AGN Accretion - multiwavelength

- Long time series optical reverberation Edelson, Kriss, McHardy
- Gravitational microlensing Chartas
- Optical disc too big for SS—but too much reprocessing for SS – not quite SS!!
- X-rays smaller - Eclipses (sanfrutos, risaliti, braito, bianchi)
AGN Accretion – X-rays

• Shape and variability: Ursini, Marinucci, Hogan, Connolly, Walton, Reynolds
• Lower L/Ledd < 0.1 have Γ < 1.8
• Akn120, IC4239a, NGC5548
BHB Accretion – X-rays

- Hard spectra can’t have disc underneath – Malzac
- Compton energetics – Haardt & Maraschi 1991
Truncated disc/hot flow at low L

- Energy spectra need disc to move from 50-6ish Rg as make transition
- Power spectra: low frequency break and QPO move to higher f
- Jet (Γ~1.5) correlates with hot flow (Malzac, Fender, Russell)

- Truncated disc models give:
  - Transitions
  - Spectral evolution in LHS (Kolehmainen, Shaw, Clavel)
  - Variability evolution (Heil, Rapisada)
  - Resonating cavity for QPOs (Motta, Ingram, Stevens, Kalamkar)
New techniques for variability

- Flux-rms – propagating fluctuations (Vaughan, Uttley)
- Lag-frequency / lag energy (Uttley, de Marco)
- Reverberation lag LHS truncated (de Marco – in which case something wrong with broad lines eg Miller et al 2015 NuSTAR extreme emissivity at smallest radii, high spin LHS)

- Resolution (??)

Complex continuum
2-3 vs 0.5-0.9 keV
6-9 vs 2-3 keV
2-3 vs 0.5-0.9 keV
6-9 vs 2-3 keV
Lag-frequency/Lag-energy in AGN

- Lag-frequency / lag energy (Fabian, Uttley, Cackett, Alston, Kara, Papadakis, Epiropakis)
- Reflector and geometry (Dauser, Garcia, Gooseman, Wilkins, Dovciak, Mantovani, Bonson)
- On axis source – R constant, L constant, h changing
- But now see reverberation so intrinsic variability
- But we don’t see this in BHB???
- Disc corona – radial shrinking rather than h drop to get dips (Wilkins)

Diagram of black hole and accretion disc with geometric parameters such as $r_{in}$, $r_{out}$, $h$, $\Omega$, $\Delta \Phi$, $\delta_i$, $\delta_e$, $\alpha$, and observer.
Do we have a clean view - Winds

- BHB winds – mostly thermal but could be MHD (Hori, diaz trigo, Ponti, Chakravorty)
- External winds HMXRB – Grinburg, Hirsch
- AGN winds – warm absorbers could be thermal, but UFOs must be diskwind in AGN (Silva, Cappi, Tombesi, Reeves, Matzeu, Pounds, Braito)
- And in UV – BALs, miniBALs (Mathews, Guistini, Saez)
- Diskwind velocity in PDS456 (NuSTAR) means launched close in – impact on lags?? And on broad iron line red wing – Braito, Mizumoto
Do we have a clean view - Winds

- 1H0707
- $2e6M_\odot = 0, 0.9, 0.998$
- Done & Jin 2015
- Clean disc??
Do we have a clean view - Winds

- 1H0707
- 2e6M $a=0, 0.9, 0.998$
- $L/L_{edd} = 20, 63, 150$
- Done & Jin 2015
- $L \gg L_{edd}$ and $L \gg L_{obs}$ so losing most of the accretion power
- disc NOT FLAT
- WINDS – eclipses by clumps can shorten intrinsic lags to match obs Gardner & Done 2015
ULX

- ULX - Nustsar
- L/Ledd >> 1
  NOT IMBH
  (Bachetti, Roberts, Earnshaw, Kobayashi, Walton et al 2015)
Conclusions

- Nustar (ULX, AGN)
- Long monitoring, multiwavelength (OM/UVOT) campaigns
- Large surveys (tidal disruption: Saxton)
- New techniques – lag-frequency, lag-energy LONG XMM but also look at multiwavelength context!!
- UFOs – LONG XMM, NuSTAR
- USE ALL THE INFORMATION

- Astro-H (Sanchez-Fernandez), Astrosat, Athena….Amazing!
Thanks to YOU!! And the SOC but most especially the LOC