# CHEESES: Constraining the High Energy Emission Sources in the Environment of Supermassive black holes

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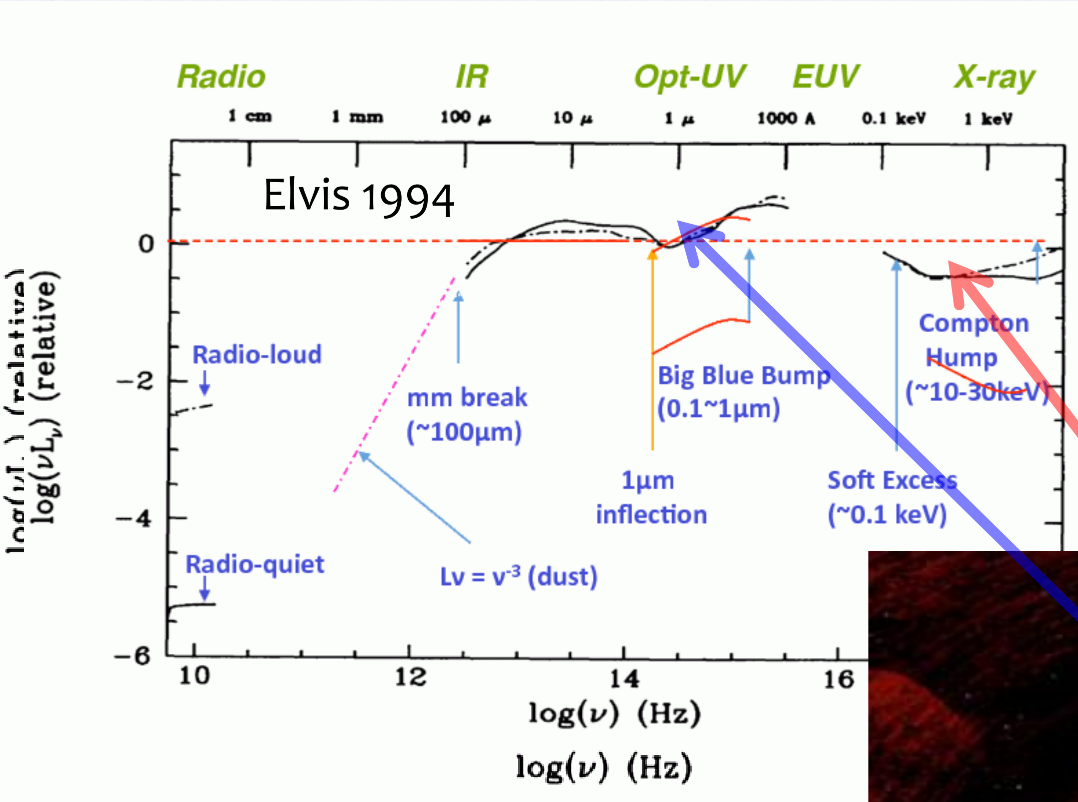
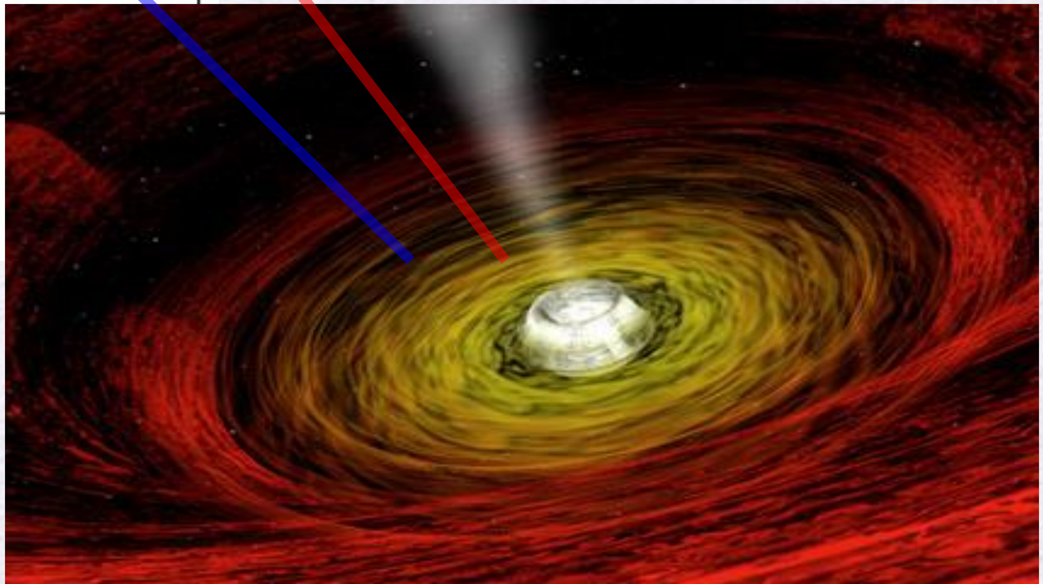
# AGN emission model




- Radio-quiet AGNs emit the bulk of their luminosity in the UV and X-ray bands
- optically thick cold plasma and hot and optically thin plasma
- Cold and hot phases are expected to be radiatively linked one with each other



# The Cheeses project

The French-Italian PICS project (INAF/CNRS): a systematic and detailed spectral analysis of the best quality data of a large sample of AGN by using the most up-to-date high energy radiative models

- use realistic and up-to-to date Comptonization models to derive the physical and geometrical parameters (the temperature and optical depth) of the hot corona responsible for the hard X-ray emission in AGN
- constrain the origin of the « secondary » spectral components (especially the soft X-ray excess)

# Multiple OM and EPIC simultaneous observations of AGNs

**Analysis**

- Realistic Comptonization models using Simultaneous XMM-pn & OM multiple observations. Spectral Variability study.

**The sample**

- X-rays: *CAIXA* (Bianchi+2009): all the radio-quiet X-ray unobscured (Nh <2e22 $cm^{-2}$) AGNs observed by *XMM-Newton* in targeted observations.
- UV: Serendipitous Ultra-violet Source Survey *XMM-SUSS2* (Page+2012) : optical/UV sources detected serendipitously by the OM/XMM-Newton in 6 filters (W2,W1,M2,U,B,V)
- 70 sources (16 NLsy1,30 BLsy1, 24 no Hbeta), 253 obsID with pn and at least one OM filter

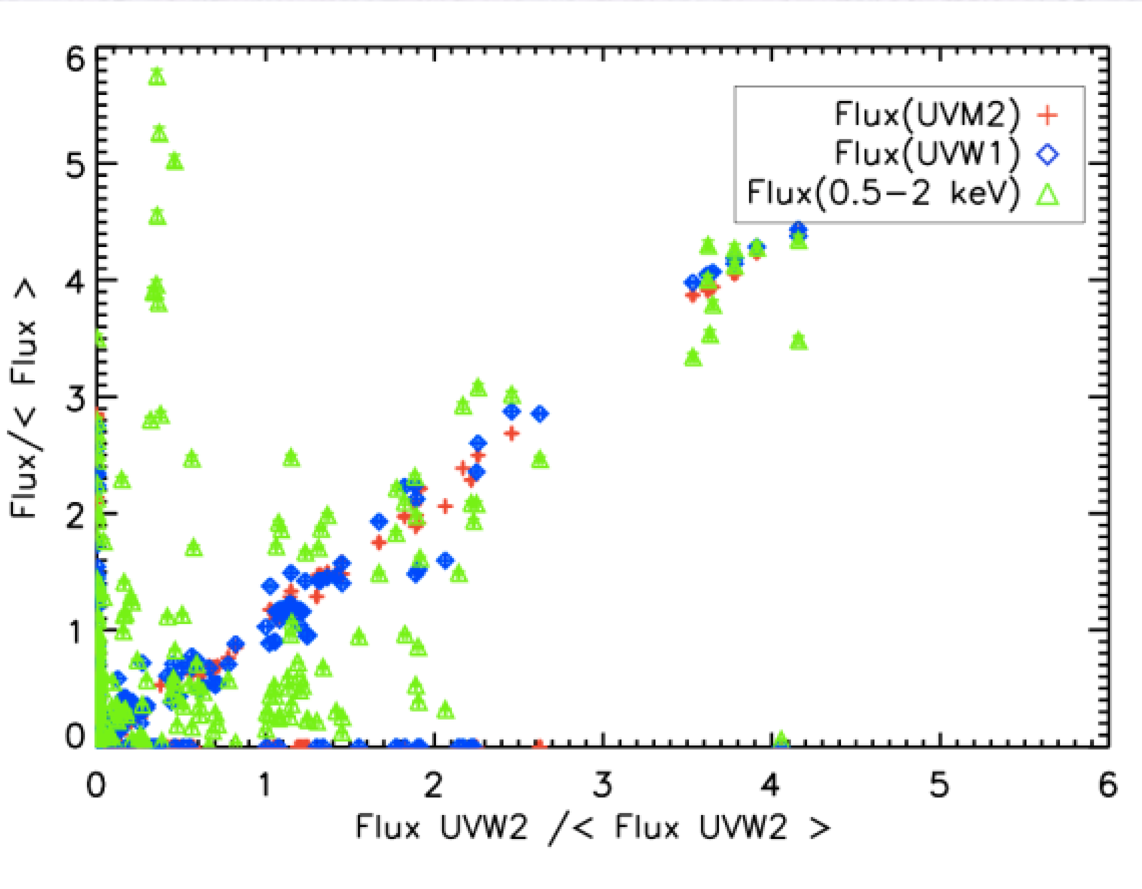
# Sample global properties

Flux-flux correlations

Intra-band and inter-band variability

NLSy1 vs BLSy1

# UV vs X-ray variability

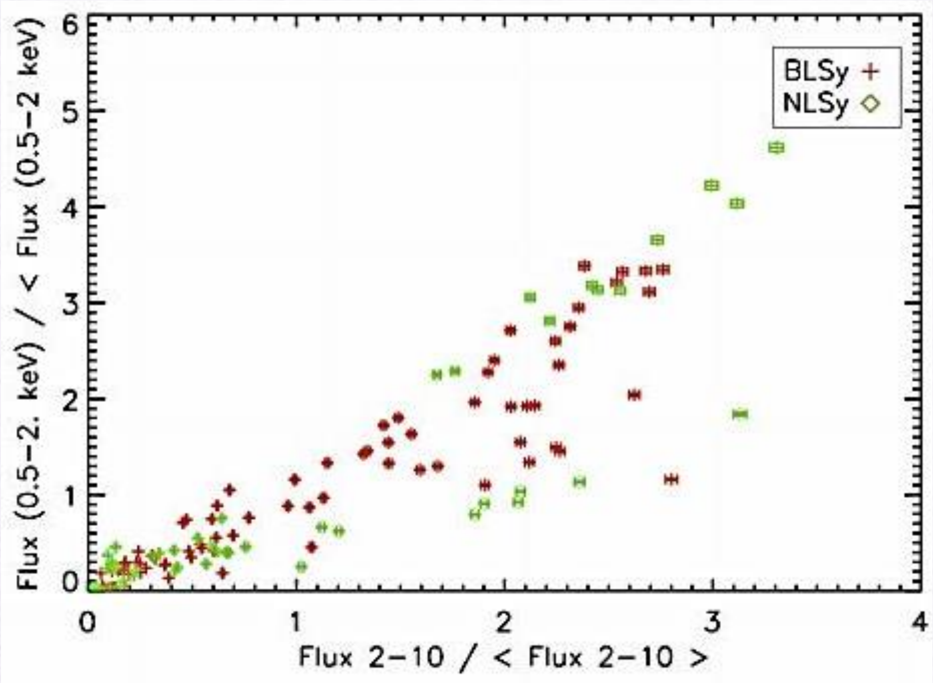


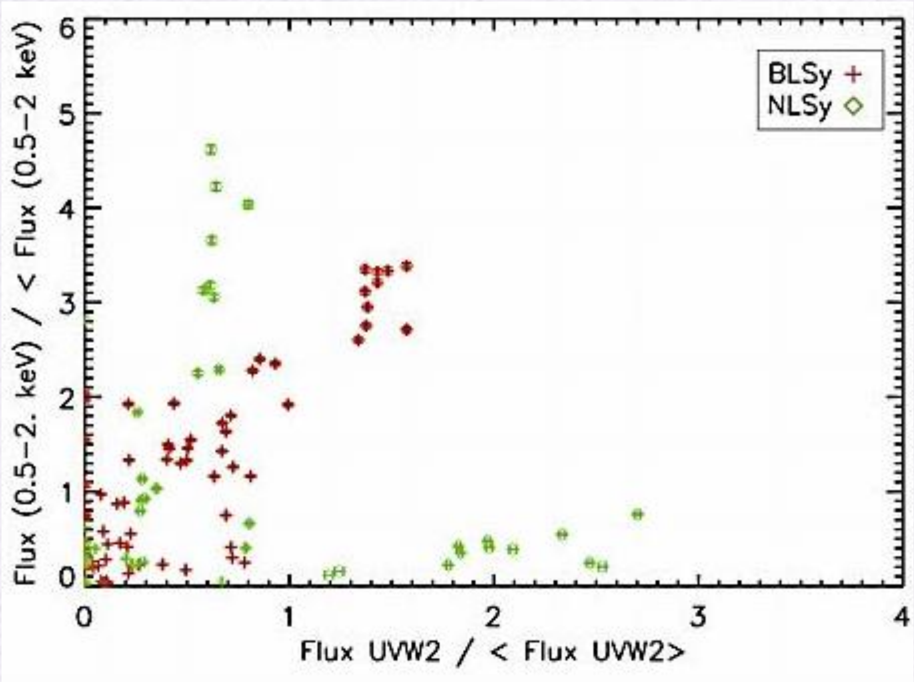

Trend of variability is different between UV and soft-X

| FILTER | &lambda$_{max}$ (Â) | Δλ (Â) |
|---|---|---|
| UVW2 | 1,894 | 1,805-2,454 |
| UVM2 | 2,205 | 1,970-2,675 |
| UVW1 | 2,675 | 2,410-3,565 |

# Flux-flux variability

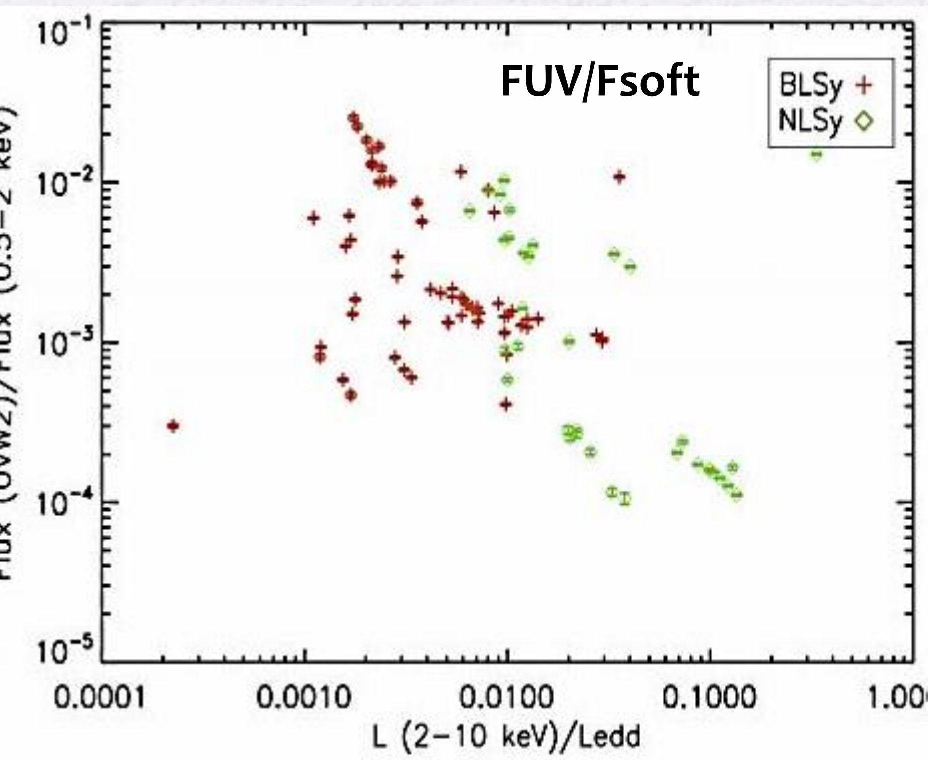
- NLSy1s exhibit larger amplitude of variation with respect to BLSy1
- The soft X-ray band seems the most variable

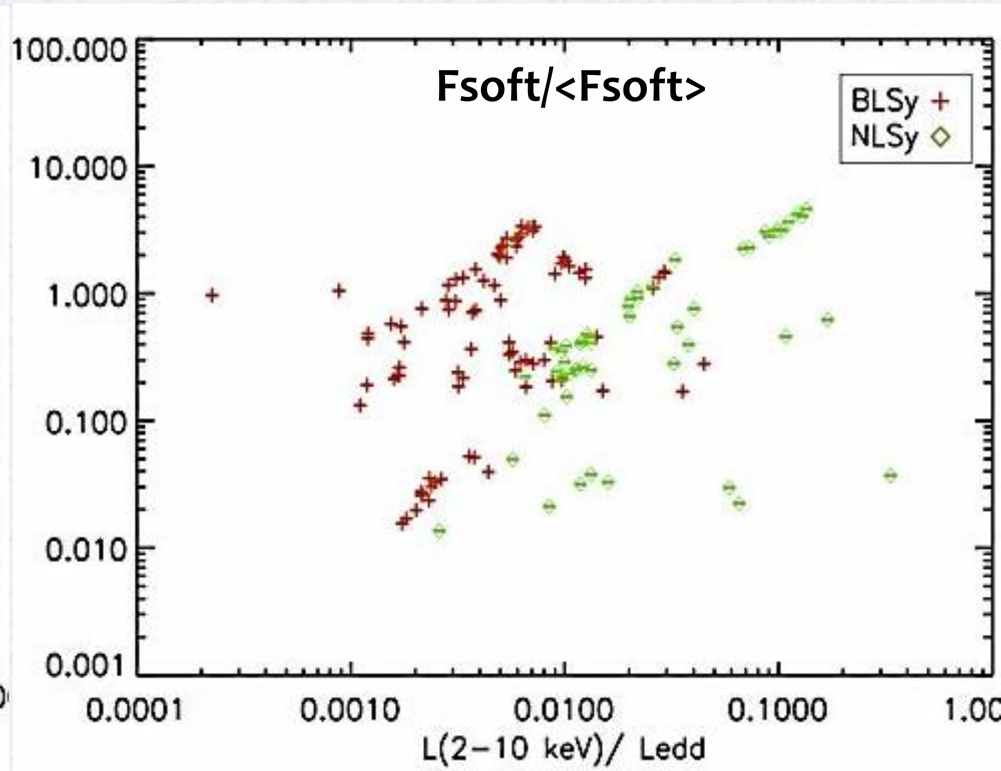



NLSy1: FWHM(Hb)<2000 km/s
BLSy1: FWHM(Hb)>2000 km/s (CAIXA, Bianchi+09)

# Inter-band variability



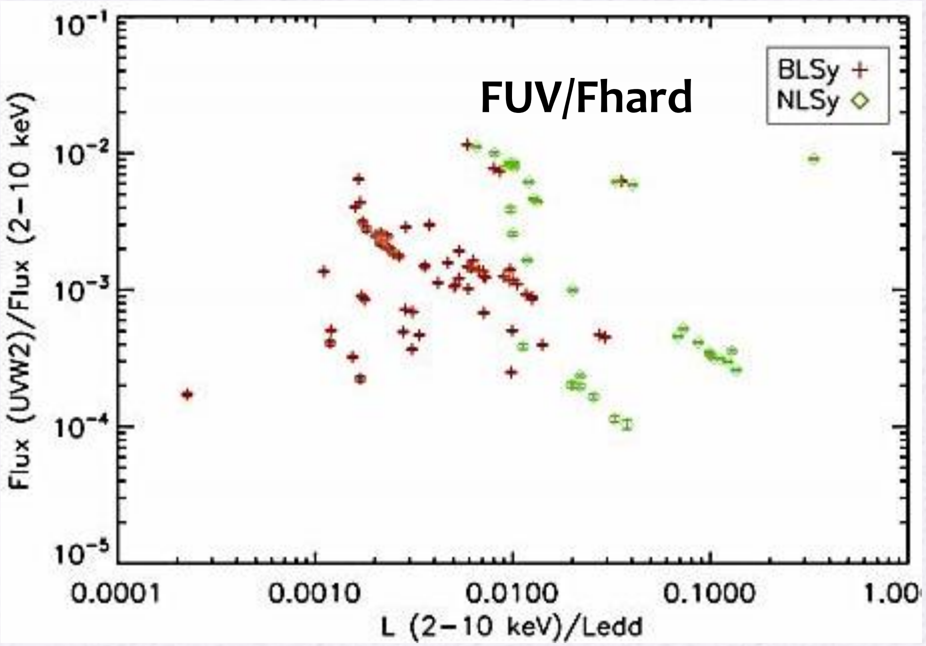



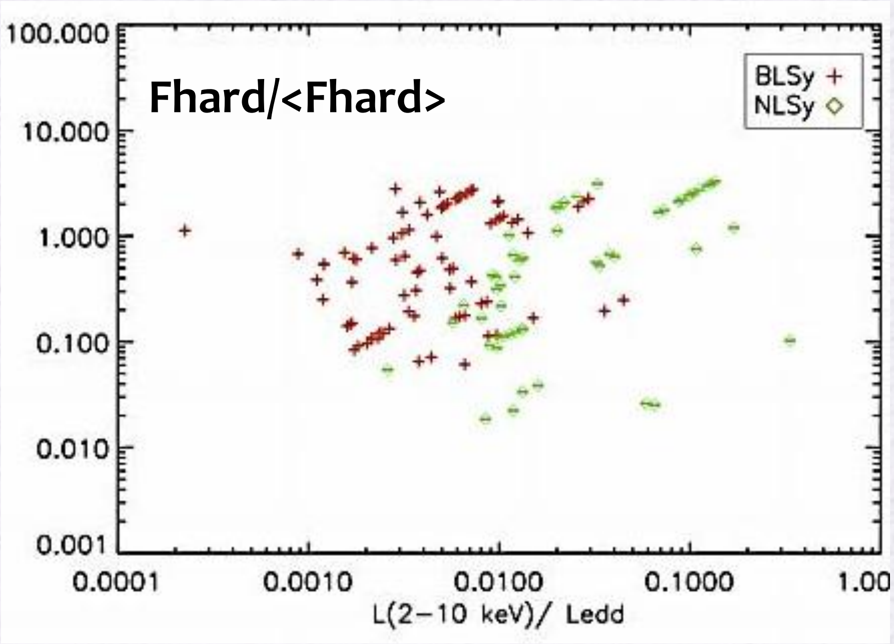

At Higher accretion rates

the soft-X flux increases with respect to the UV

# Inter-band variability

…. Less evident in the 2-10 keV band



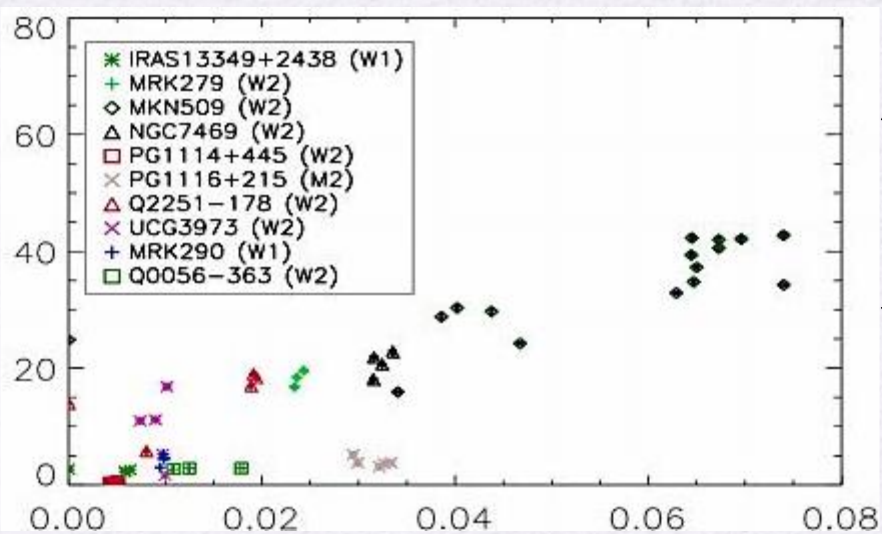

NLSy1 tend to have higher L/Ledd and higher alpha_ox wrt BLSy1
(see also Jin+2012)

# Single source analysis

Sources with more than three EPIC and OM simultaneous observations: 9 BLSy1 8 NLSy1

# Inter-band flux correlations

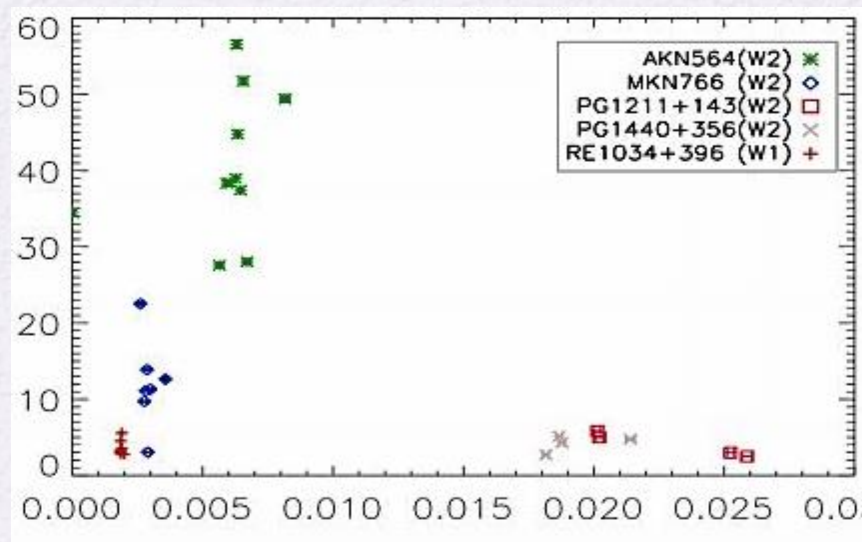
## BLSy1




FUV

## NLSy1

F(0.5-2 keV)

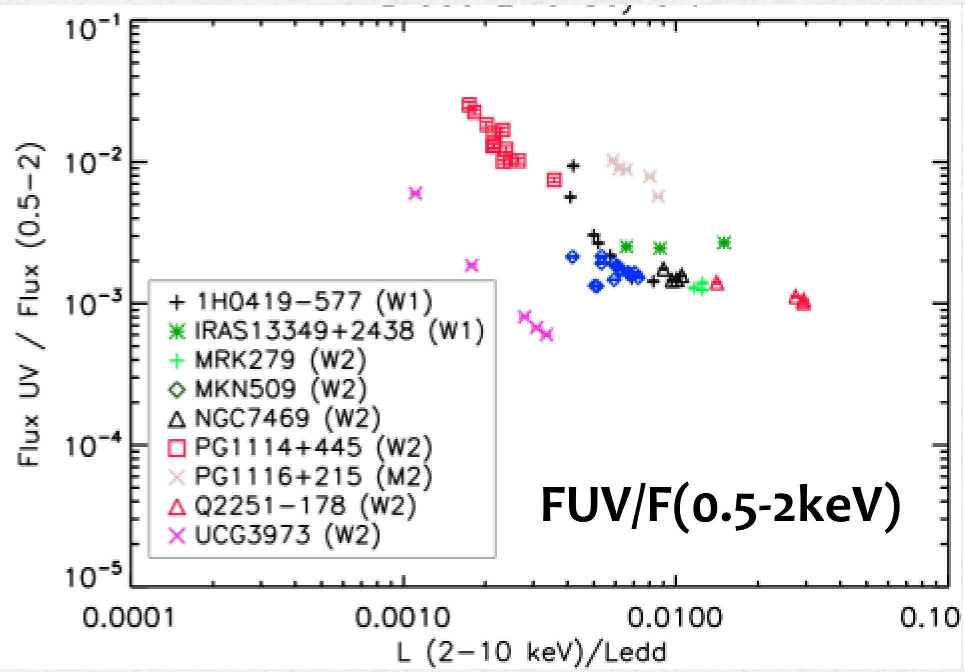



FUV

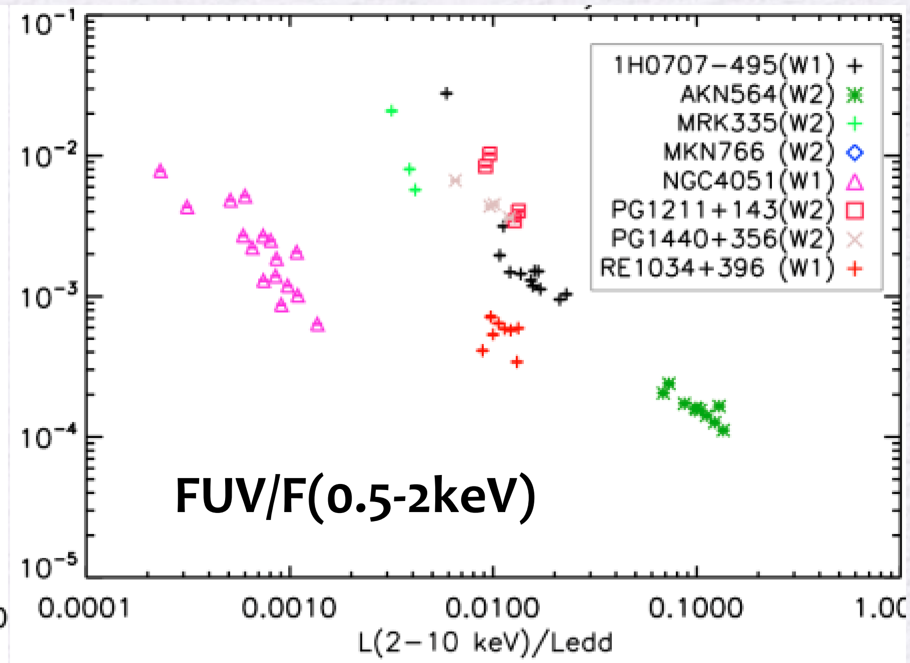
The different variability patterns on NLSy1 and BLSy1 may be due to variability, different components in the band, physical??

# Inter-band flux variability

## BLSy




## NLSy1



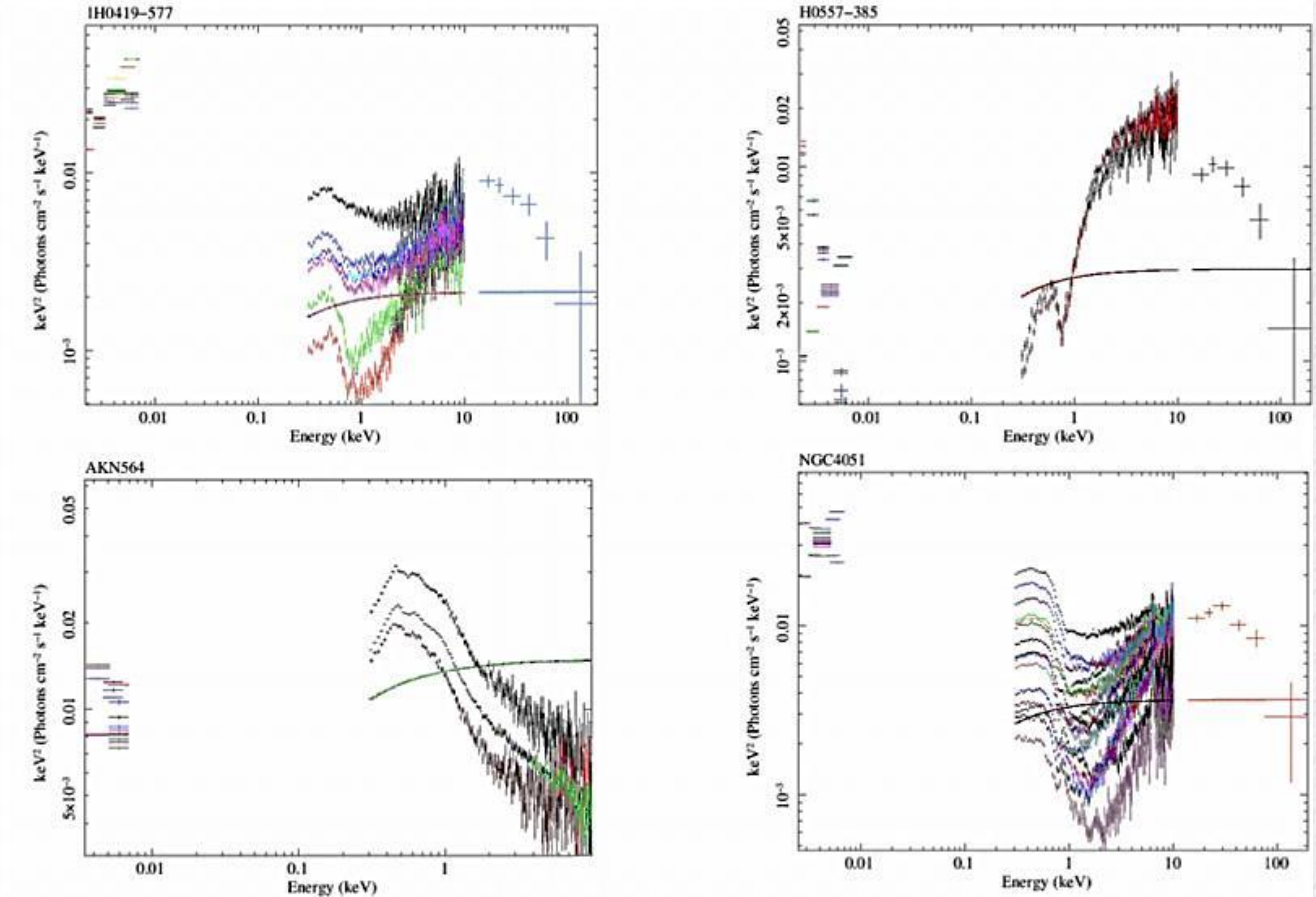

At Higher accretion rates
the soft-X flux  increases with respect to the UV …?

# simultaneous SEDs with EPIC and OM

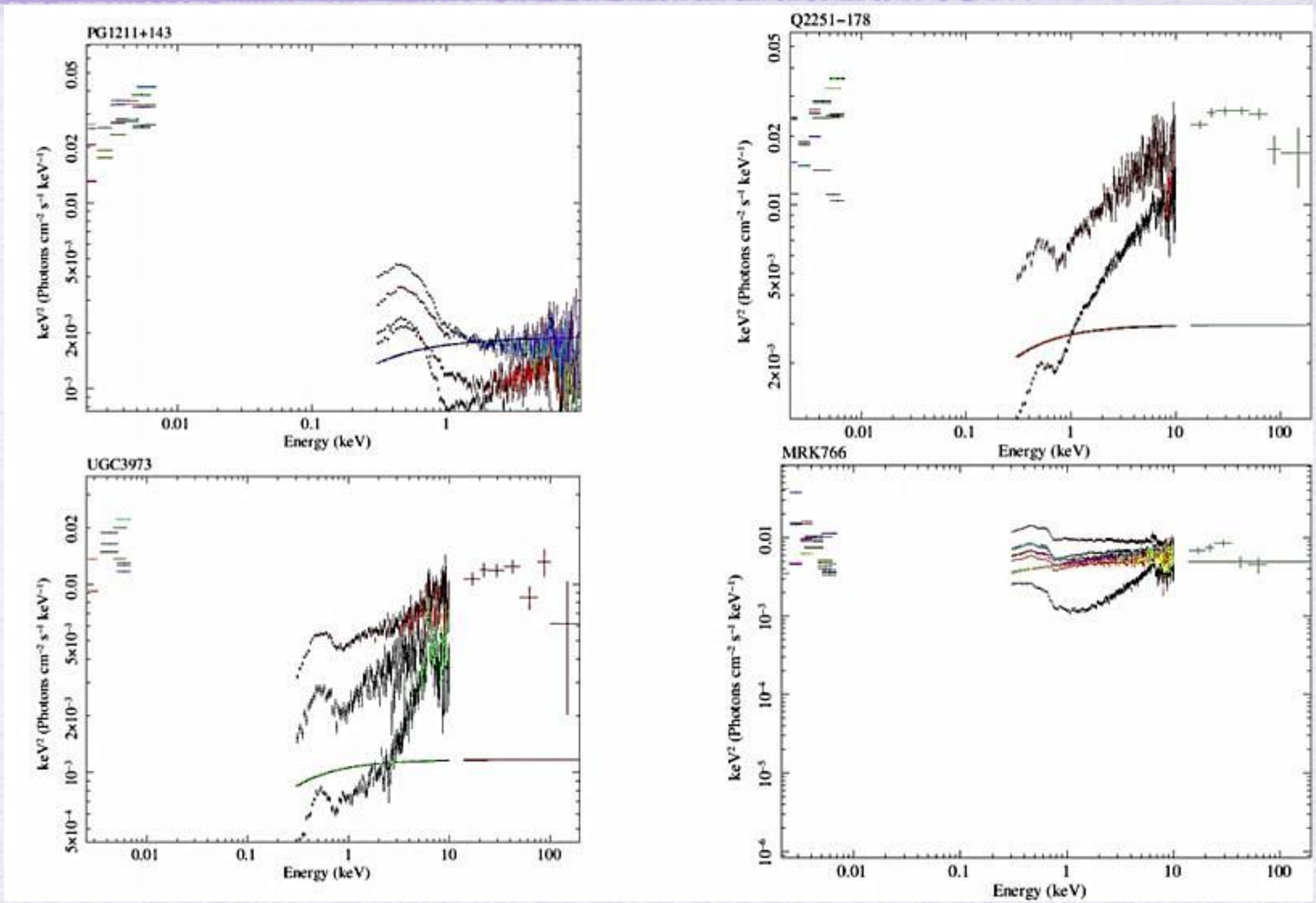
Building the SED

Modelling with comptonization models: a test case

# Simultaneous SEDs

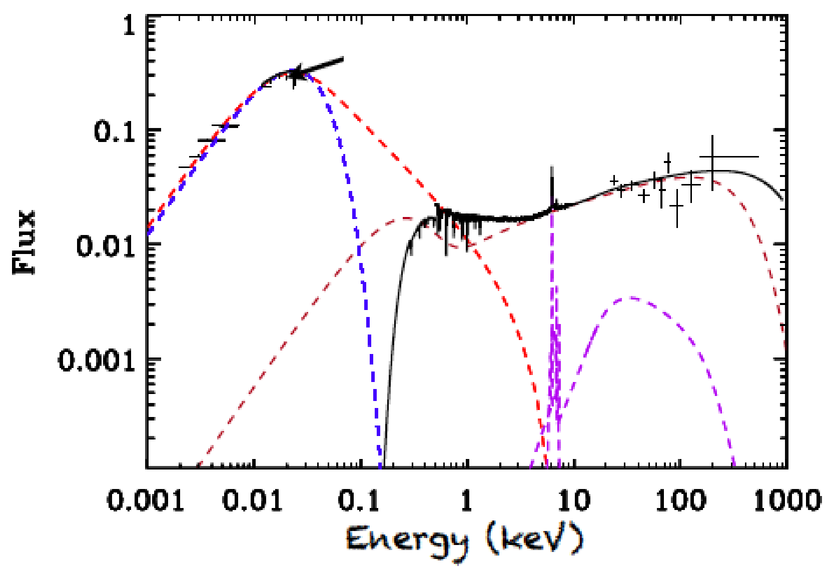


# Simultaneous SEDs



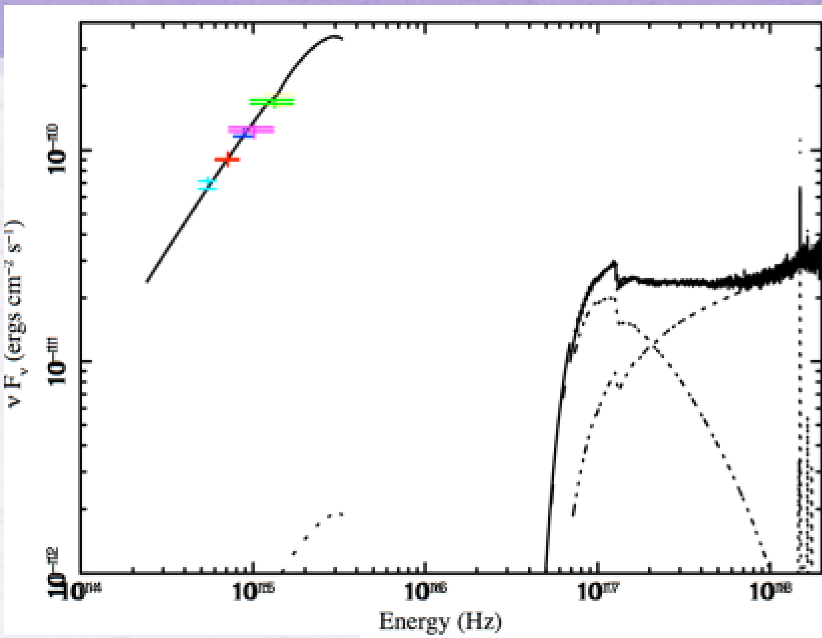
# SED modelling

Each observation is fitted with a realistic thermal Comptonization model for the continuum emission.



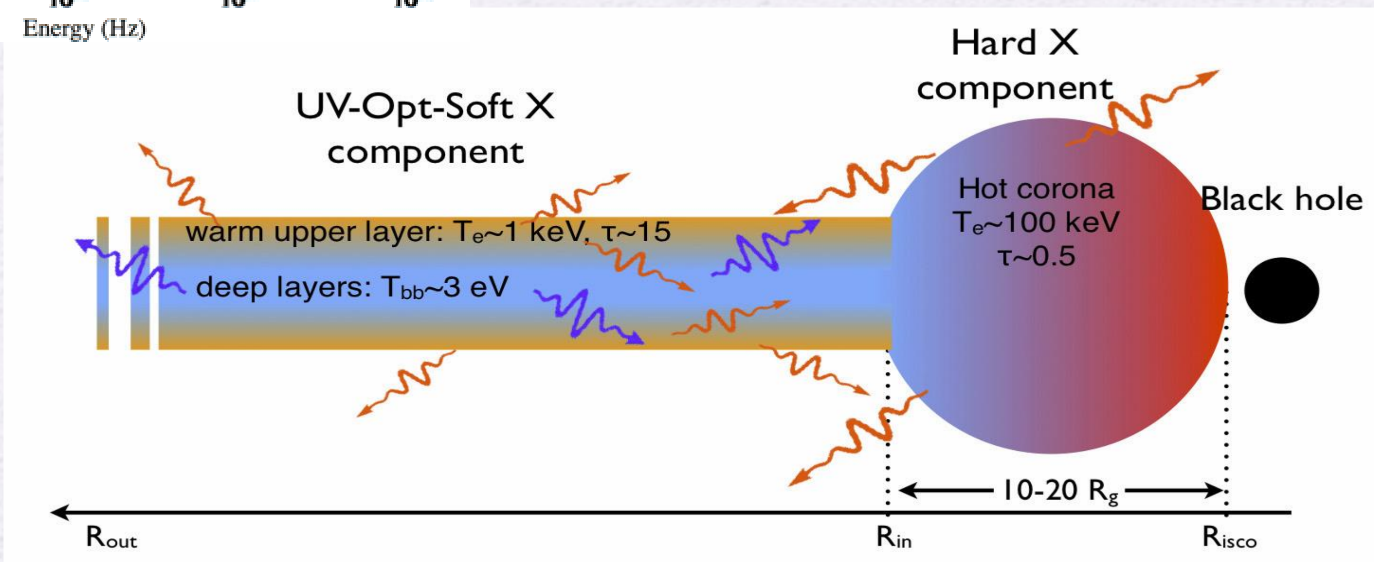

- A multi-black body disc to fit the optical-UV data
- A "warm" corona to fit the soft X-ray emission
- A "hot" corona to fit the hard X-rays
- Reflection components to fit the iron line profile
- A warm absorber from the outflow analysis

# SED modelling




Mkn509 obs1

Warm corona: optically thick, kT=.0.5 keV, Tsoft~eV
Hot corona: kT~200 keV, Tsoft~150 eV



# (very) Preliminary results

- Soft X-rays have different trend of variability with respect to UV(W2)
- In the soft X-ray and UV band the NLSy1s exhibit larger amplitude of variation with respect to BLSy1
- NLSy1 tend to have higher L/Ledd and higher alpha_ox wrt BLSy1
- The different variability patterns on NLSy1 and BLSy1 in the soft X-rays may be due to different components in the band, physical??

# Work in progress

- SED modelling for all the observations of the sample
- Timescale variability. Further constraint for sample selection
- Hard-X rays. For NGC4593 a MW campaign is ongoing (XMM/HST/NuStar)