

Martin Ward with C. Jin, S. Hutton & C. Done

**AGN SEDs from 1 micron to 10 keV:
a multi-component analysis**



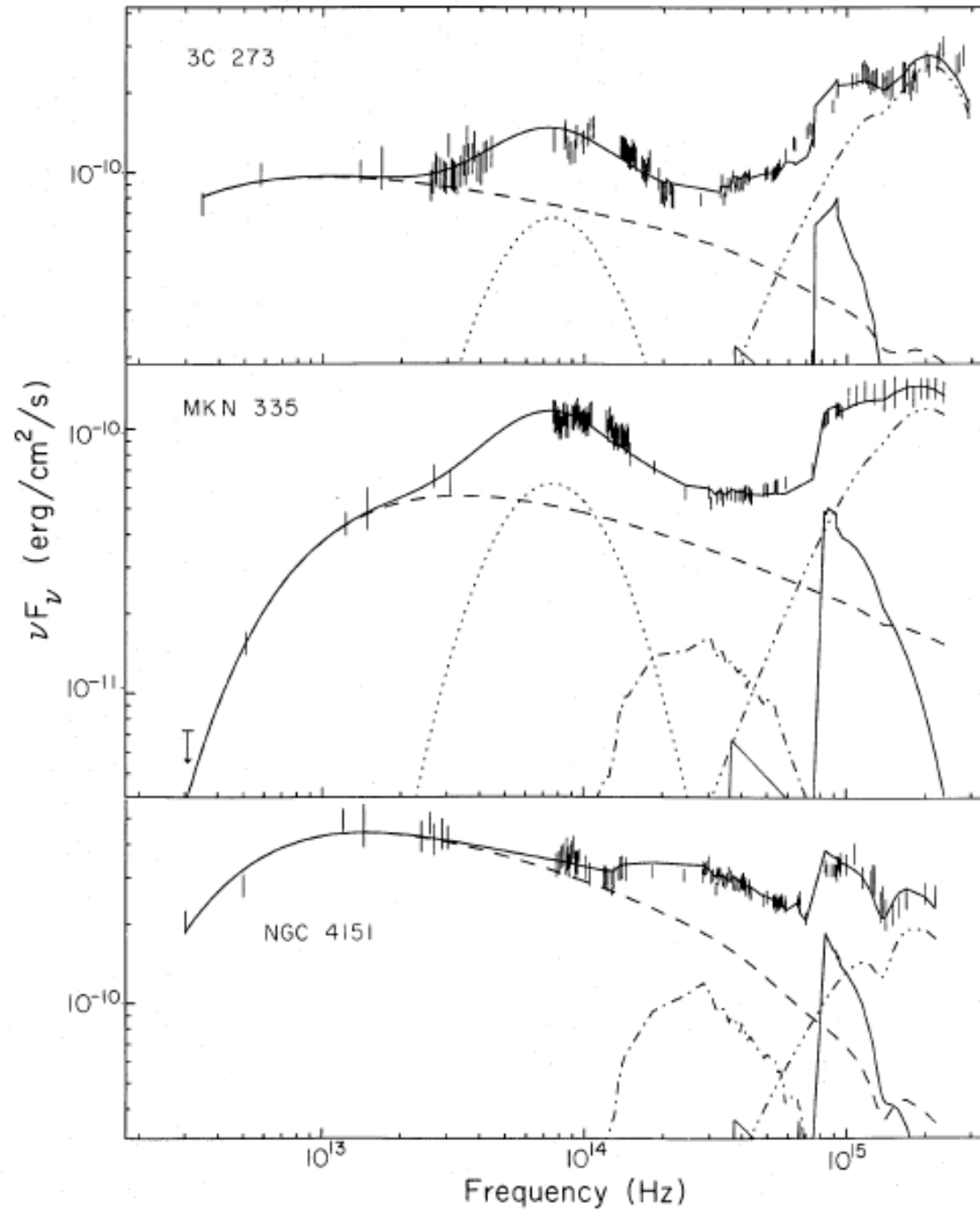
Issues with SED analysis

- Frequency coverage
- Variability
- Aperture corrections
- Stellar contribution
- Reddening – optical/UV
- Photo-electric absorption – X-rays

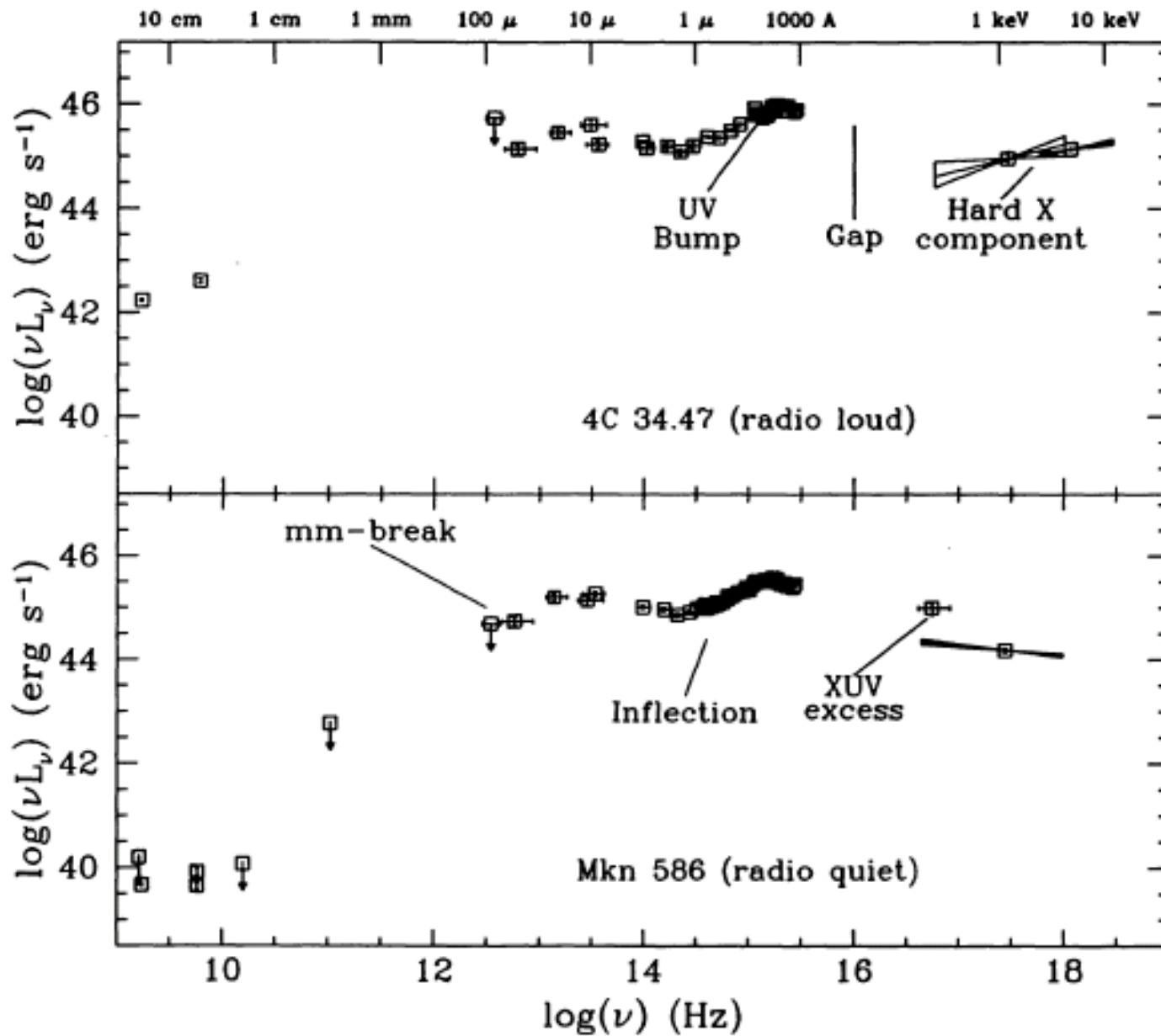
v.

g...

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C NUCLEI



v. Brief History of SED fitting...

Mon. Not. R. Astron. Soc. **000**, 000–000 (0000) Printed 15 July 2009 (MN \LaTeX style file v2.2)

Optical–to–X-ray emission in low-absorption AGN: Results from the Swift-BAT 9 month catalogue

R. V. Vasudevan¹ R. F. Mushotzky², L. M. Winter³ and A.C. Fabian¹

¹Institute of Astronomy, Madingley Road, Cambridge CB3 0HA

²Laboratory for High Energy Astrophysics, NASA/GSFC, Greenbelt, MD 20771, USA

³Center for Astrophysics and Space Astronomy, University of Colorado at Boulder, 440 UCB, Boulder, CO 80309-0440, USA

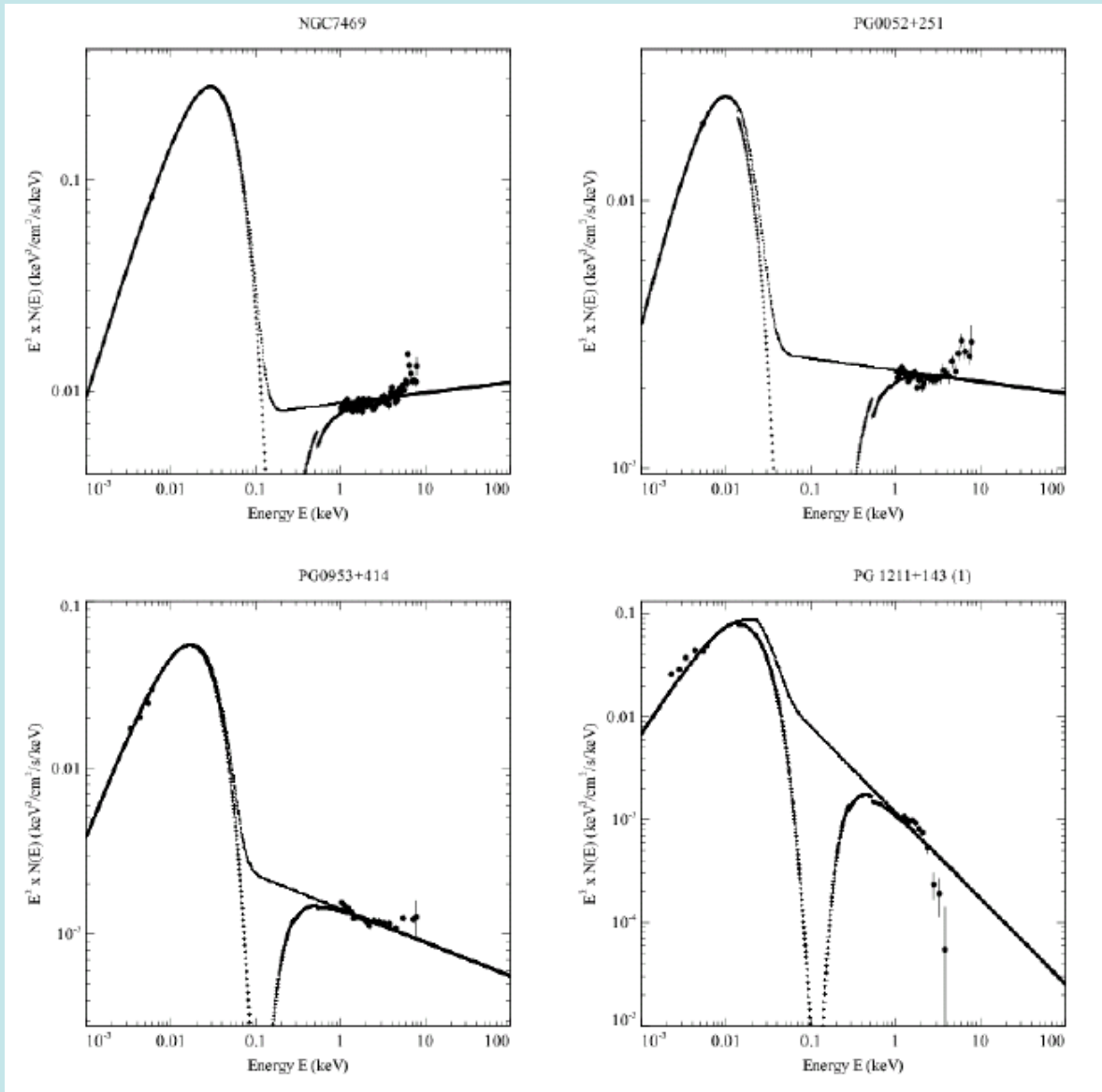
Mon. Not. R. Astron. Soc. **000**, 000–000 (0000) Printed 21 October 2008 (MN \LaTeX style file v2.2)

Simultaneous X-ray/optical/UV snapshots of active galactic nuclei from XMM-Newton: spectral energy distributions for the reverberation mapped sample

R.V. Vasudevan^{1*} and A.C. Fabian¹

¹ *Institute of Astronomy, Madingley Road, Cambridge CB3 0HA*

v. Brief History of SED fitting...



Our AGN Sample (51 objects) Jin et al. (in prep.)

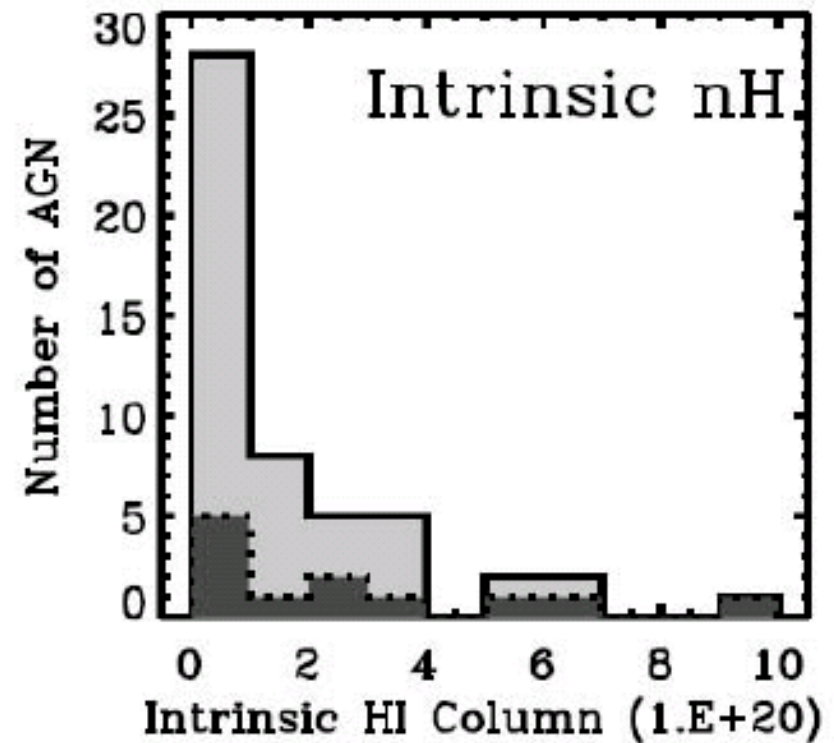
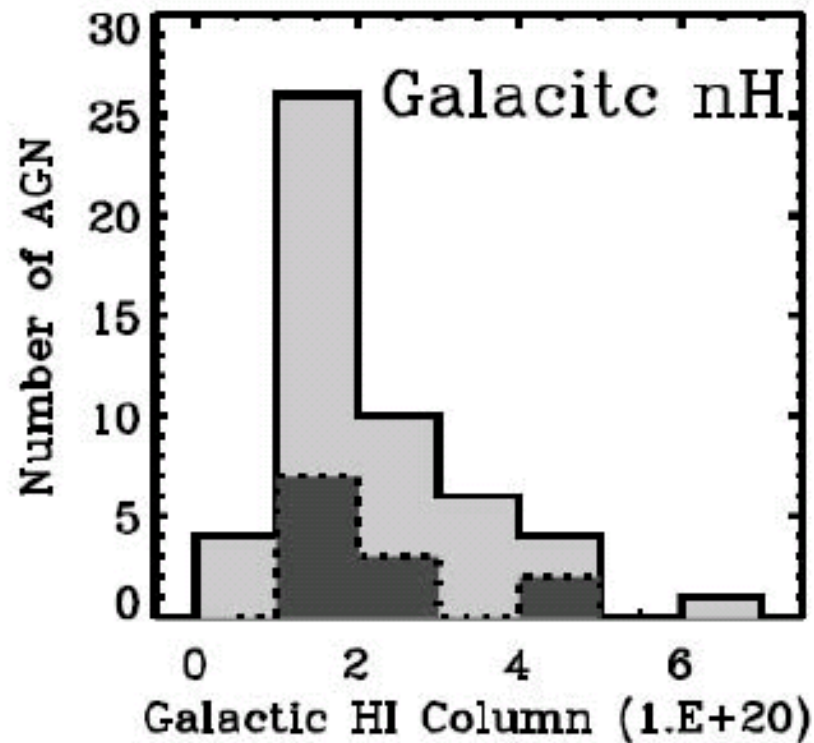
- Cross correlation between 2XMMi and SDSS DR7
- $z < 0.4$ (to get H alpha in range, so can estimate reddening)
- FWHM 600 km/s – 12,000 km/s
- More than 2,000 counts in one of the XMM cameras

Plug for a Poster... (larger sample)

Sarah Hutton et al. (in prep.)

- Cross correlation between 2XMMi and SDSS DR7
- $z < 0.4$ (to get H alpha in range, so can estimate reddening)
- FWHM 600 km/s – 12,000 km/s

X-ray column densities



Typical object in our sample

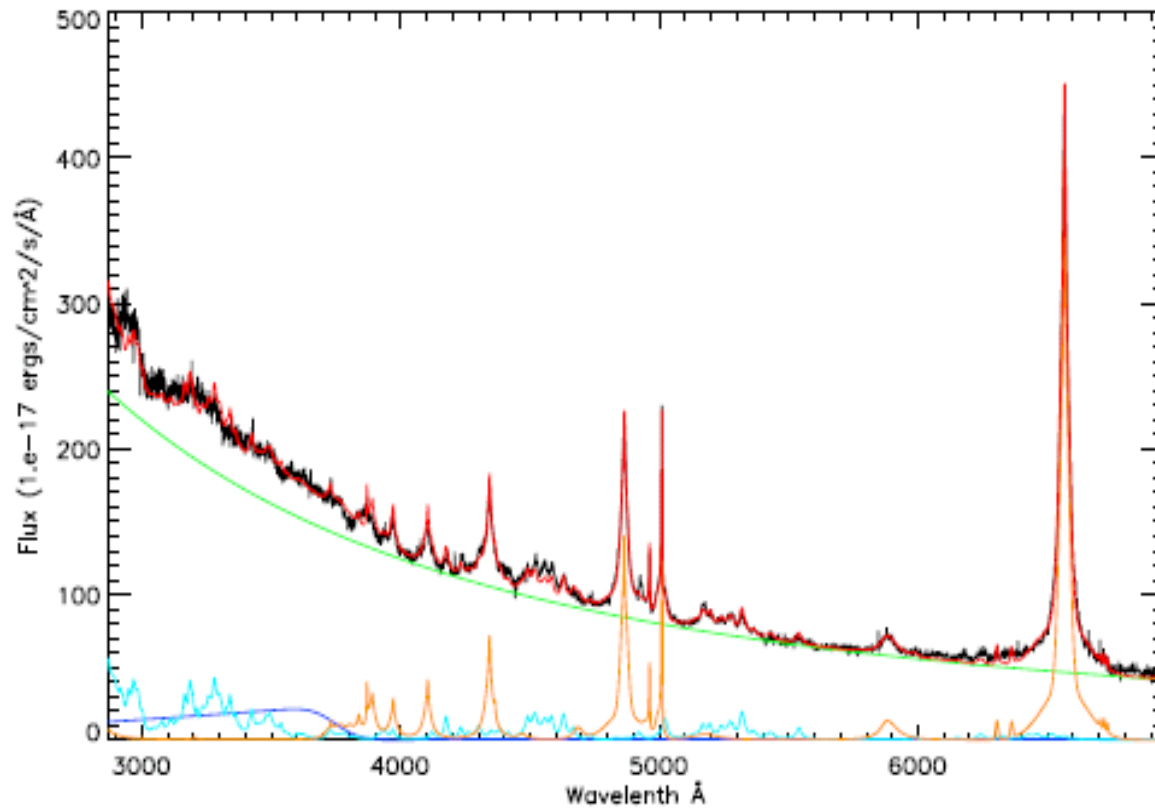


Fig-1a: PG 2233+134 SDSS Spectrum Fitting
residual $\leq 10\%$

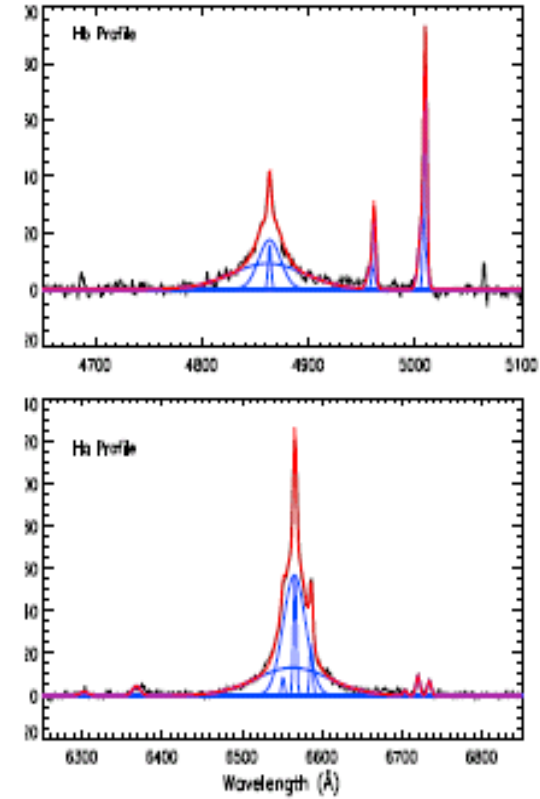
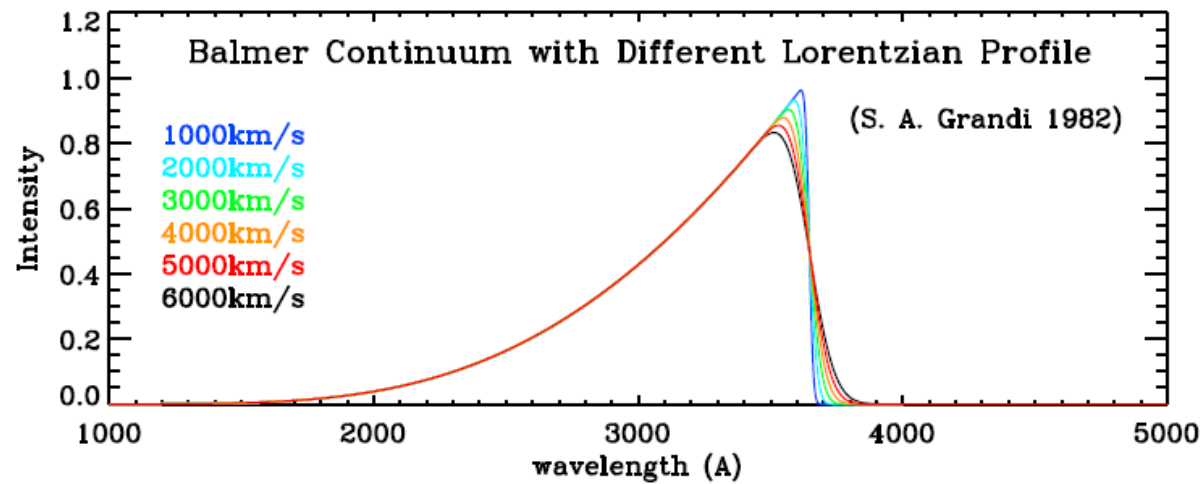
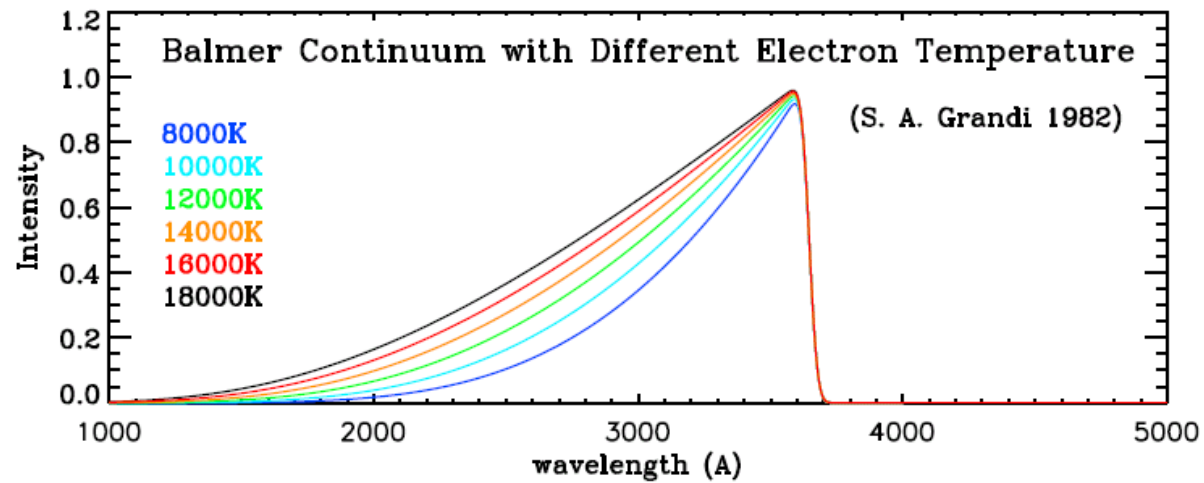
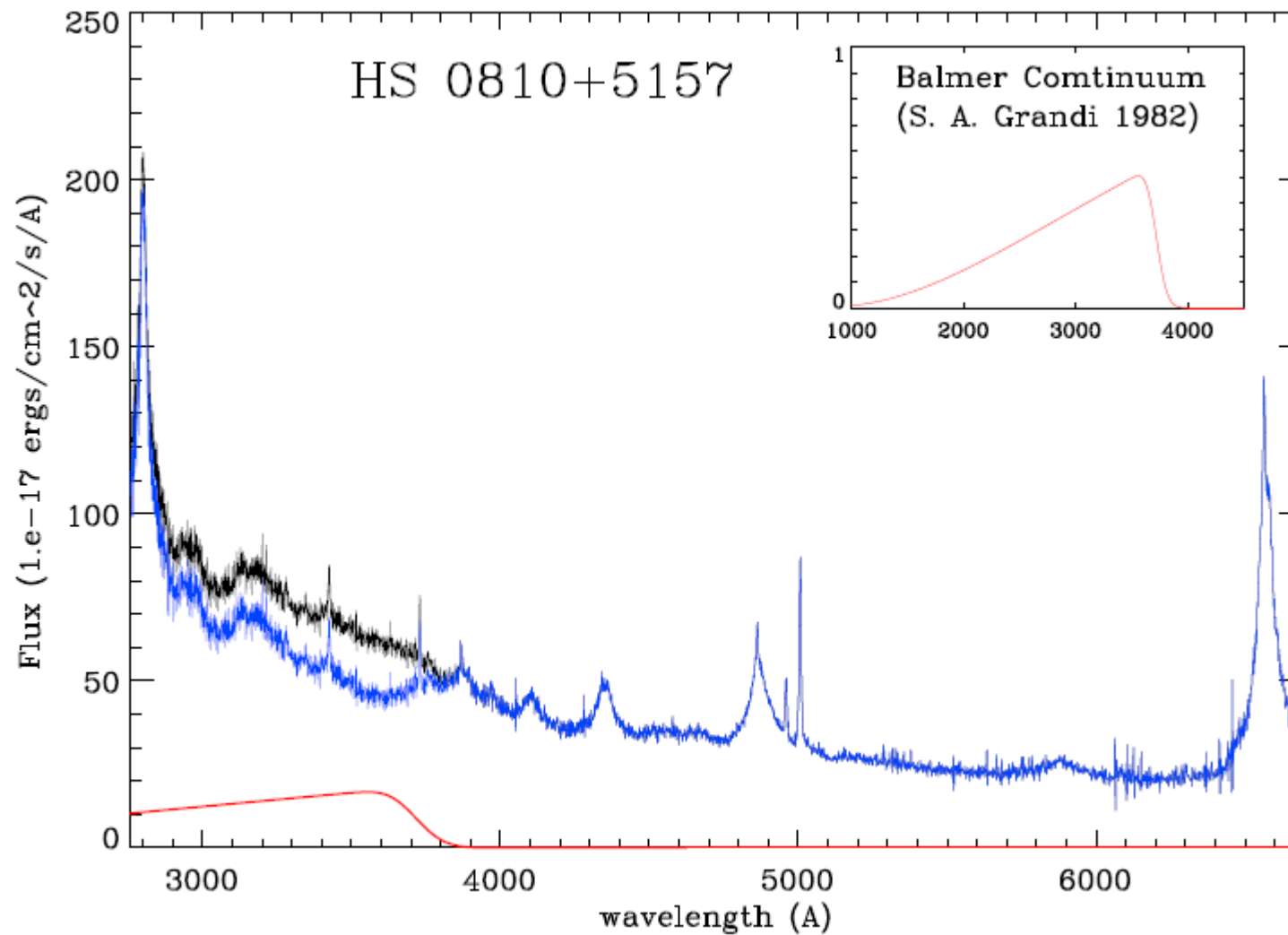


Fig-1b: 2XMM J112328.0+052823
Balmer Line Fitting

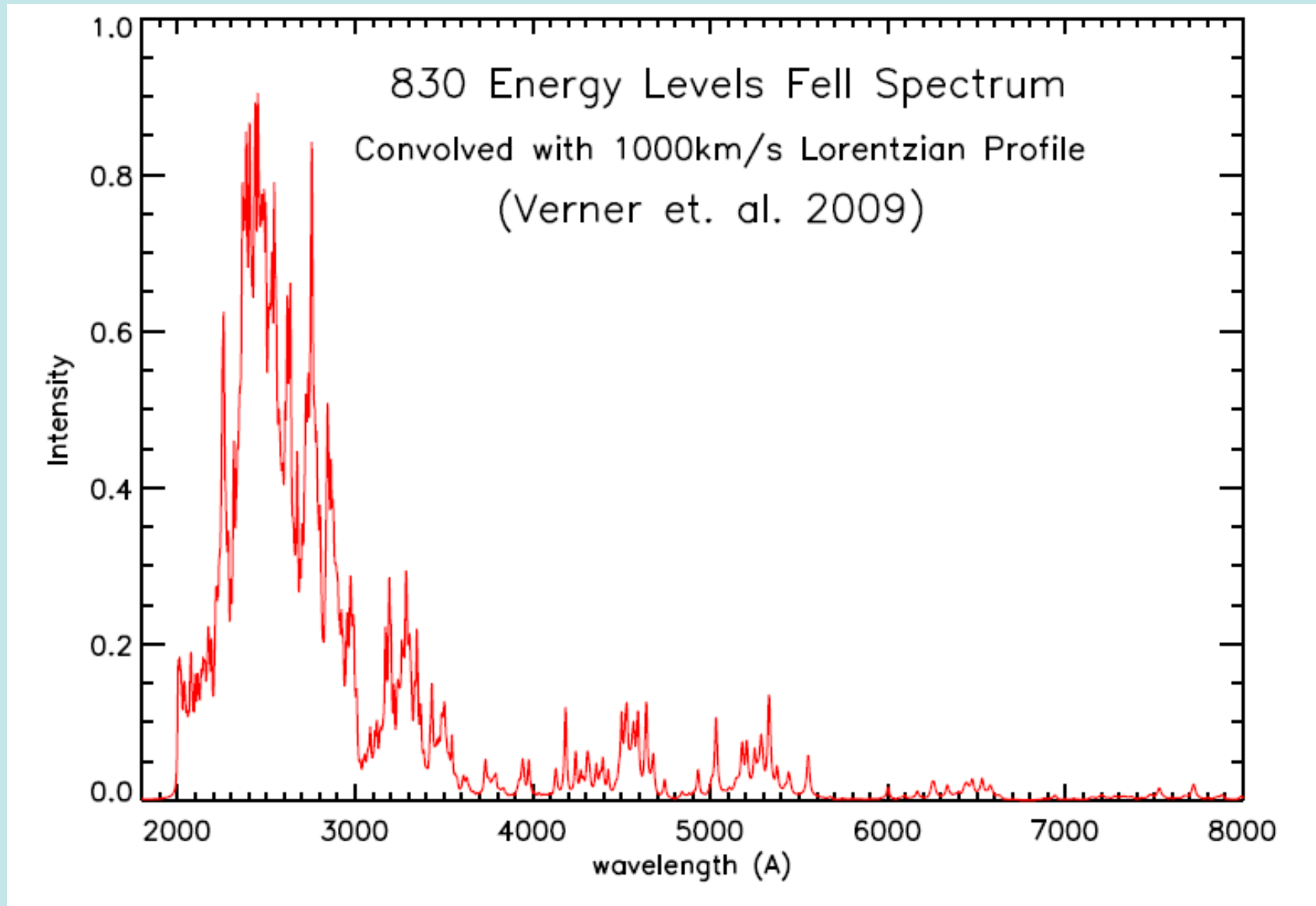
Devil's in the detail...



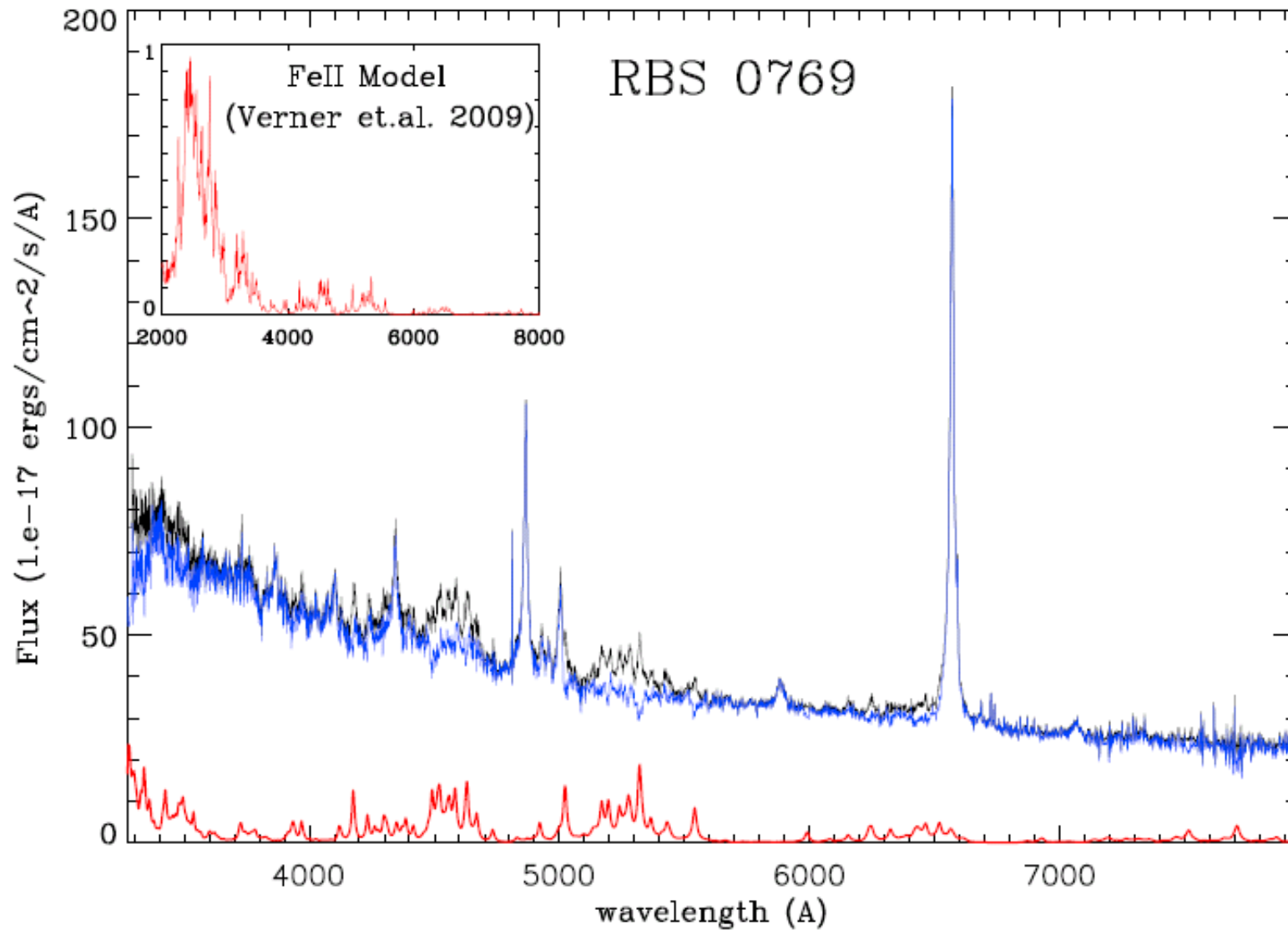
Correction for the Balmer Continuum



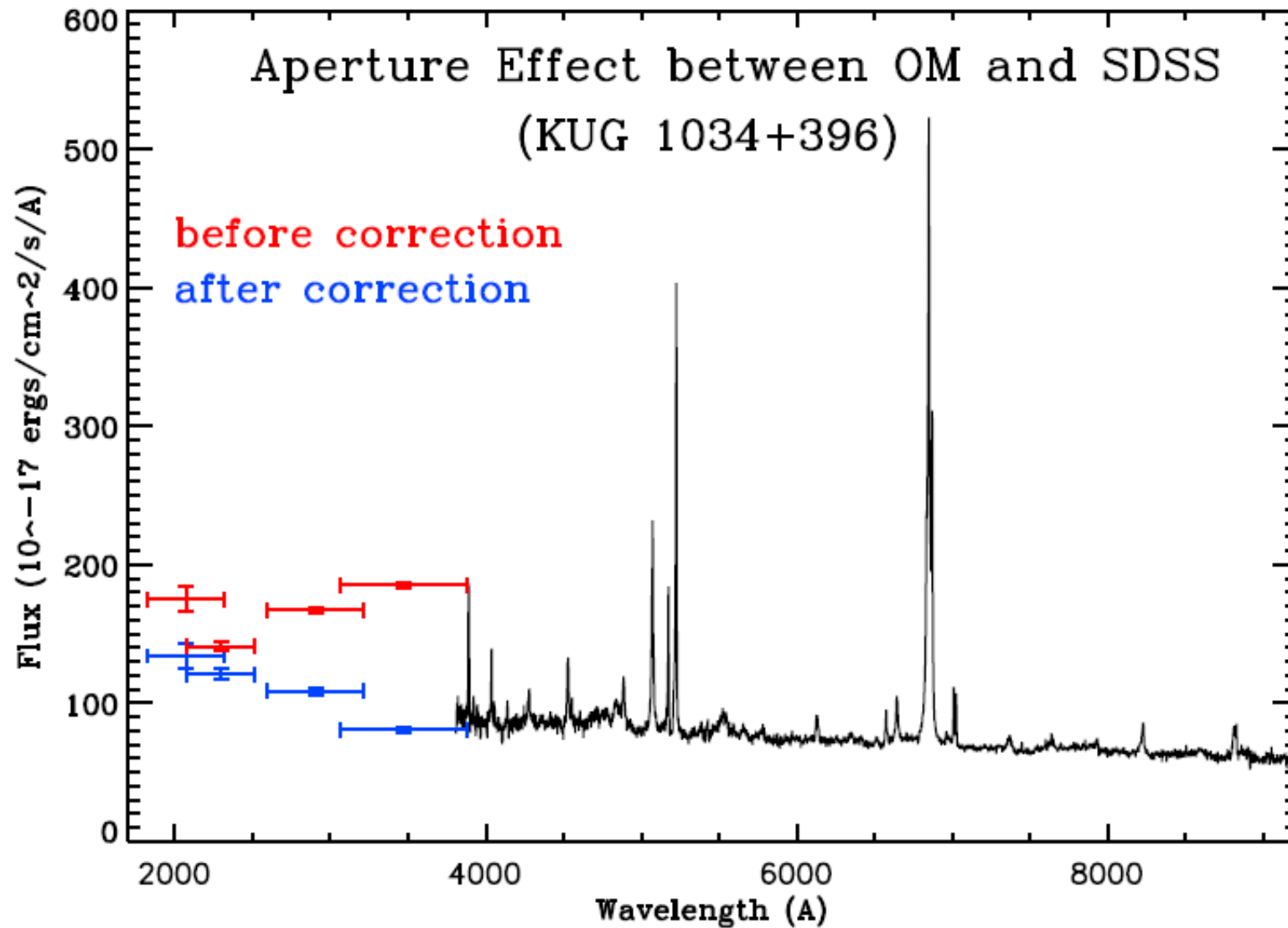
The FeII Spectrum



Correction for FeII Emission



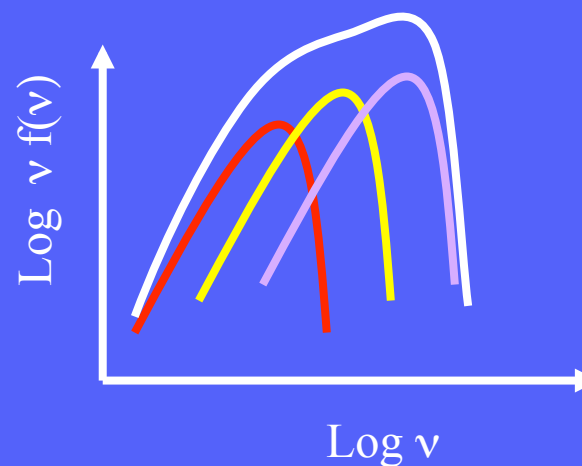
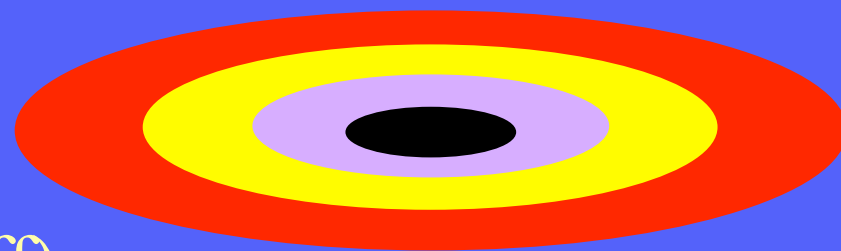
Aperture Corrections (OM)



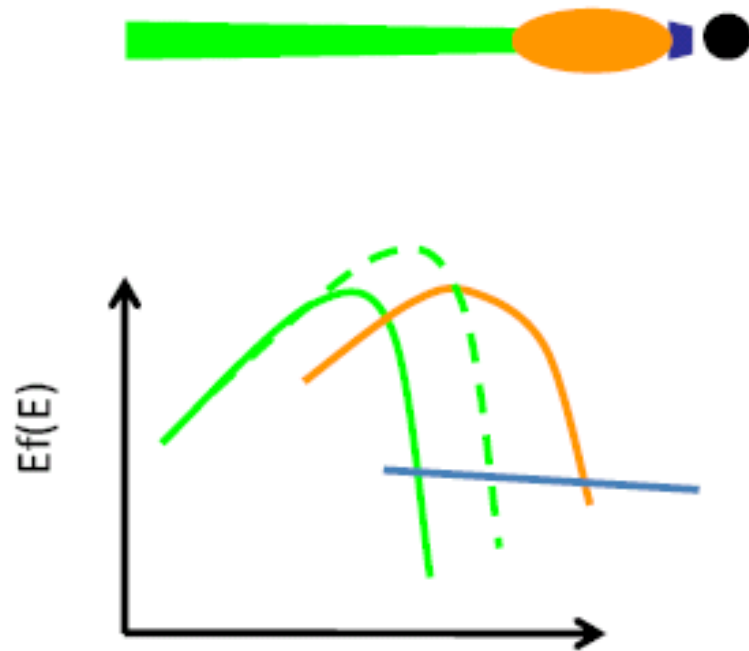
Three Components of the X-ray SED

- The Multicolour disc
- Compton component
- Power Law (with low E cut-off)

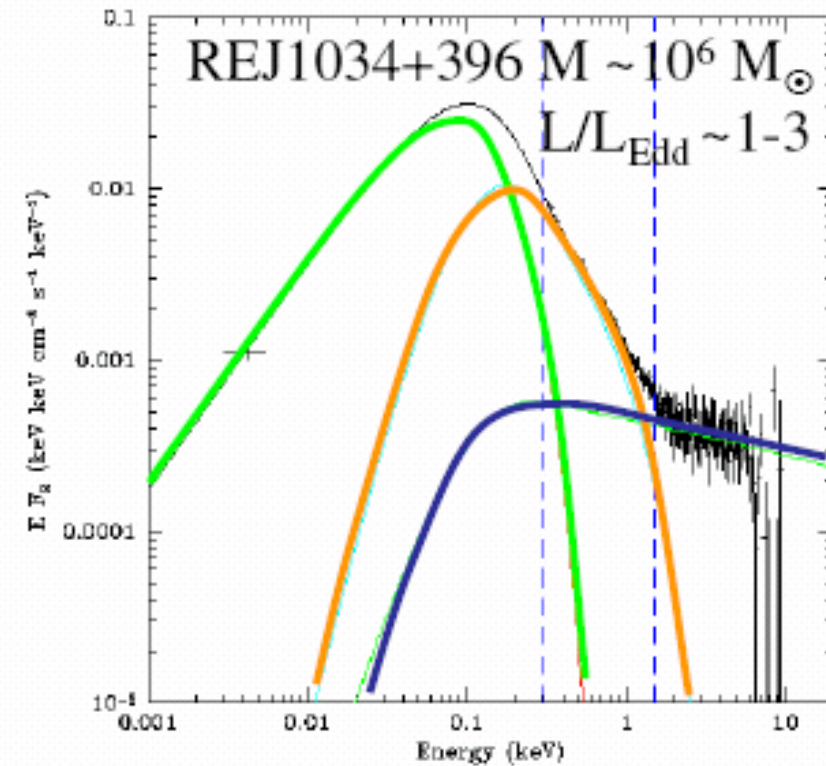
Includes conservation of energy,
between disc, Compton comp.
and power law...



The three component model location and geometry

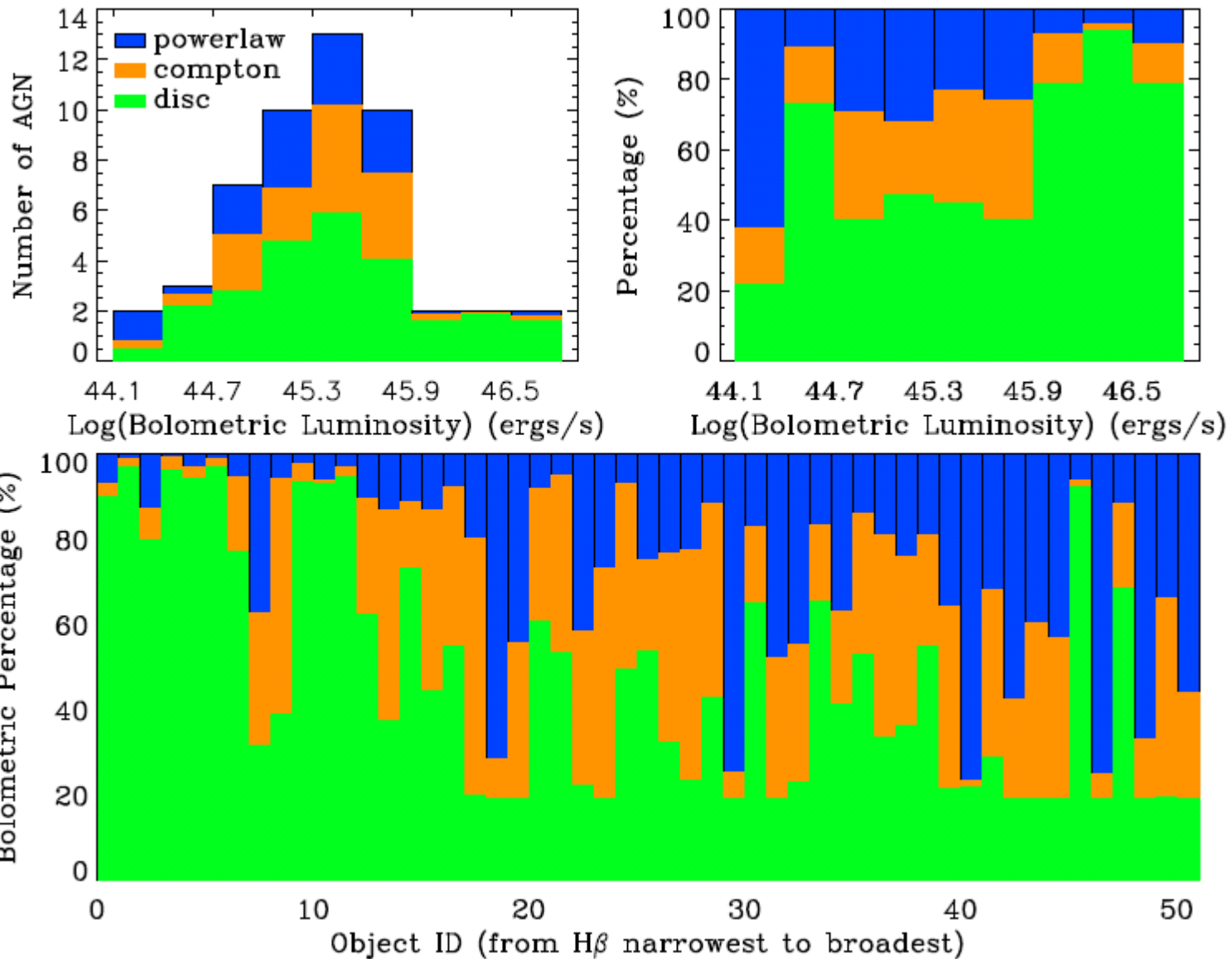


Gladstone, Roberts & Done 2009;

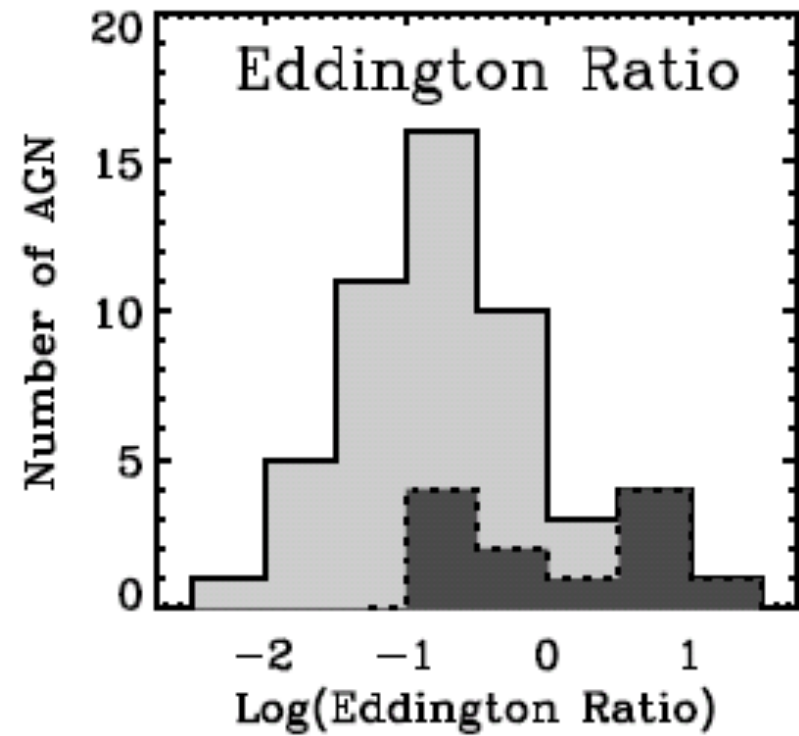
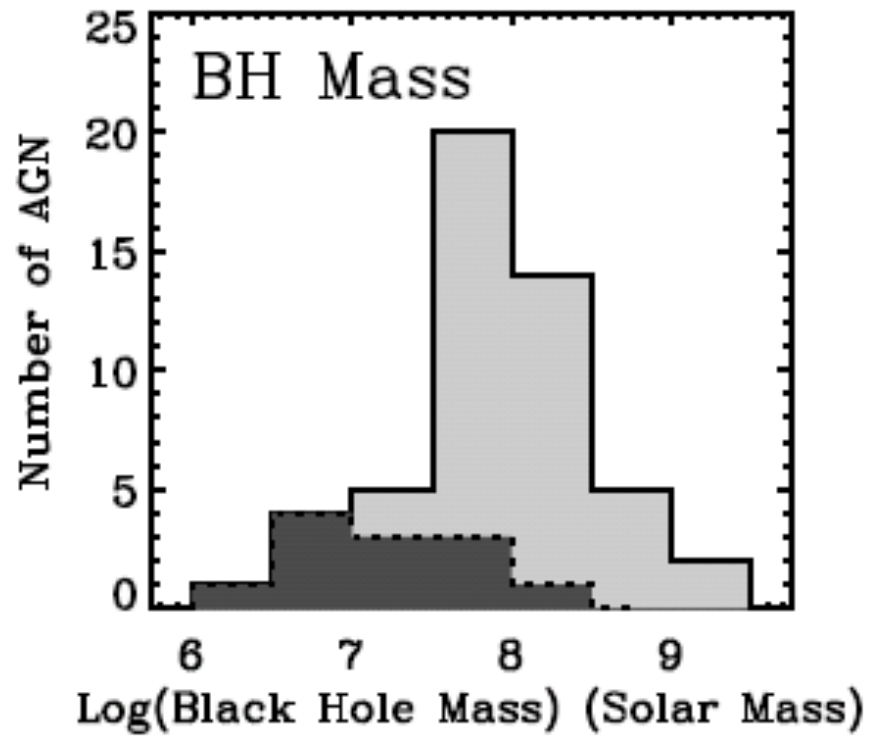


Middleton et al 2009; 2010;

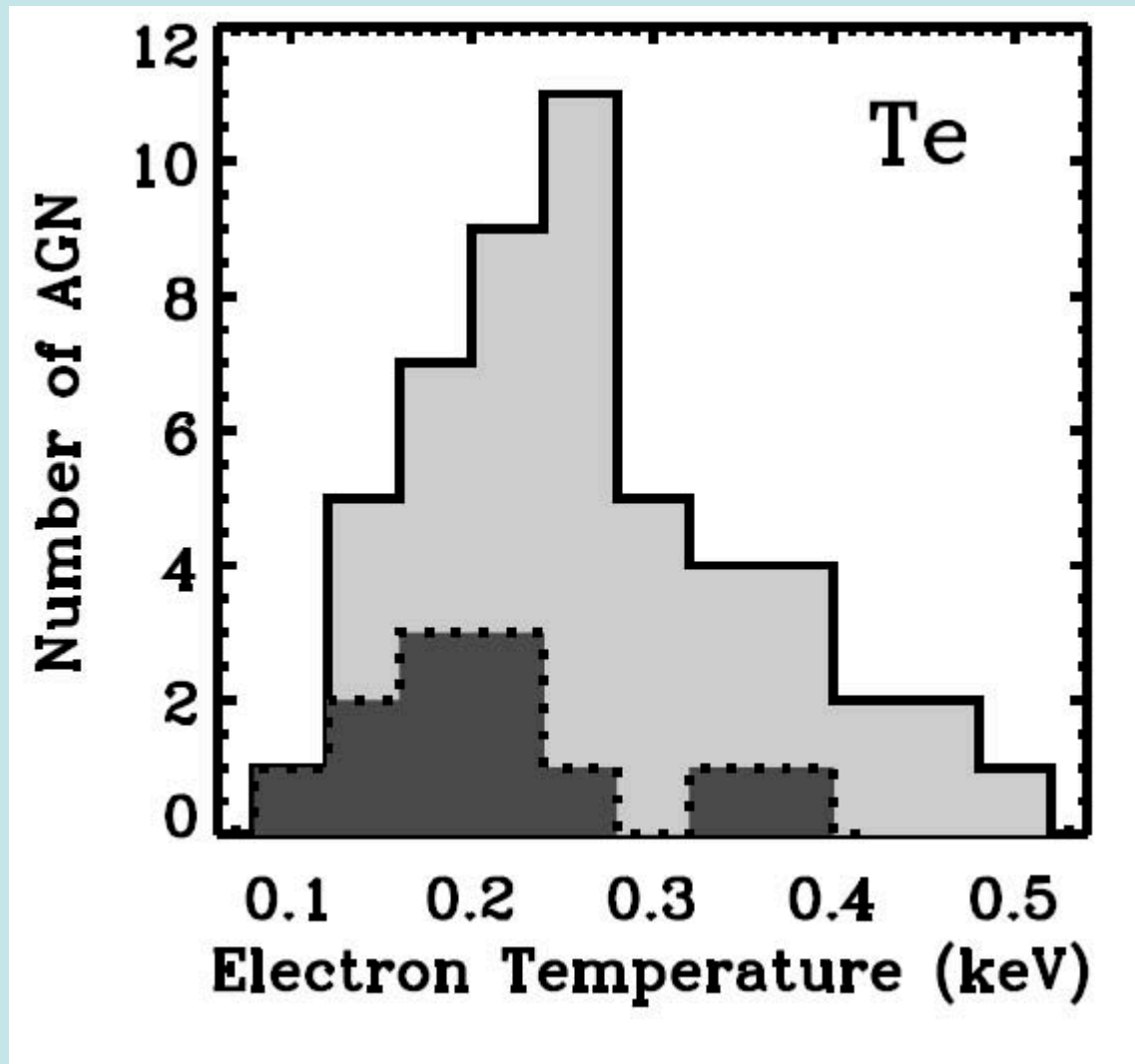
Sample Summary



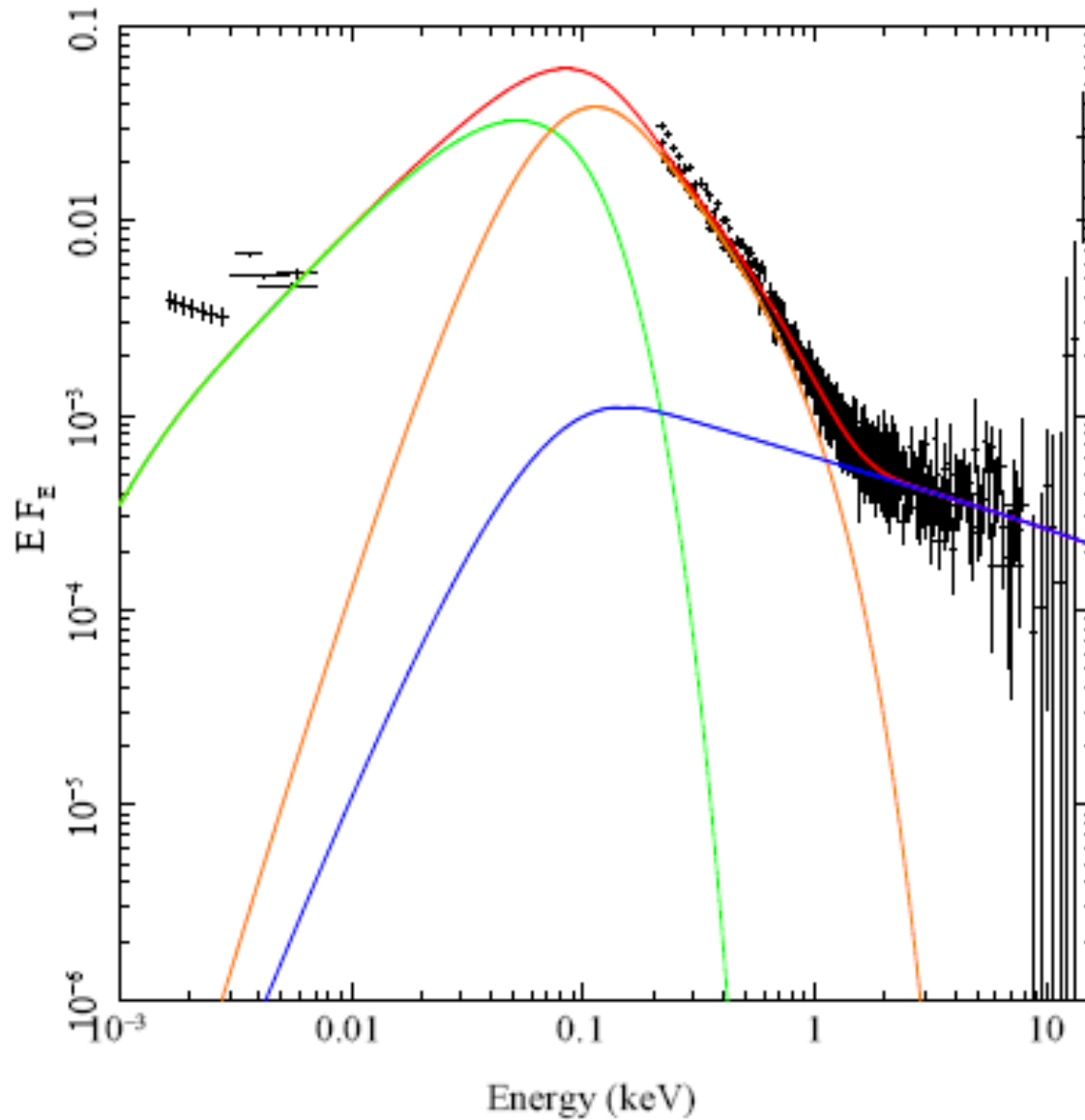
BH Mass and L(Edd)



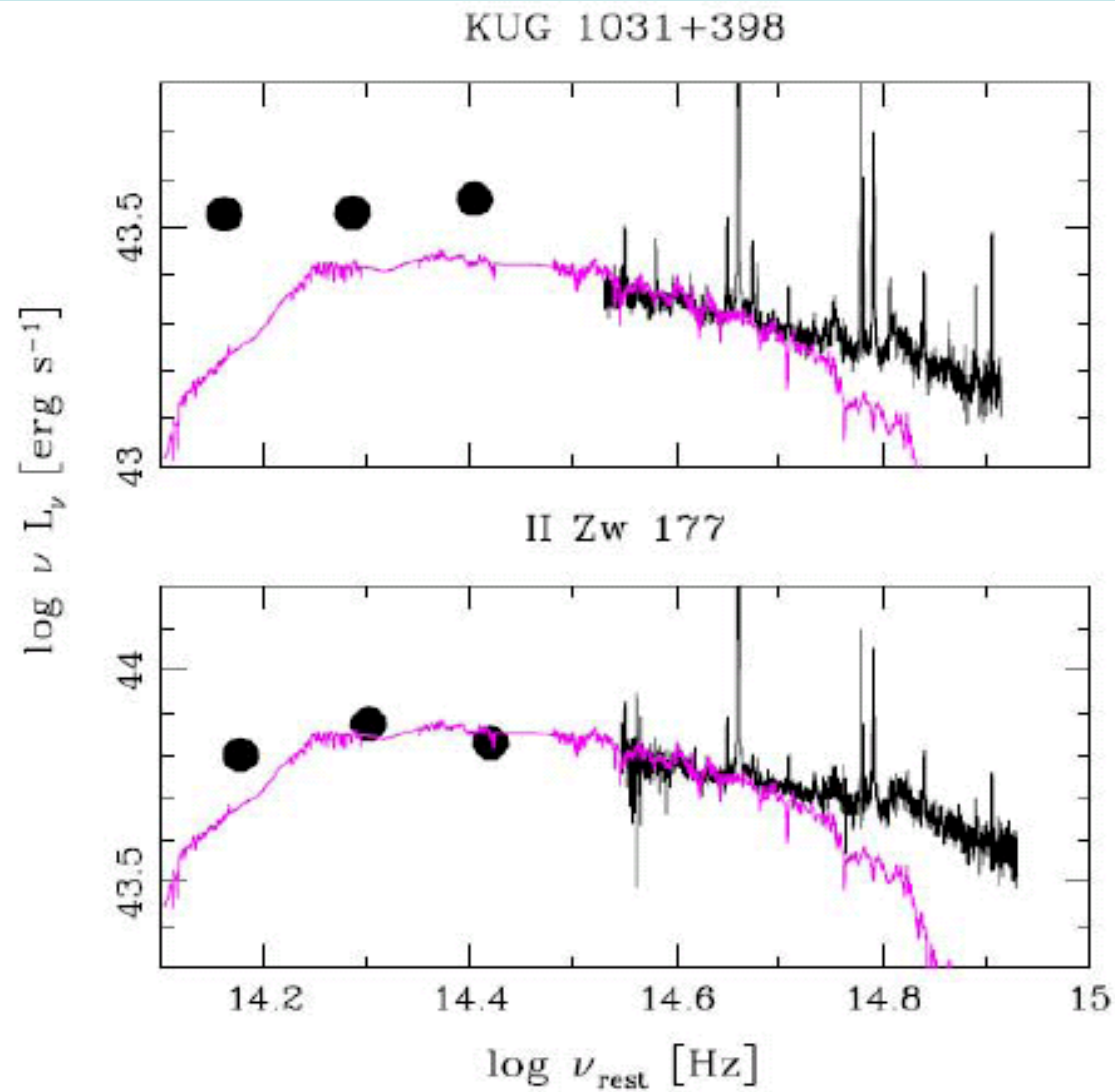
Quantifying the X-ray Components: Te of Compton Component



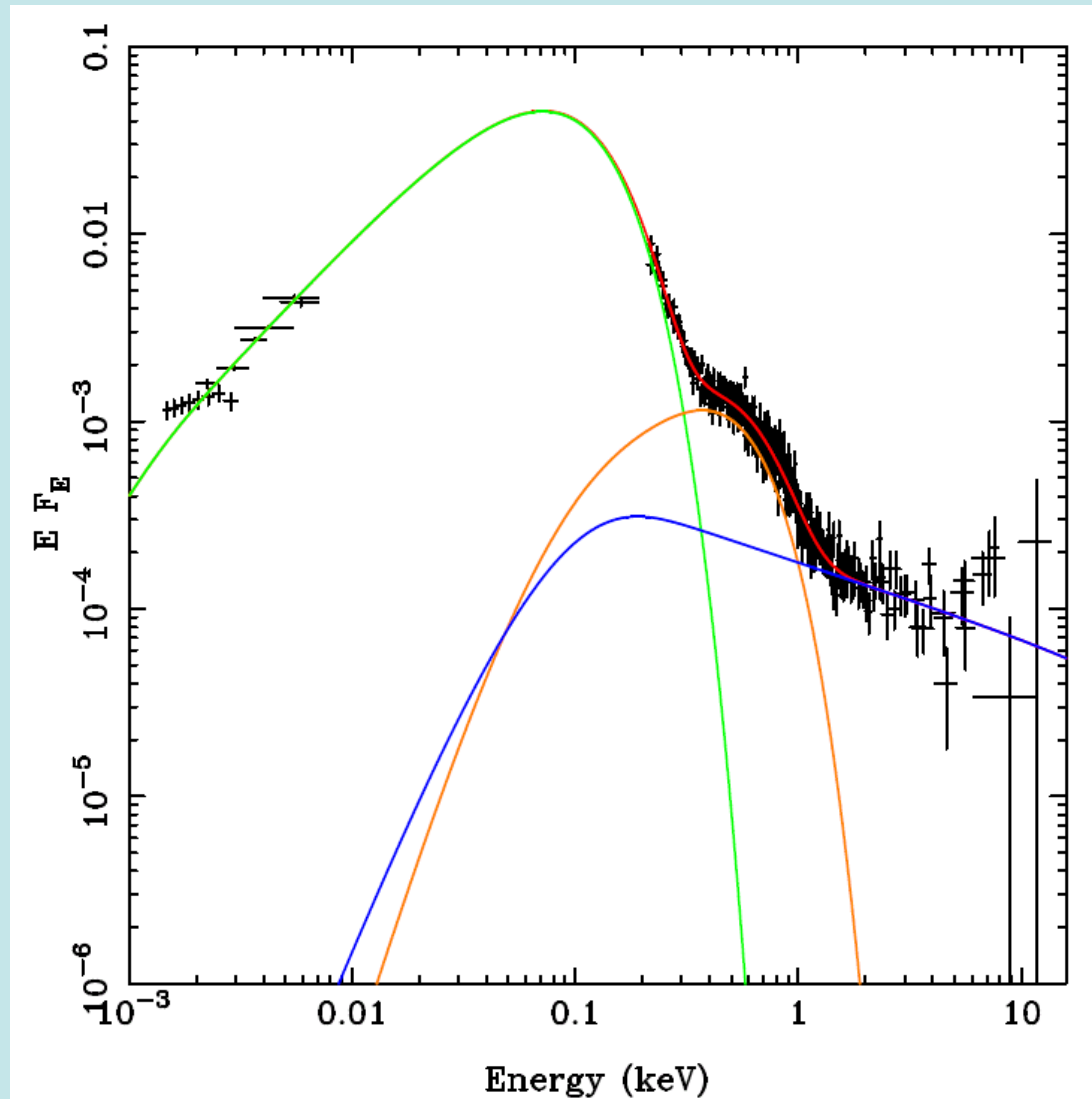
KUG1034+398 (only AGN with detected QPO)



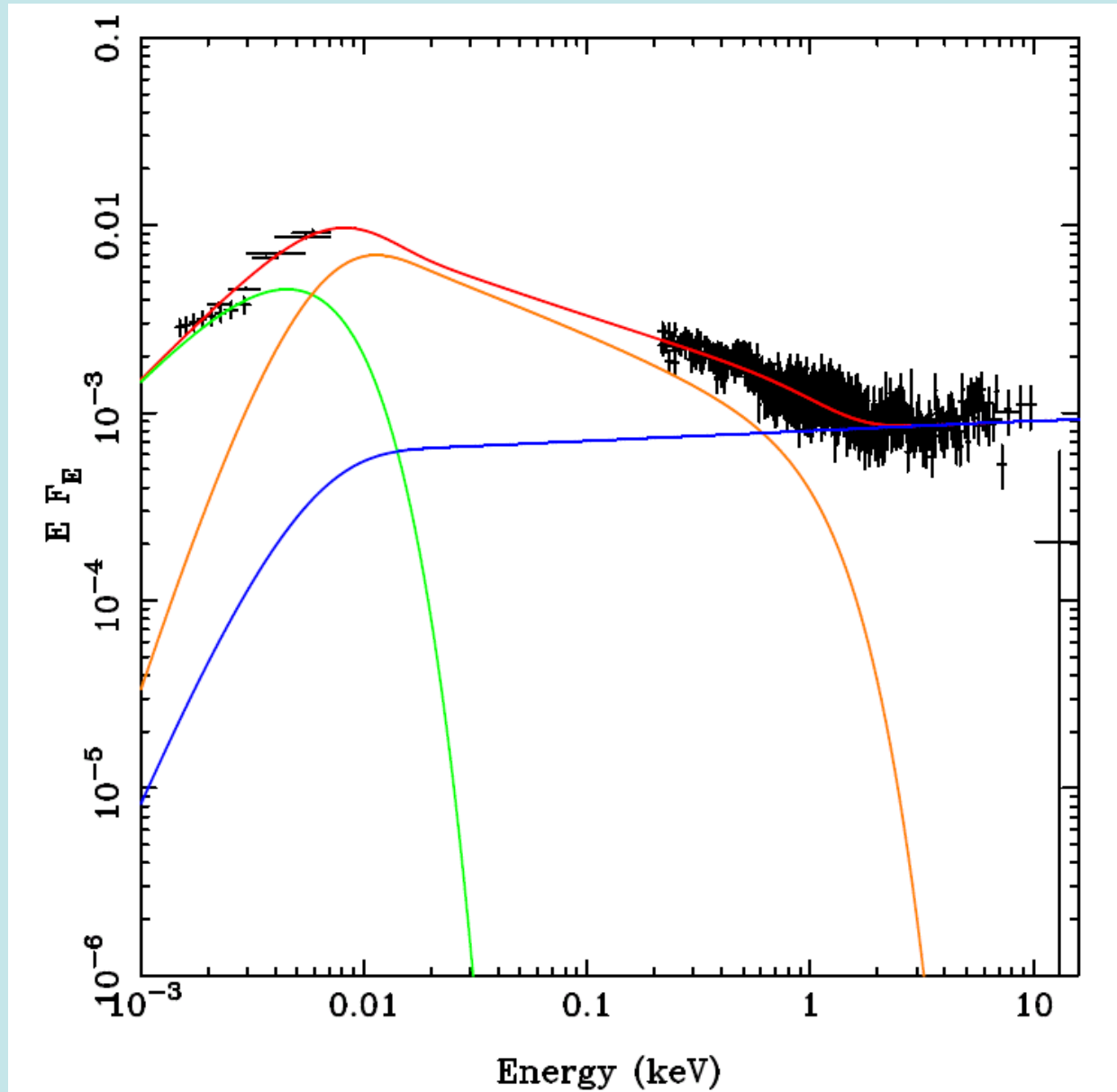
Stellar Contamination – Landt et al. (in prep.)



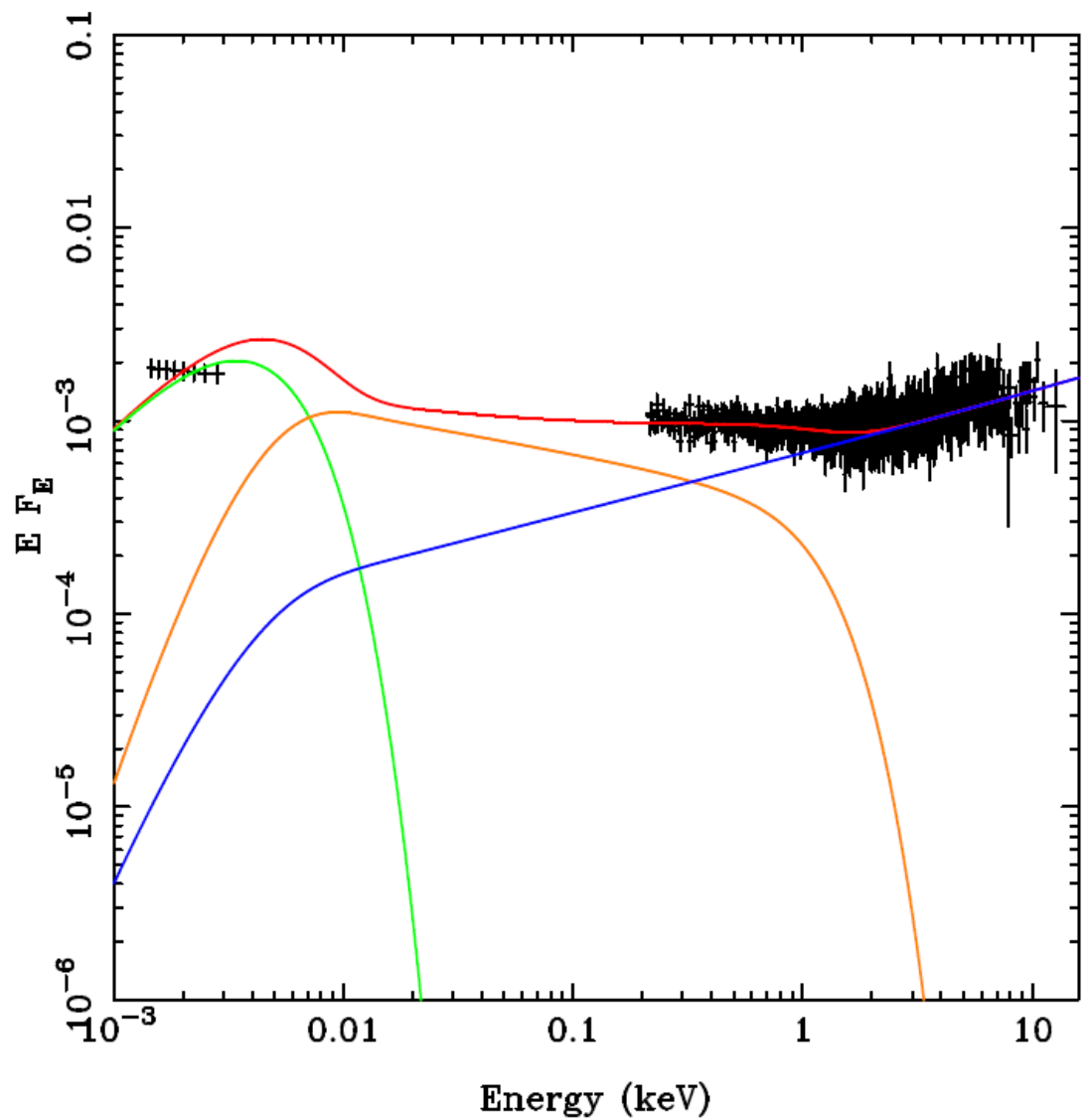
Diversity of the SEDs – disk component



Diversity of SEDs – Compton component



Diversity of SEDs – power law component

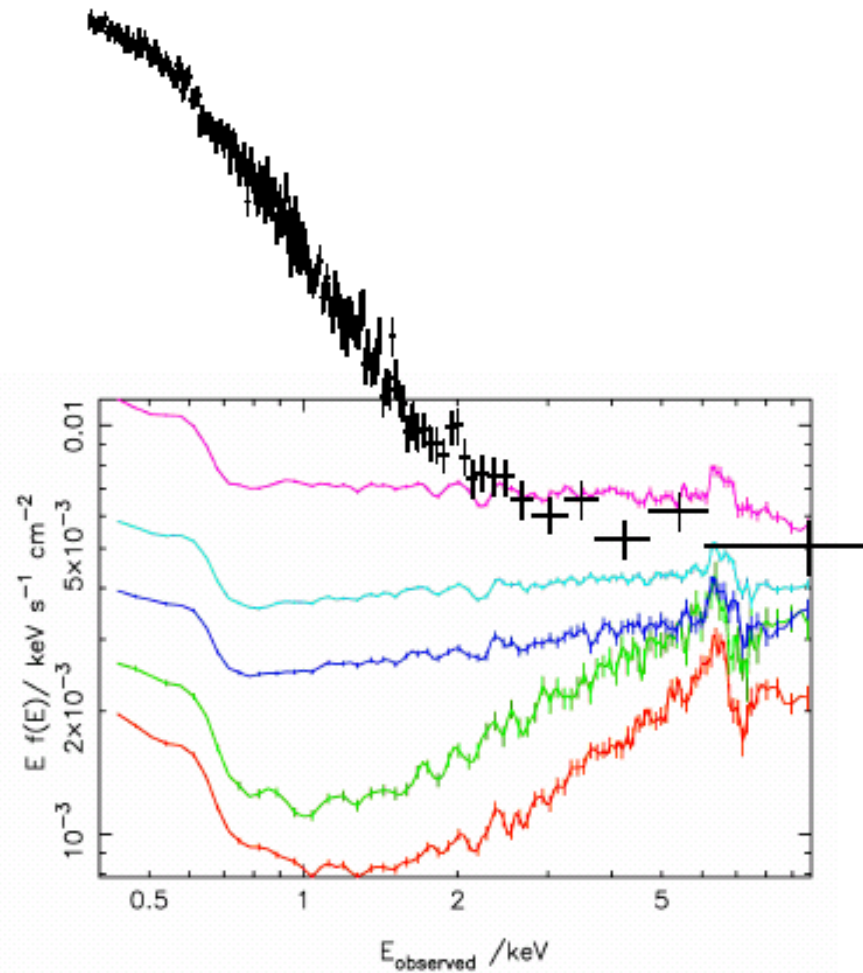


Diversity of soft X-ray excesses

RE1034

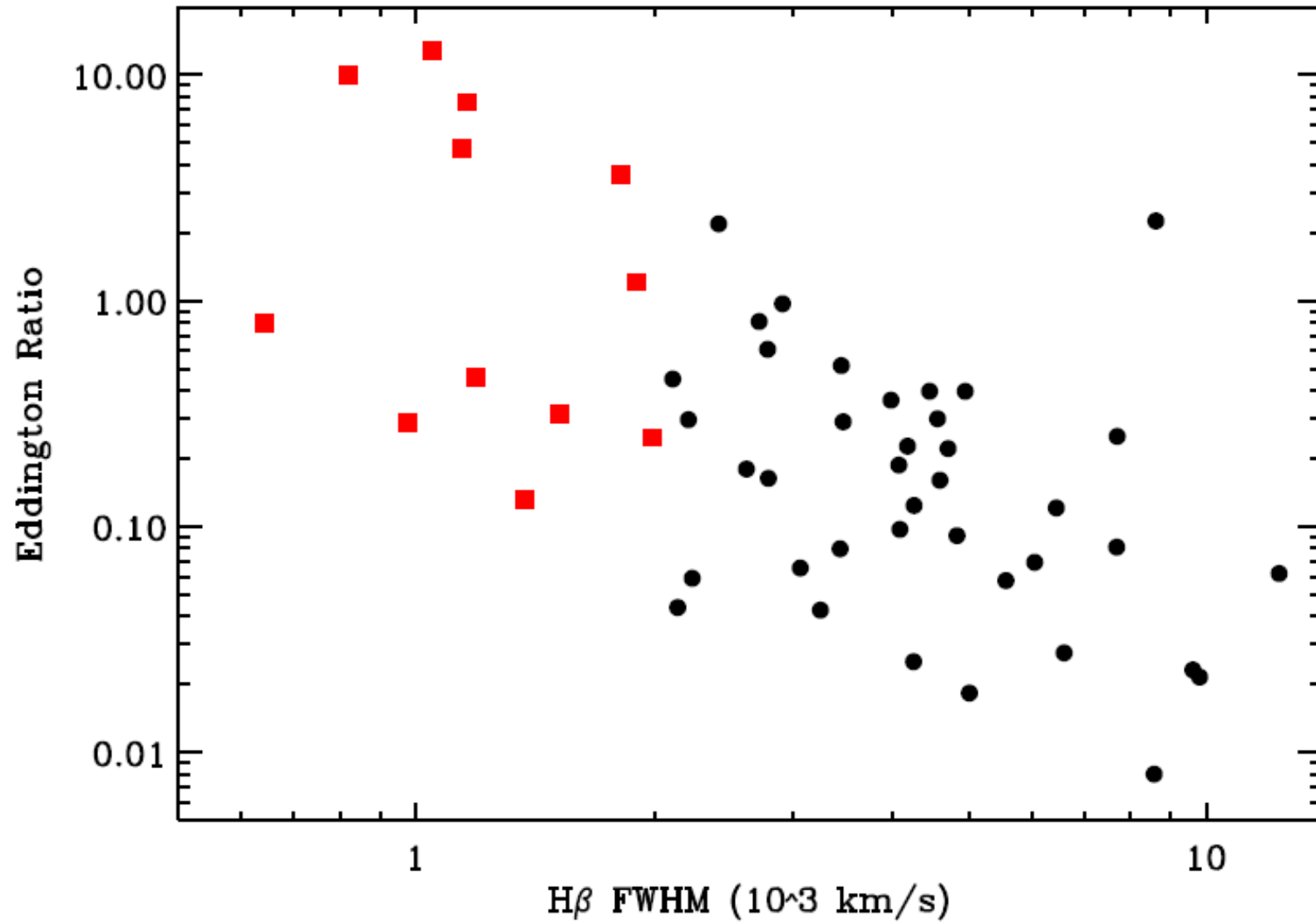
Mkn766

- REJ1034 has huge SX and not much variability below 2keV
- Mkn766 looks less like true excess and varies tremendously below 2keV

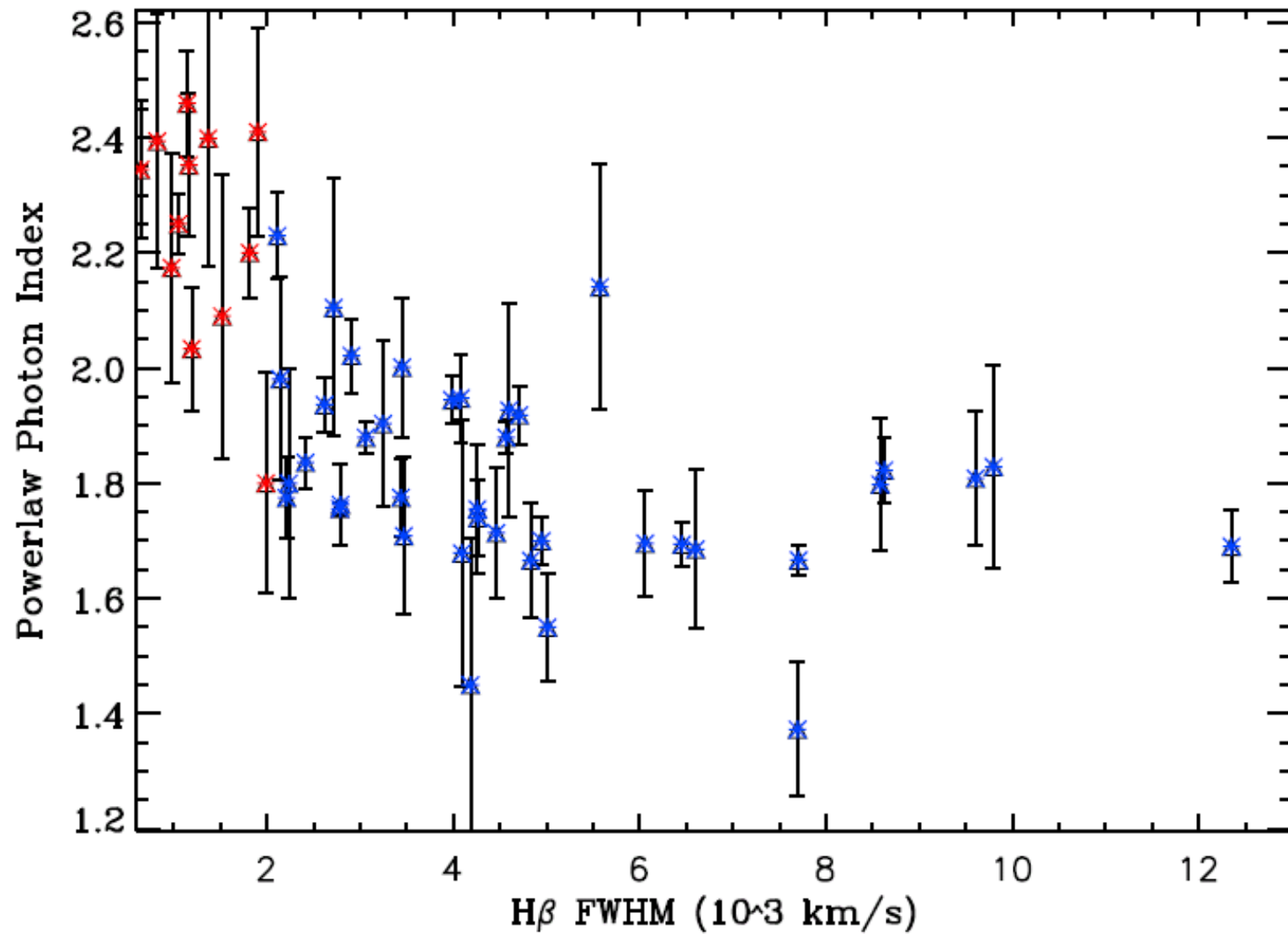


Miller et al 2007 Middleton et al 2008

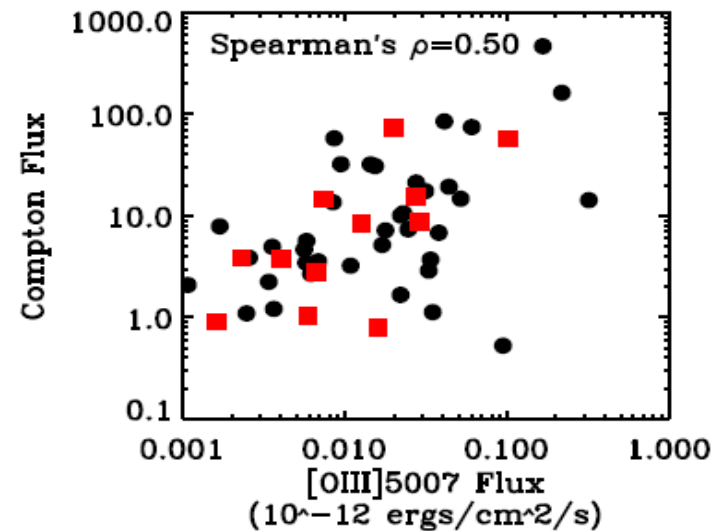
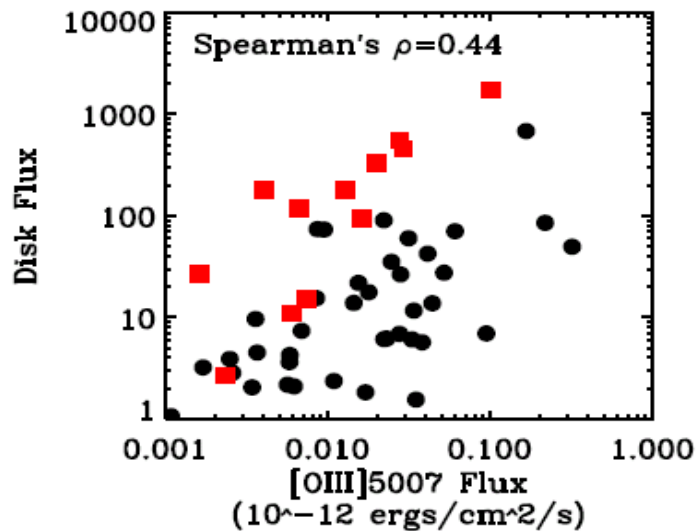
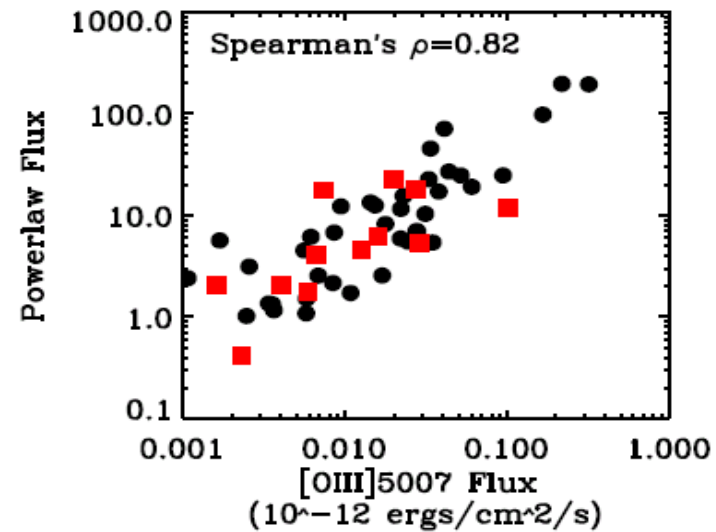
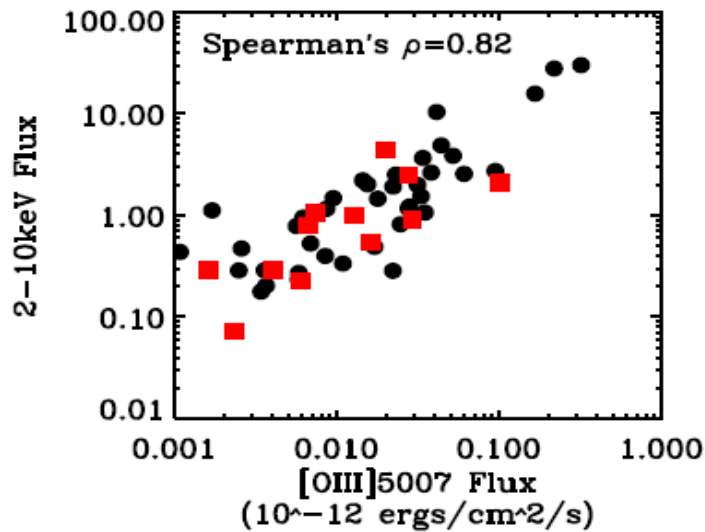
Edd. Ratio vs. H beta FWHM



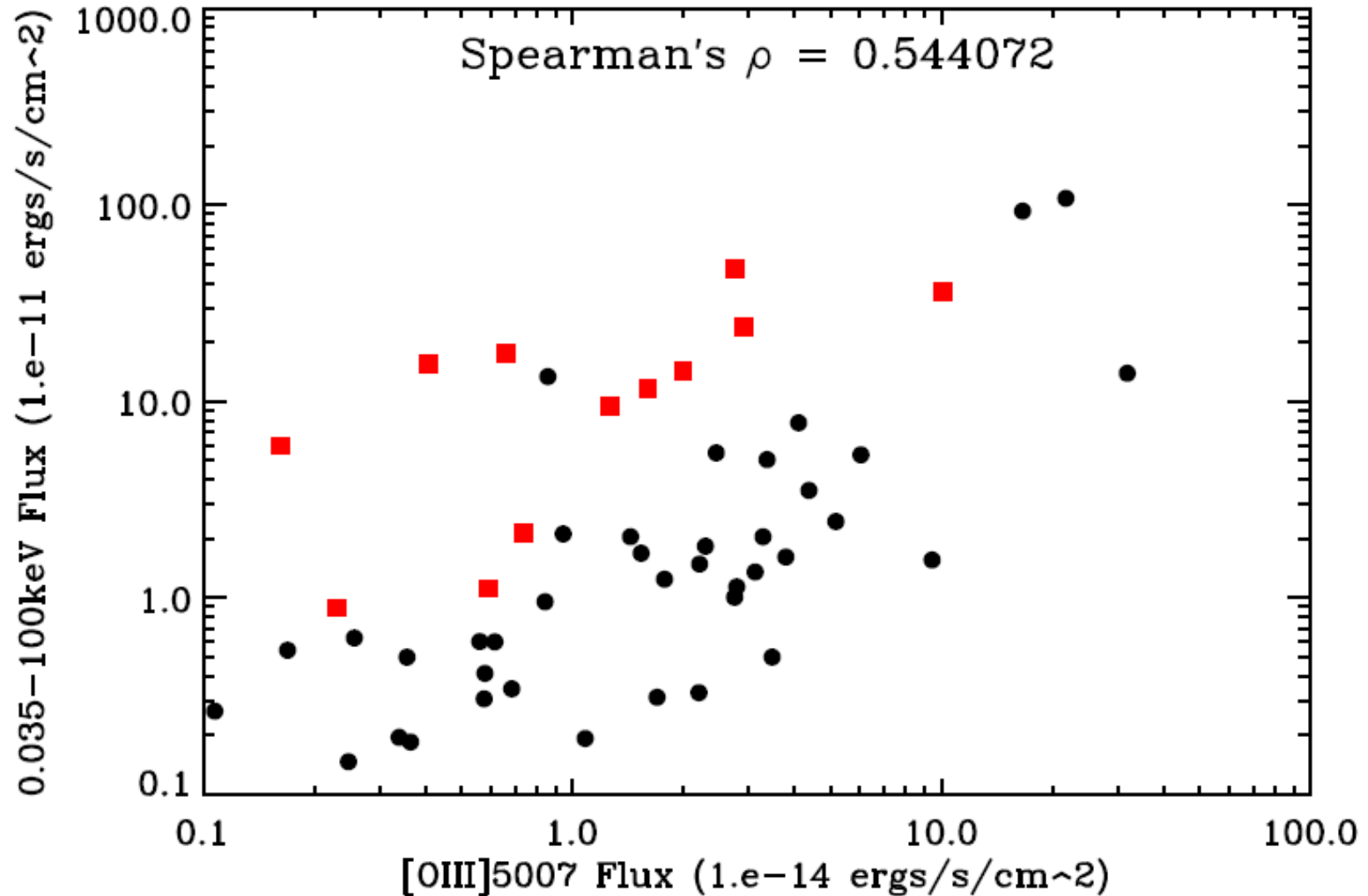
PL index vs. H beta FWHM



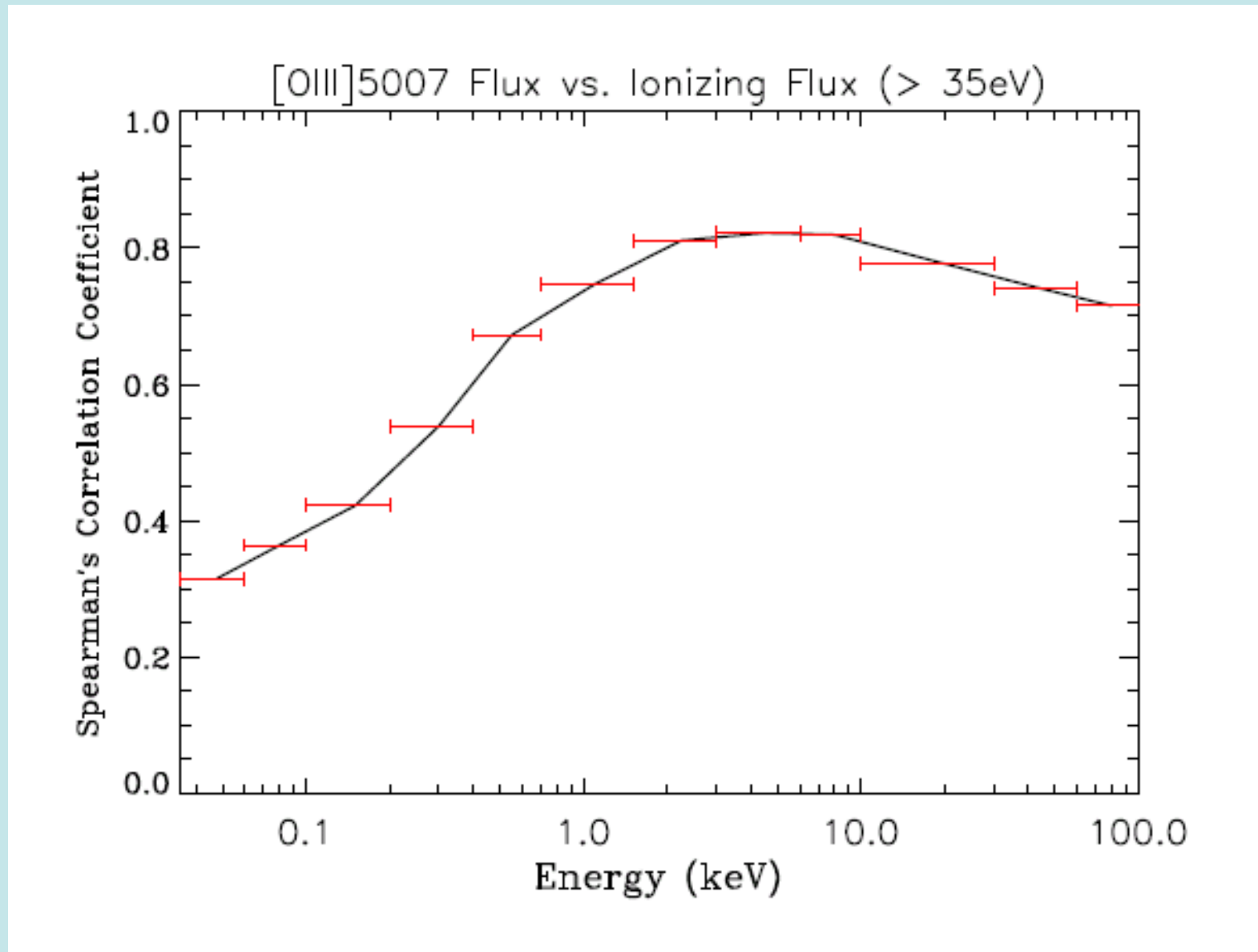
Optical emission lines vs. X-ray Comp.



[OIII] line vs. X-rays (above I.P.)



Correlation coeff. vs X-ray energy



The future...

- Complete component vs emission line analysis
- Variability studies using Pan-STARRS
- Extend the SEDs into the near-IR, to better determine the stellar component, and quantify the hot dust (torus?) contribution

AGN Variability: Pan-STARRS



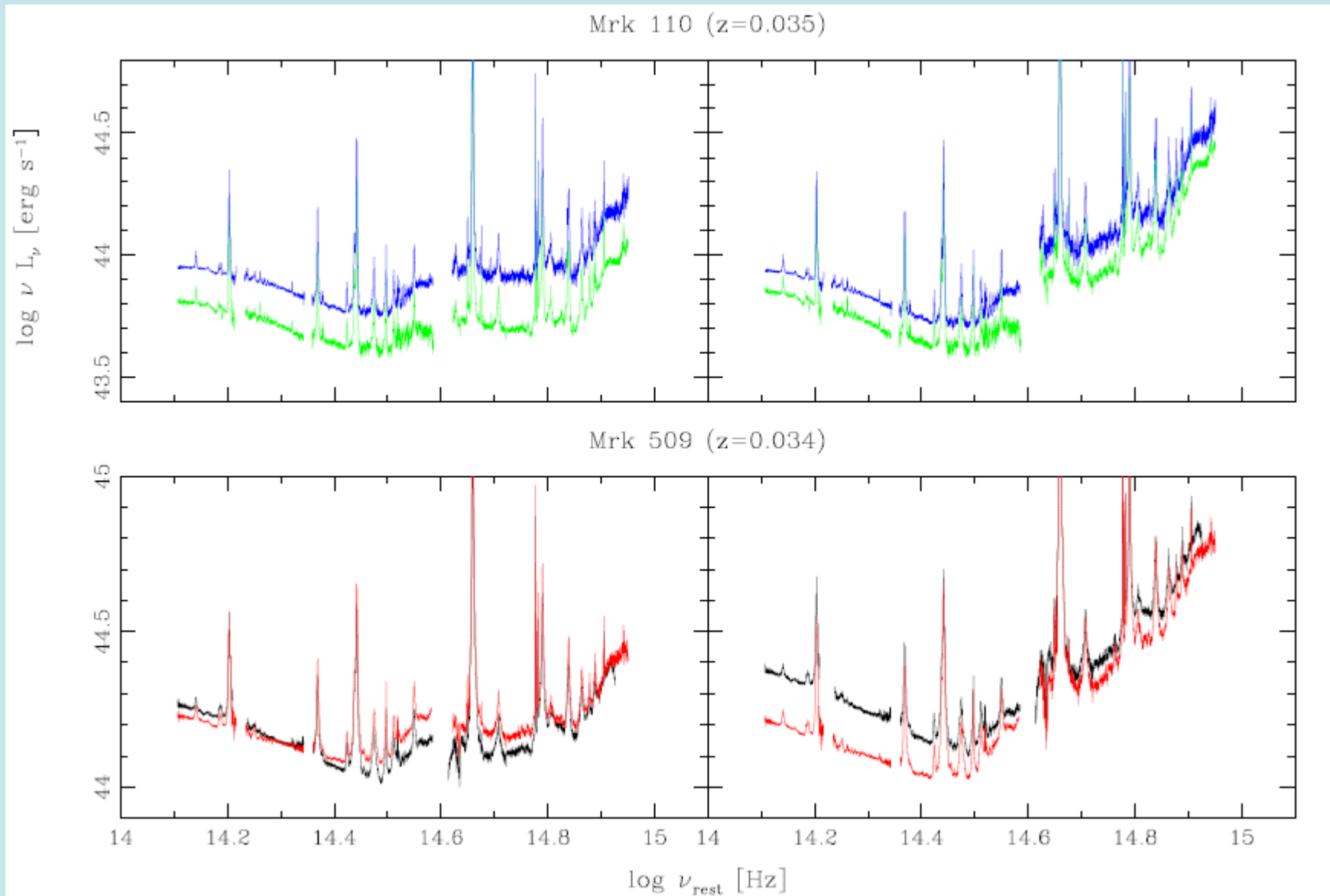
Asteroids down to ~150m



POS-1 Camera FoV



The future....(stellar comp. Landt et al.)



Conclusions

- in the absence of complete simultaneous frequency coverage, application of all *significant* corrections should be applied
- this will help reveal if/how the multi-emission line components are related to the multiple continuum components
- regular monitoring will enable high and low states to be investigated in the same AGN