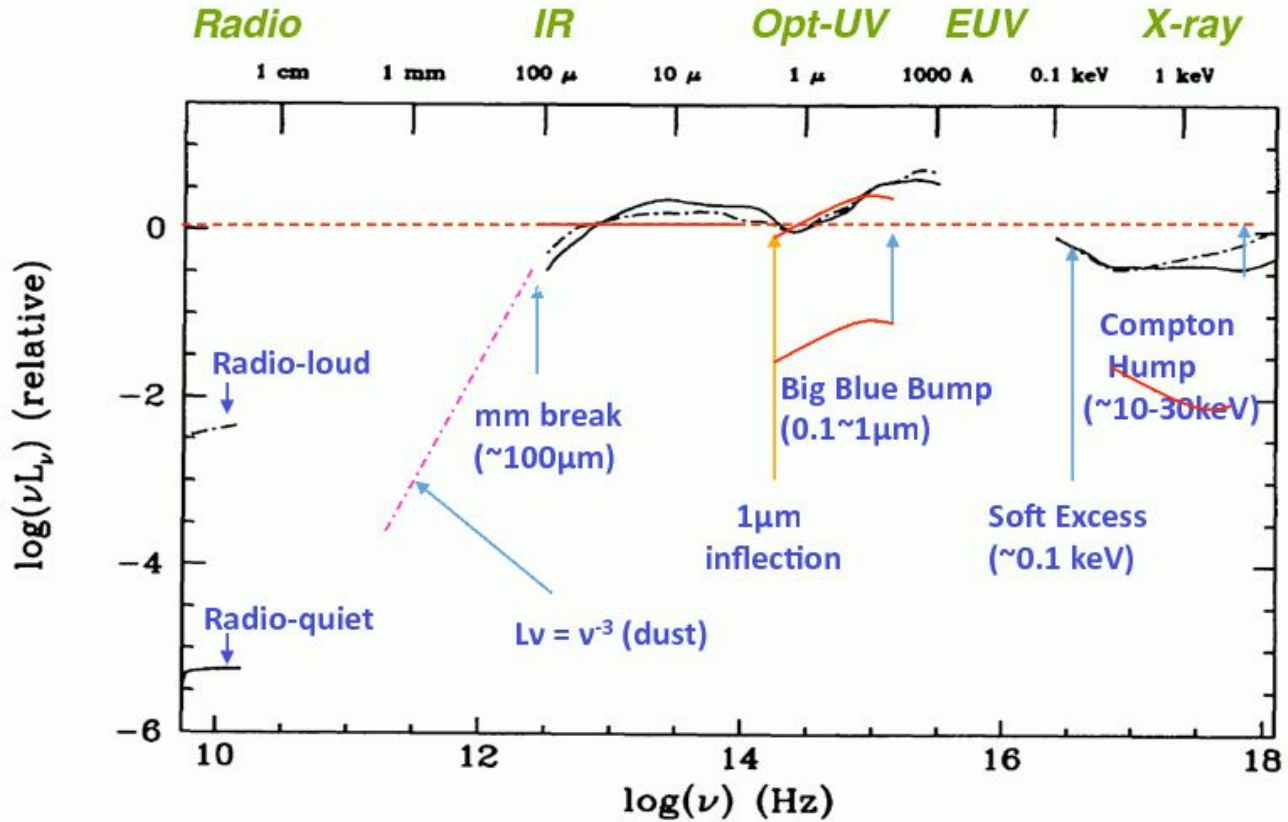
SDSS DR17 **22656** NLSy1s -> quality cut (~**3000** sources) -> the LOw-Frequency ARray crossmatch - LOFAR DR2 (~**400** sources) (but DR3 already available!) -> The Very Large Array Sky Survey (VLASS) (~**60** sources) -> XMM NEWTON (**5** sources) + SWIFT (**9** sources)



General summer project plan

★ multiw

SDSS DR1
ARray cross
The Very La
sources) +



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Project overview

Desired skills:

- **Enthusiasm for scientific work** and some knowledge of programming

Skills to get familiar with during the project:

- Work on fits files
- Data analysis and processing (TOPCAT, Python packages...)
- Optical spectral fitting (PyQSOFIT or FANTASY or ...)
and/or
- SED fitting (CIGALE ...)

Duration: 4 weeks (with a possibility of continuing online)

Start: mid-june to mid-september
(online or on-site)

Thank you!



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marzena.sniegowska@asu.cas.cz