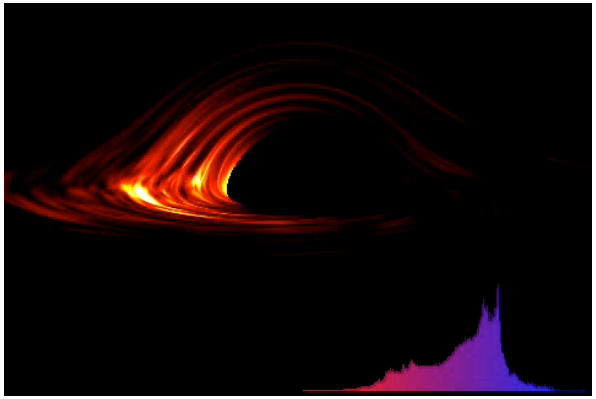
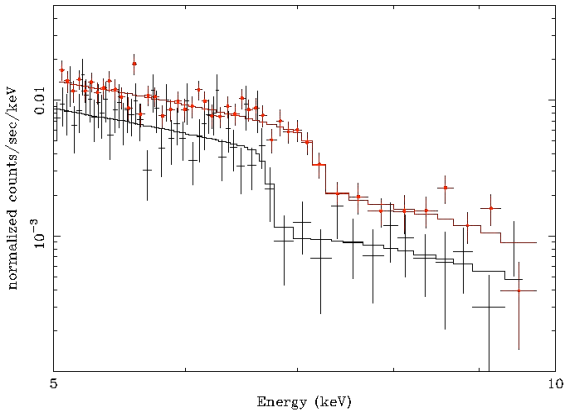




Flux dependency on the level of spectral complexity in narrow-line Seyfert 1 galaxies

Luigi Gallo
Max-Planck-Institut für extraterrestrisch Physik

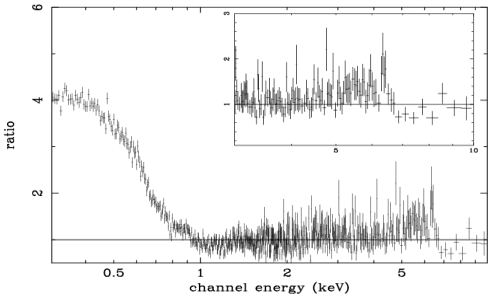
Outline

1. *High-energy complexity in NLS1*
2. *Investigating NLS1 with high-energy complexity – assumptions, sample definition, method*
3. *How do complex NLS1 differ from non-complex NLS1?*
   * *X-ray weak objects*
   * *strongest FeII emitters*
4. *Connection to reflection/light-bending scenario*
5. *Conclusions*

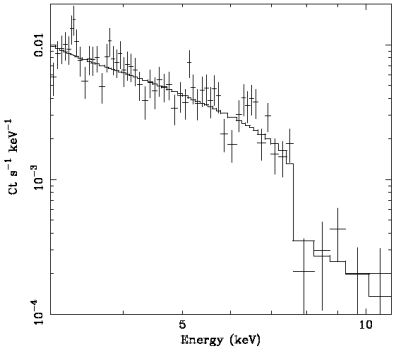
Gallo 2006, MNRAS, 368, 479

High-energy complexity in NLS1

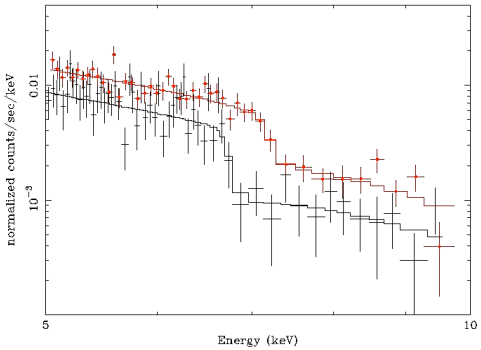
IRAS 13349+2438 (Longinotti et al. 2003)



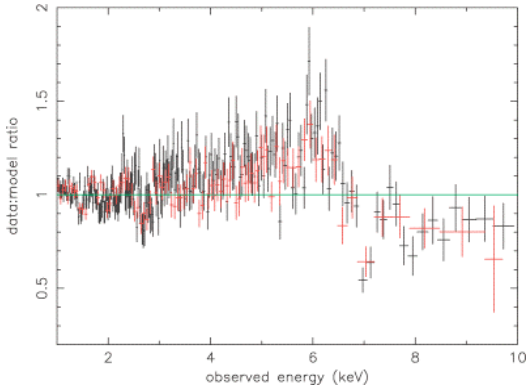
IRAS 13224-3809 (Boller et al. 2003)



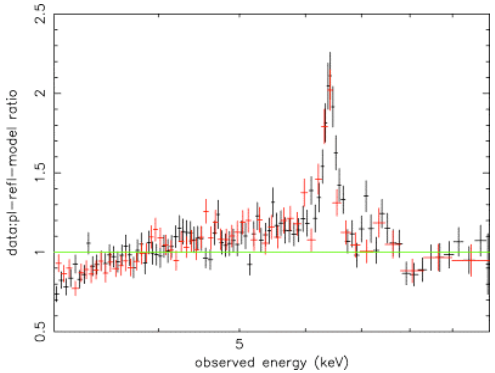
1H0707-495 (Gallo et al. 2004)



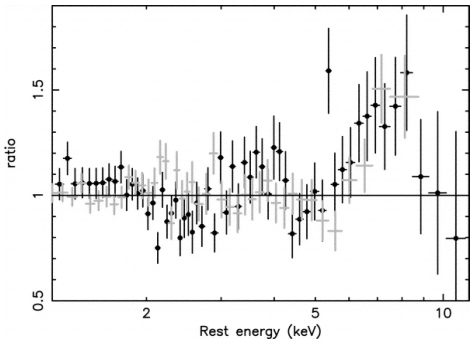
PG1211+143 (Pounds et al. 2003)



NGC4051 (Pounds et al. 04; Uttley et al. 04)



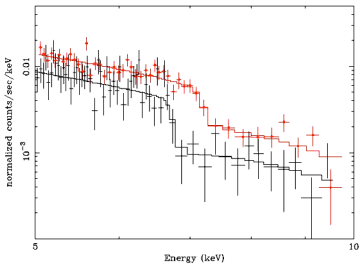
PG1402+261 (Reeves et al. 2004)



and others, but not all

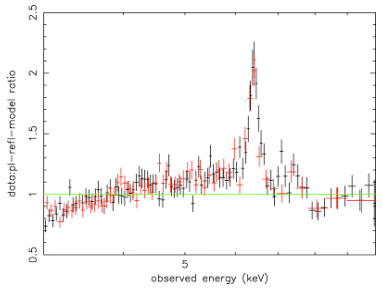
Assumption: Whatever the process, it occurs in all NLS1 (AGN?) to some degree

Extreme



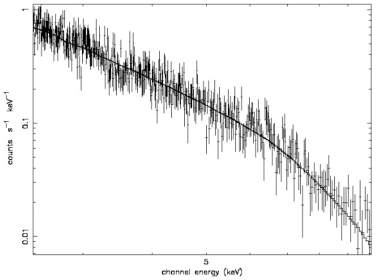
1H0707-495

Moderate



NGC4051

Minimal



Akn 564

Goal: Determine in what ways the "extreme" objects differ from the rest

Method

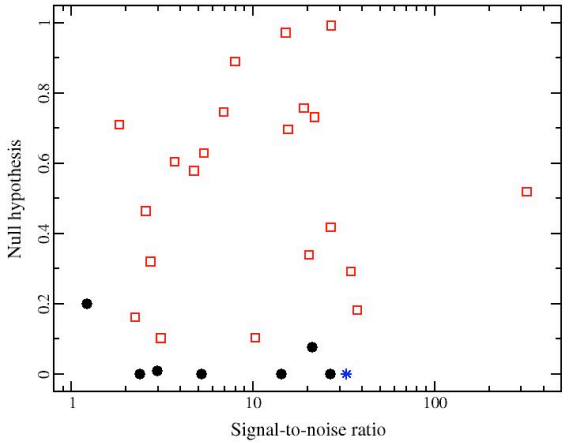
(1) From XMM-Newton archive, collect all known NLS1 with good signal-to-noise and energy coverage up to at least 9 keV (rest-frame).

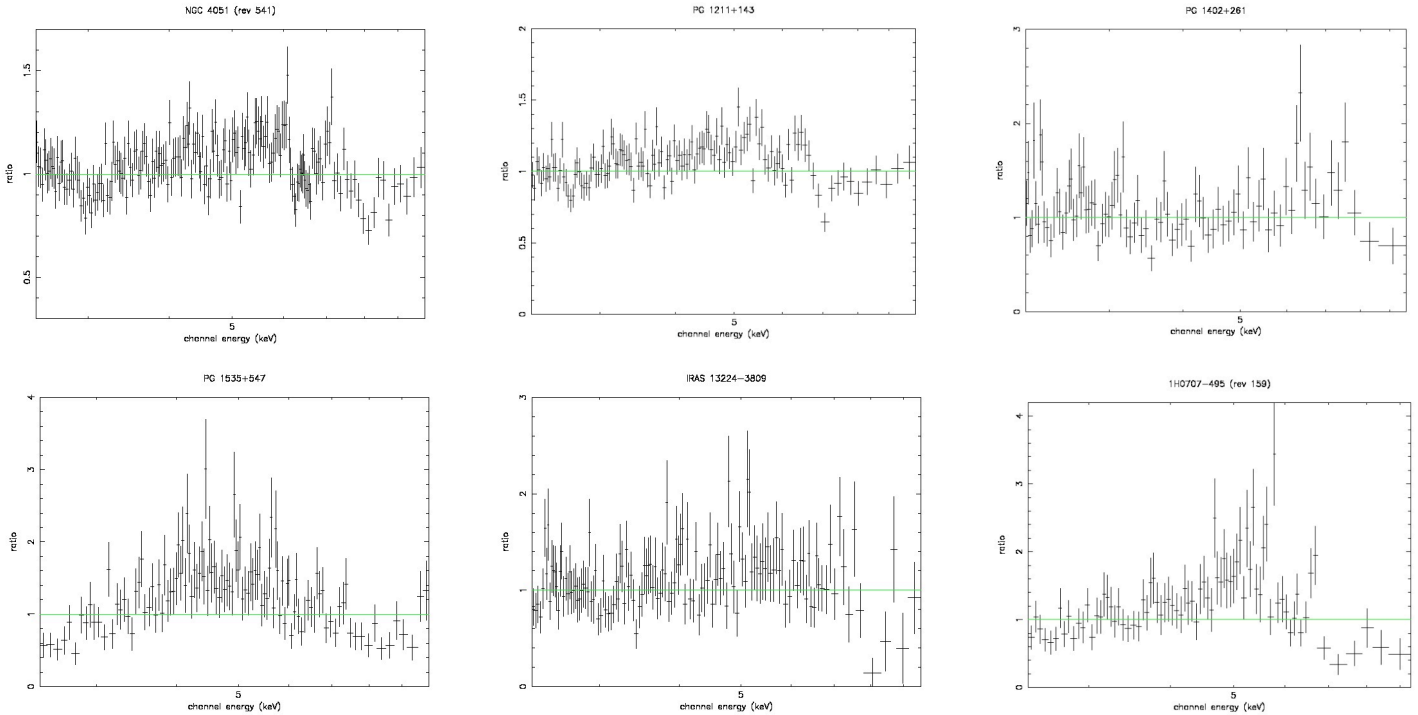
(2) Fit intrinsic 2.5-10 keV band with "simplest" AGN model: power-law and unresolved Gaussian profile.

(3) Use null hypothesis (n) to determine for which objects this fit is not acceptable (n<0.1).

Sample definition

- *Simple sample : 21 NLS1*
  (S sample)
- *Complex sample: 7 NLS1*
  (C sample)





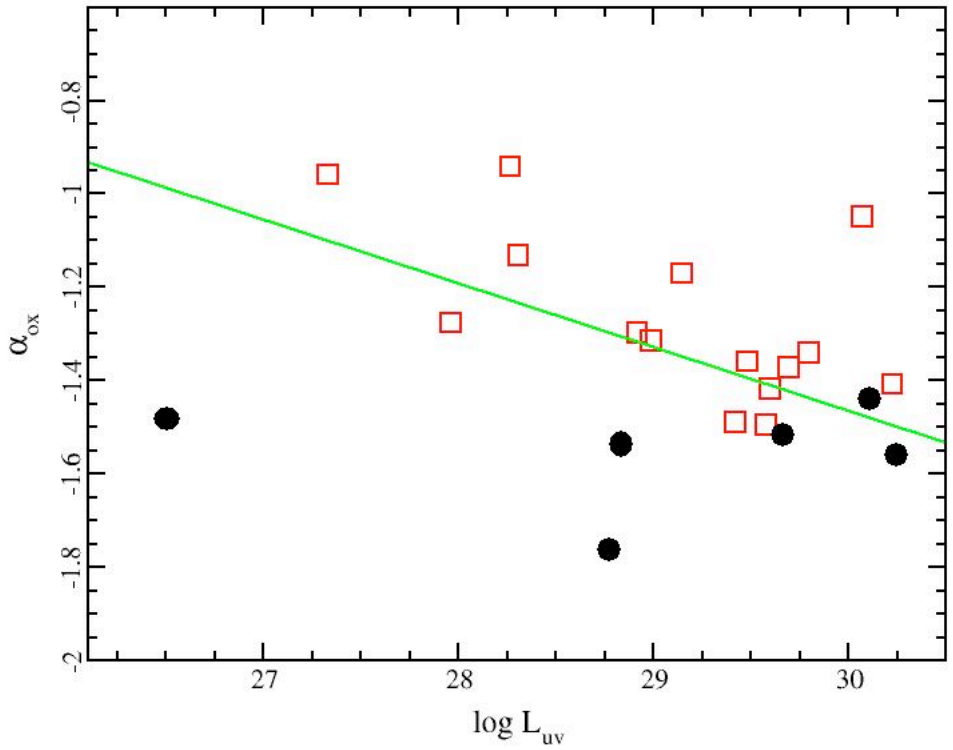
How does the C sample stand out?

α_{ox} calculated from simultaneous X/UV observations with XMM-OM

Strateva et al. (2005) α_{ox}-L_{uv} relation

S sample

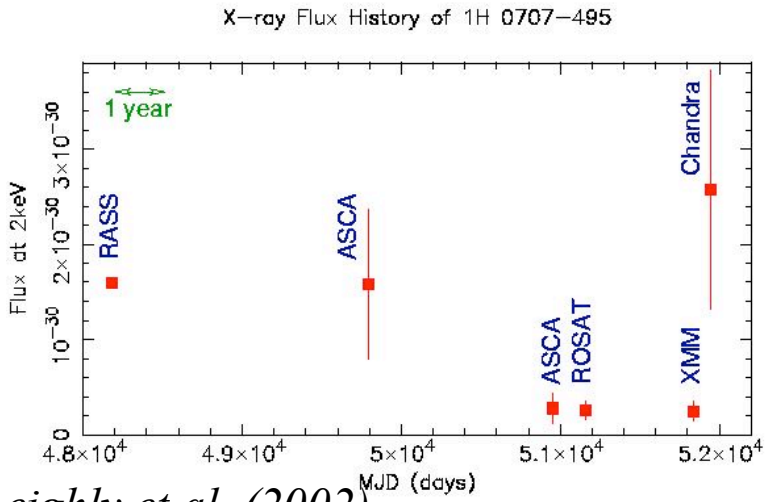
C sample



C sample NLS1 are in an X-ray weak state

X-ray weak NLS1?

XMM fluxes compared with fluxes from previous missions/observations



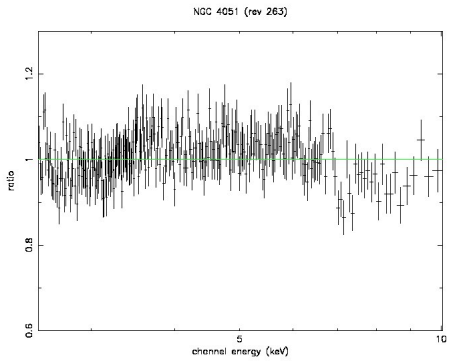
Leighly et al. (2002)

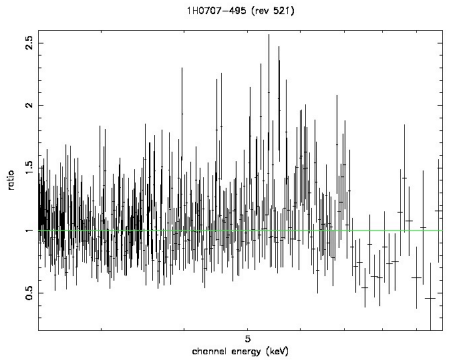
IRAS 13224-3809, 1H0707-495, NGC 4051, PG 1211+143 were all in X-ray low-flux states.

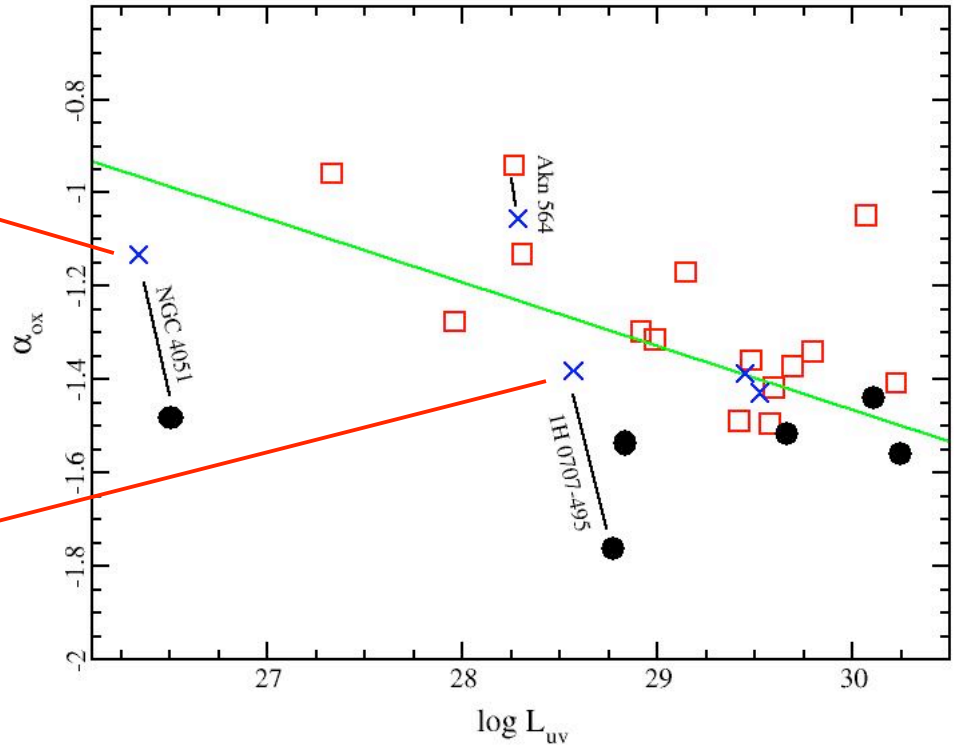
PHL1092, PG1402+261, PG1535+547 possibly in X-ray low-flux states (limited data)

X-ray "weakness" is due to temporary low in X-ray flux

C sample NLS1 with multiple observations?

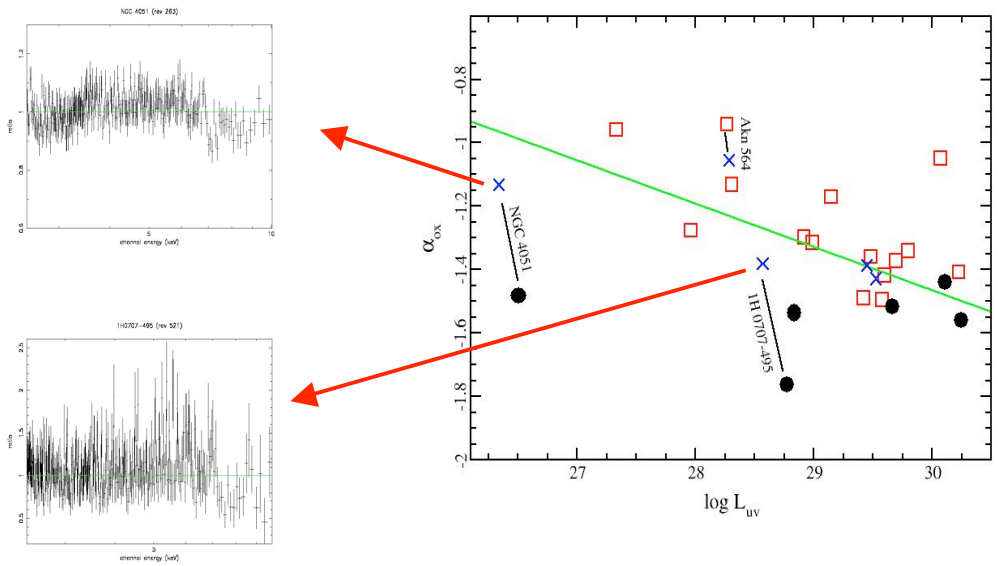






Level of complexity diminishes with increasing X-ray flux

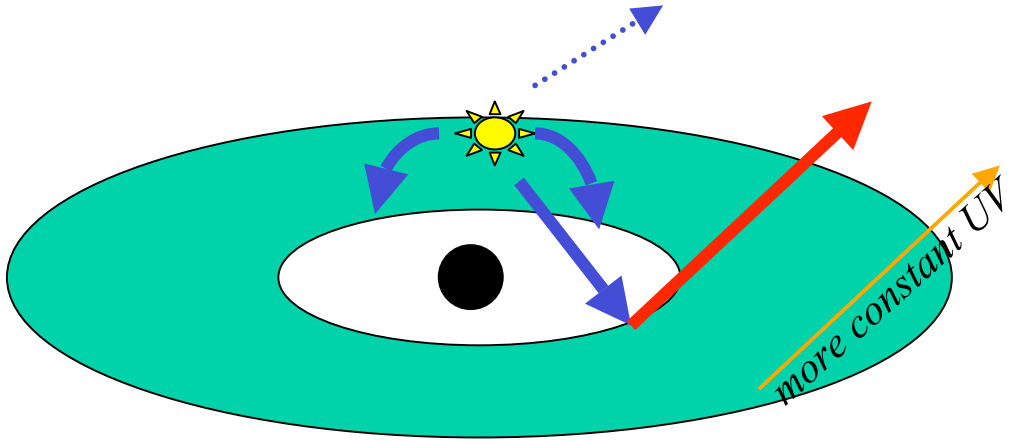
Low X-ray flux – spectral complexity connection

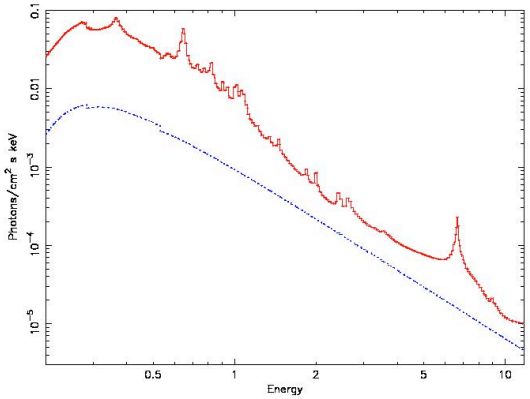


My two-bits: *1) Is it only low-luminosity AGN that show spectral complexity (e.g. M. Guainazzi's talk), or do we need to consider the X-ray flux history of each source?*

2) Is the XMM stacked spectrum biased (somehow) to luminous, but intrinsically X-ray weak objects?

X-ray weak NLS1 in terms of reflection





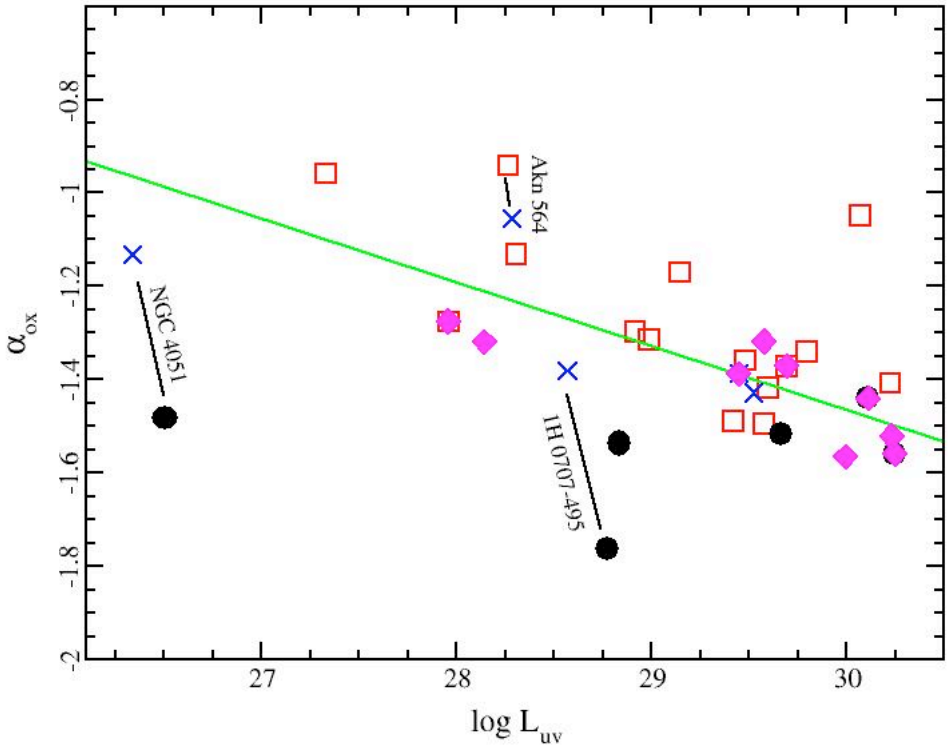
Increased spectral complexity and X-ray weakness during low X-ray flux states prediction of reflection/light bending scenarios

Also consistent with lumpy accretion flow (J. Malzac's talk on Monday)

Reflection dominated objects should be X-ray weak

Crummy et al. (2006) survey of NLS1 and PG QSO (i.e. not only NLS1) identified 11 reflection dominated objects (only 9 have OM data).

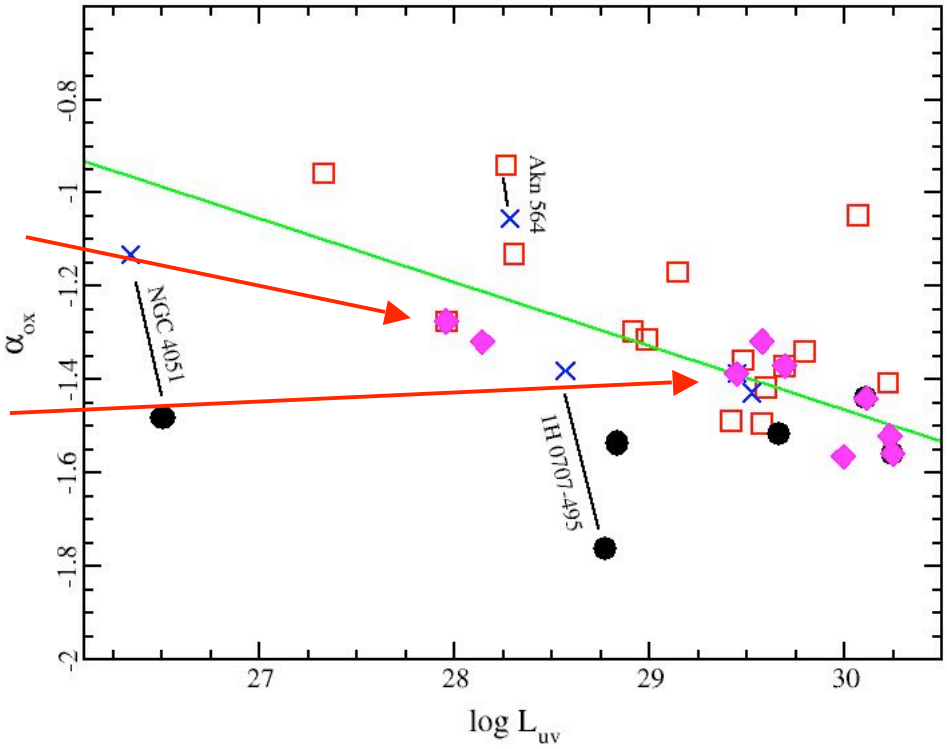
Are they X-ray weak?



Should X-ray flux/α_{ox} be considered when determining degree of reflection in X-ray spectra?

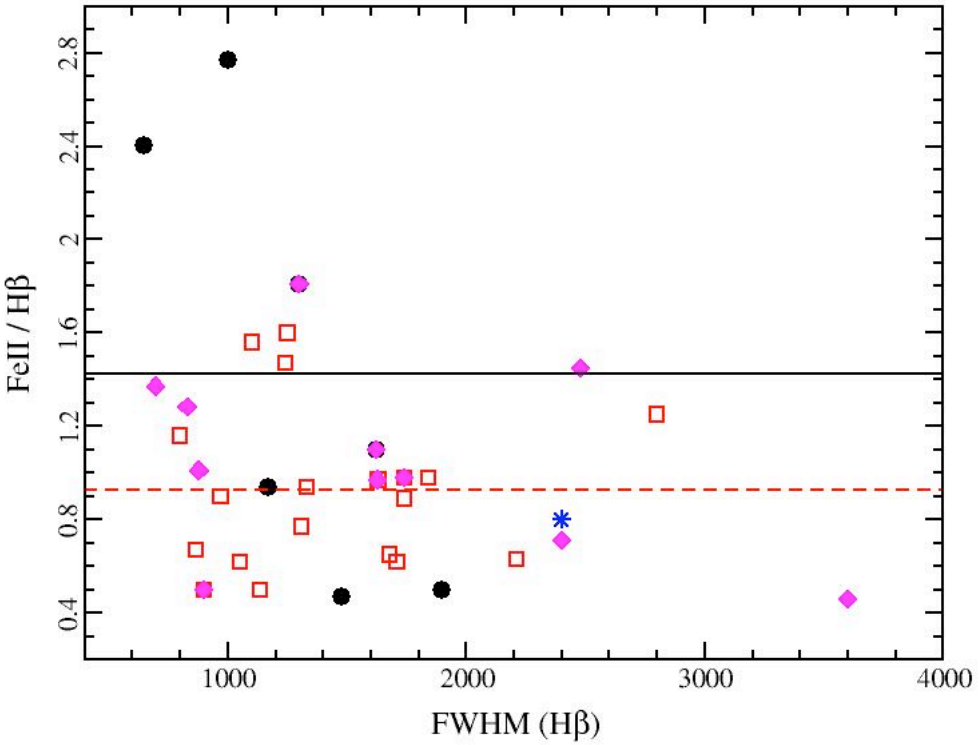
Reflection dominated objects should be X-ray weak

**Note: some potentially complex NLS1 could be missed by fitting only the 2-10 keV band (possible explanation for shortage of broad features in NLS1 from the Guainazzi sample)*



How else does the C sample stand out?

Are the most extreme FeII emitters preconditioned to show 2-10 keV complexity?



S sample

C sample

Conclusions

- NLS1 (AGN?) appear more complex in the 2-10 keV band when in an X-ray weak, low-flux state
- X-ray weakness/low-flux a prediction of reflection/light-bending scenarios
- α_{ox} should be considered when modelling reflection spectra
- possible connection between FeII strength and spectral complexity – stronger FeII emitters exhibit more extreme variability (?)

Thank you!