

Unification of X-ray winds in Seyfert galaxies: from ultra-fast outflows to warm absorbers

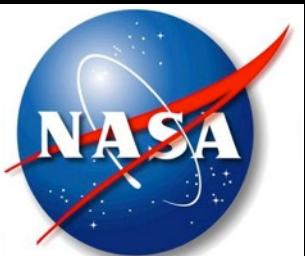


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Nemmen, M. Gaspari, ...

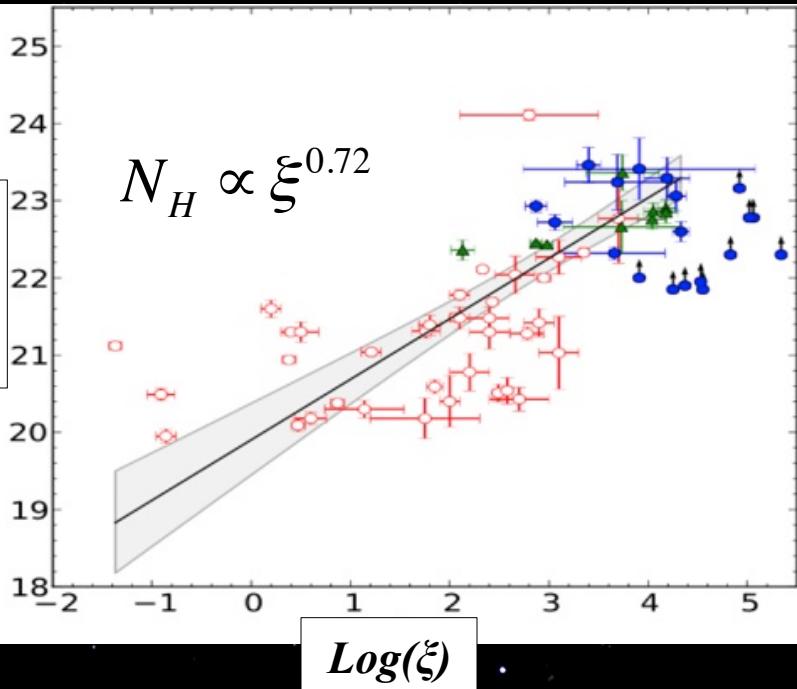


	<u>Warm absorbers</u> (WAs)	<u>Ultra-fast outflows</u> (UFOs)
Fraction	>50%	>40%
Ions	O VII-VIII, Ne IX-X, Fe L	Fe XXV-XXVI
Log ξ	~0-3 erg s ⁻¹ cm	~3-6 erg s ⁻¹ cm
N _H	~10 ²⁰ -10 ²² cm ⁻²	~10 ²² -10 ²⁴ cm ⁻²
V _{out}	~100-1,000 km/s	~10,000-100,000 km/s
Variability	~months/years	~days
Distance	~1-100 pc	≤1 pc
Origin	~torus, ~outer disk?	~inner accretion disk?
	(e.g., Reynolds 1997; George et al. 1998; Crenshaw et al. 2003; Blustin et al. 2005; McKernan et al. 2007)	(e.g., Pounds et al. 2003; Braito et al. 2007; Cappi et al. 2009; Tombesi et al. 2010, 2011, 2012; Gofford et al. 2013)

What are the relations, if any, between WAs and UFOs?

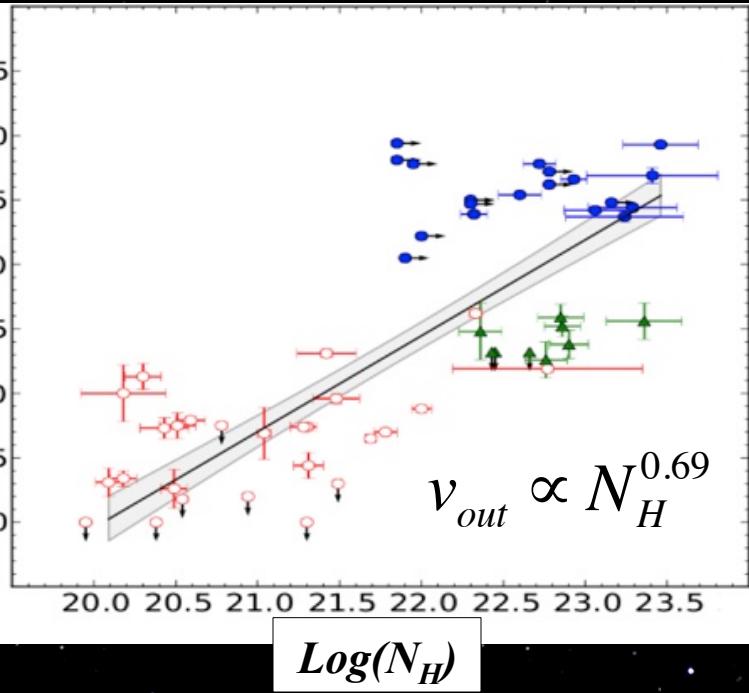
Comparison WAs and UFOs in 35 Seyfert 1s (Tombesi et al. 2013)

$\text{Log}(N_H)$



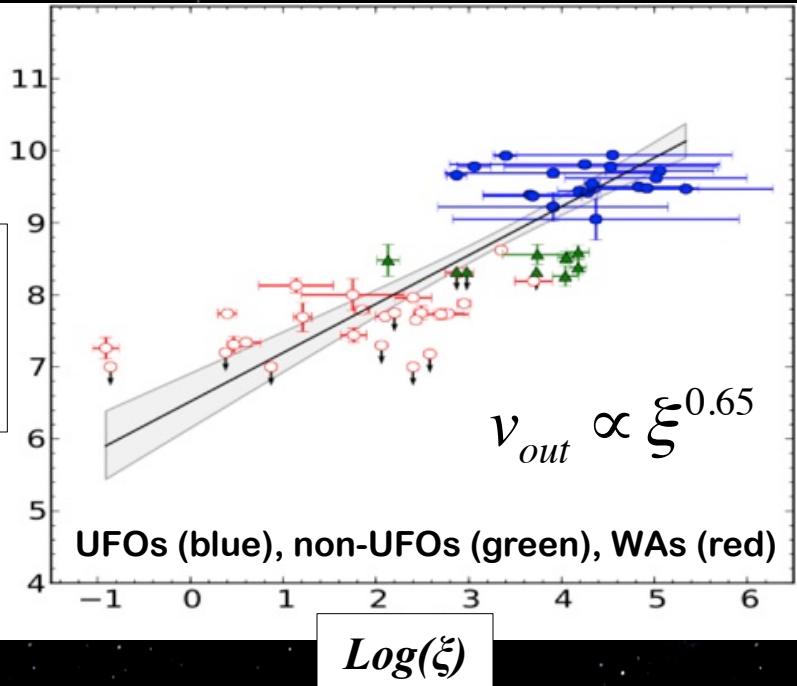
$\text{Log}(\xi)$

$\text{Log}(v_{out})$



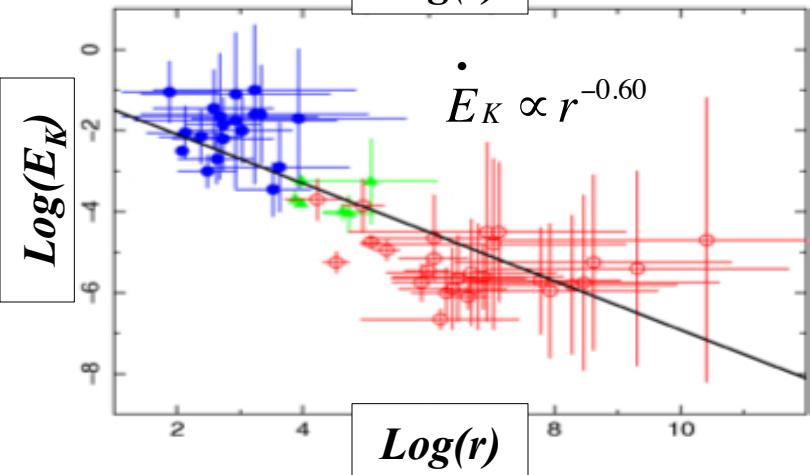
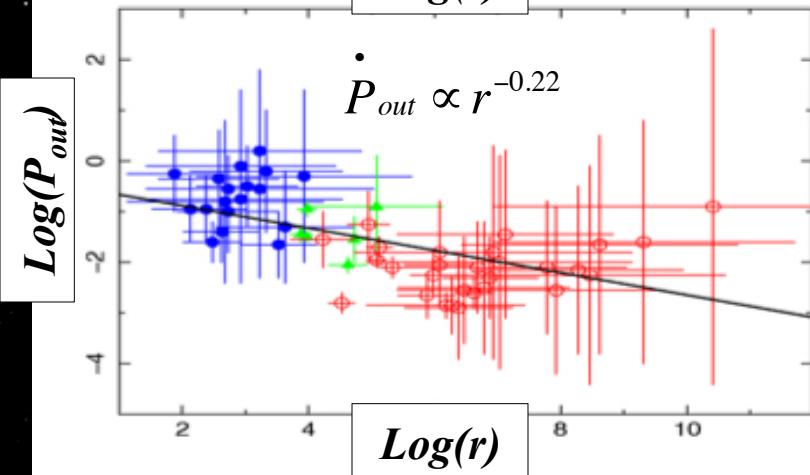
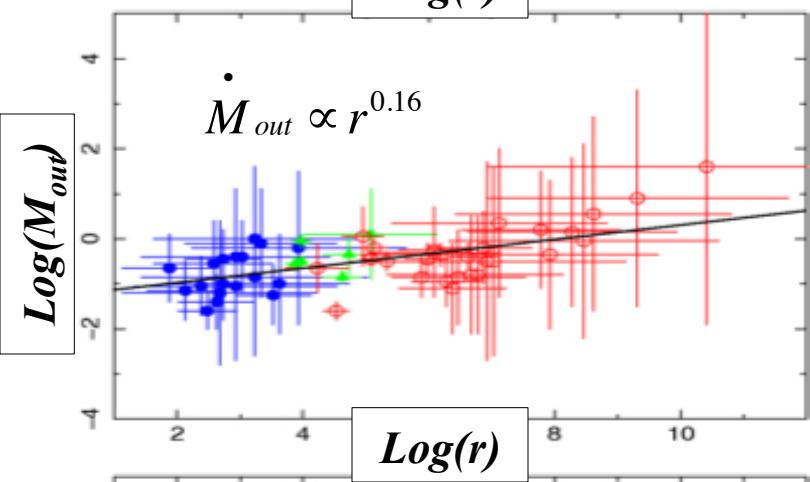
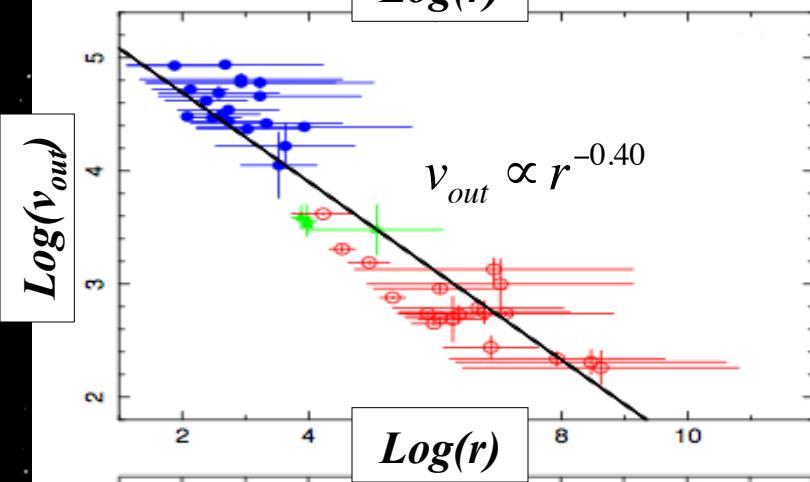
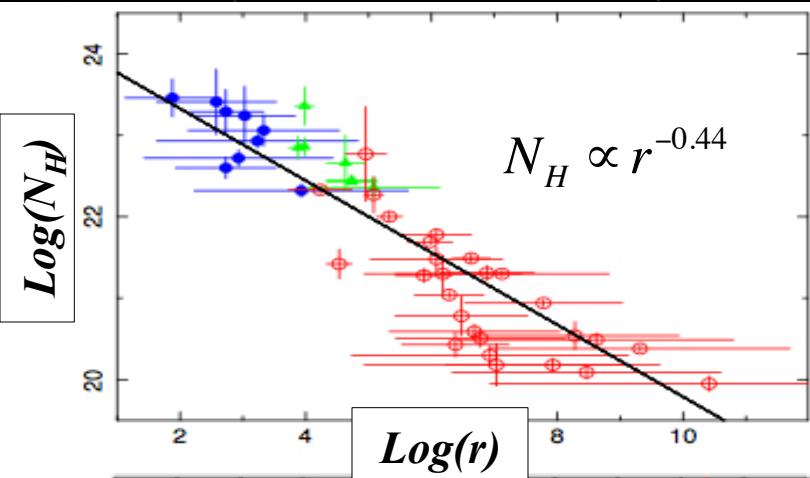
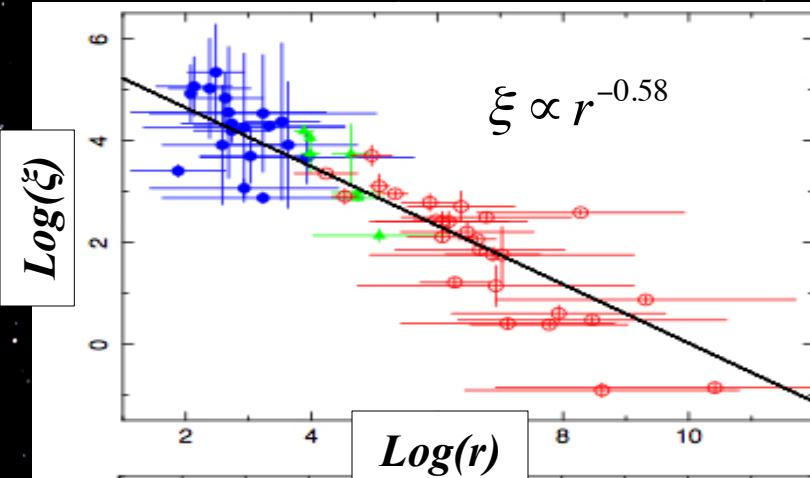
$\text{Log}(N_H)$

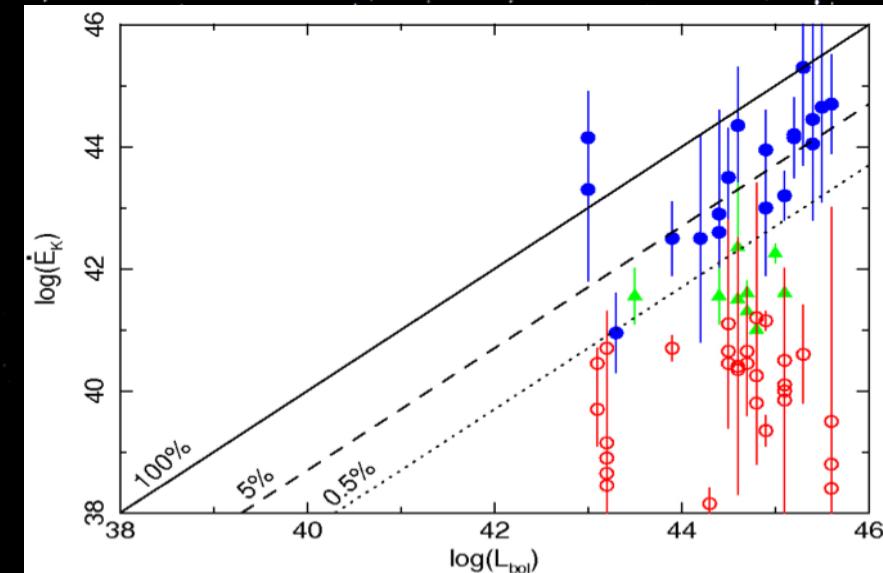
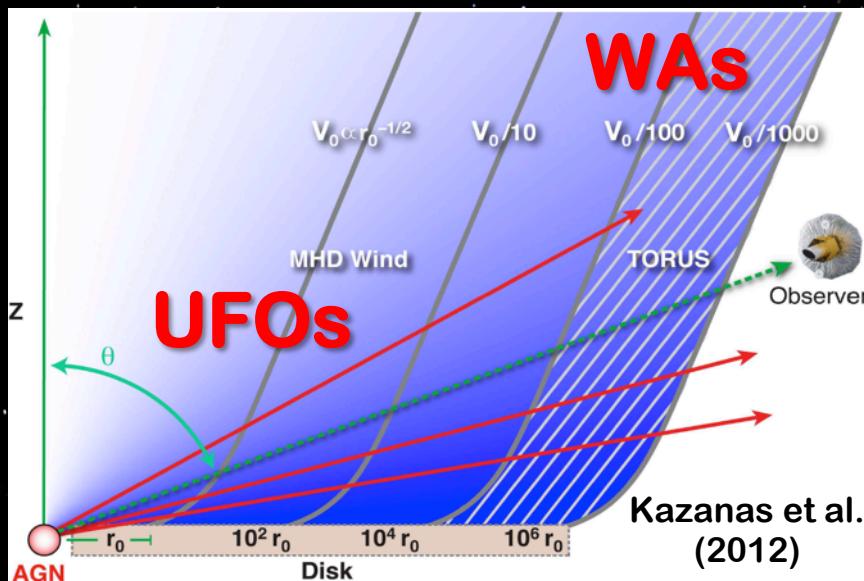
$\text{Log}(v_{out})$



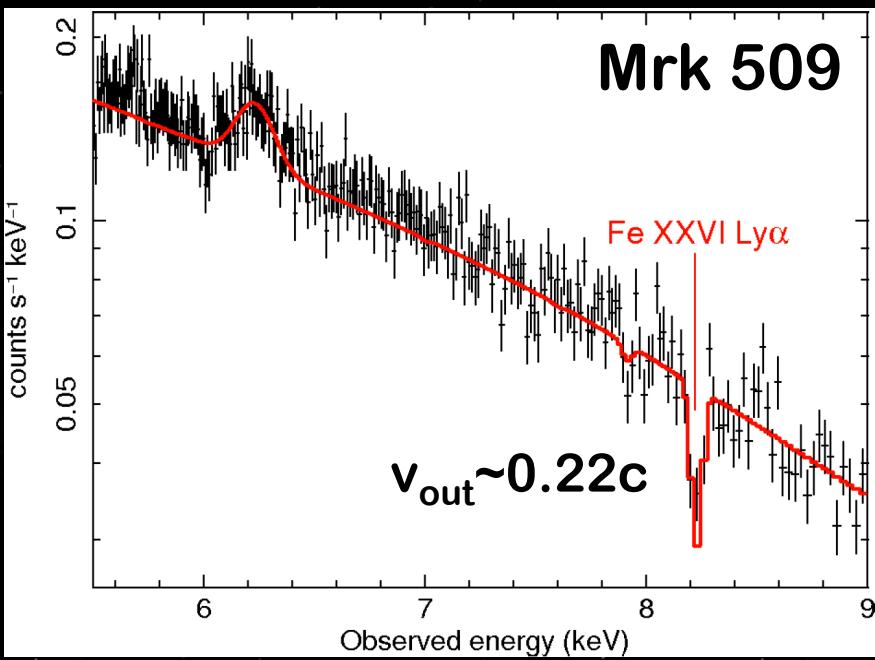
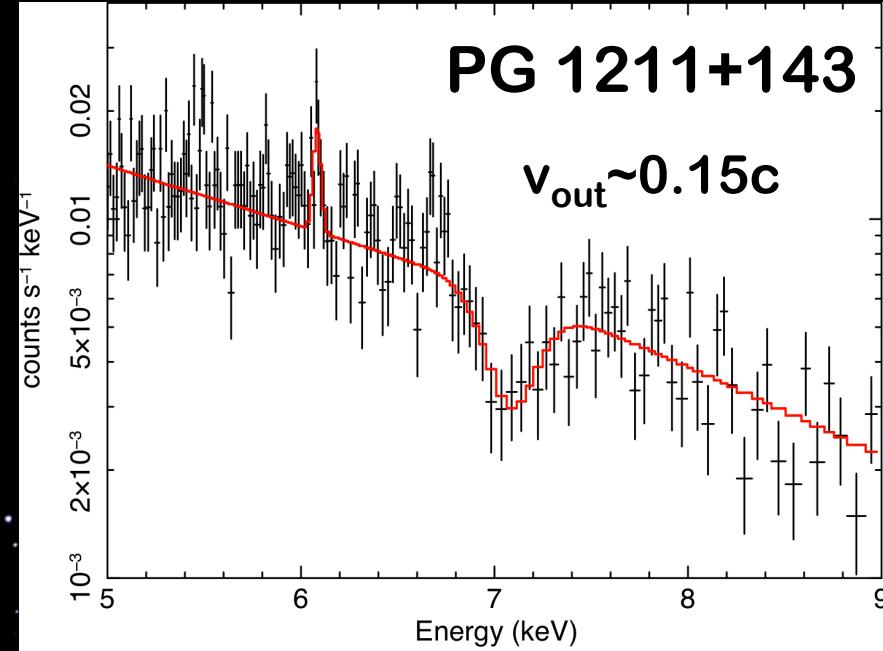
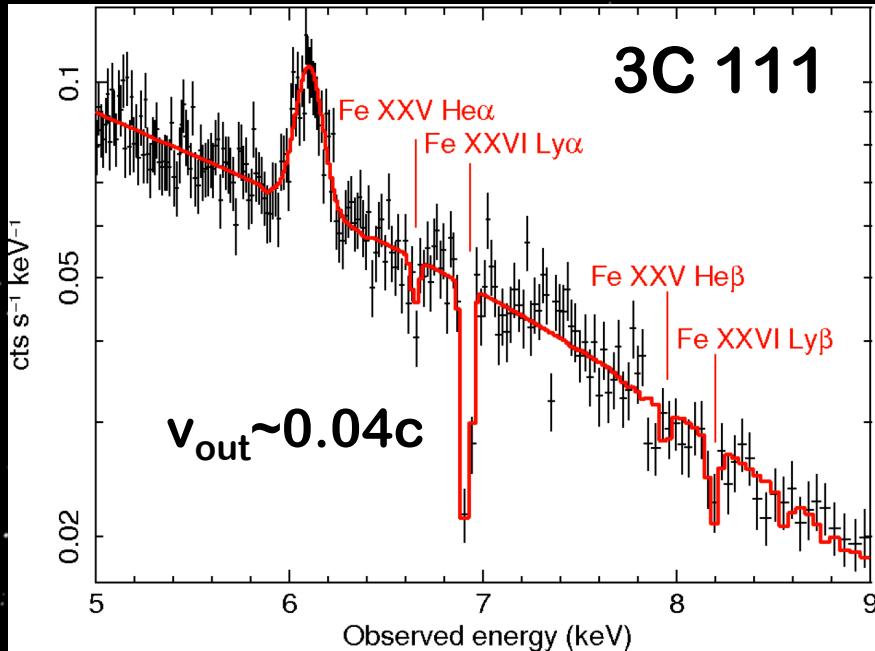
$\text{Log}(\xi)$

- **WAs found in >60% sources**
- **UFOs in >40%, >70% also WAs**
- **Significant (>6 σ) correlations**

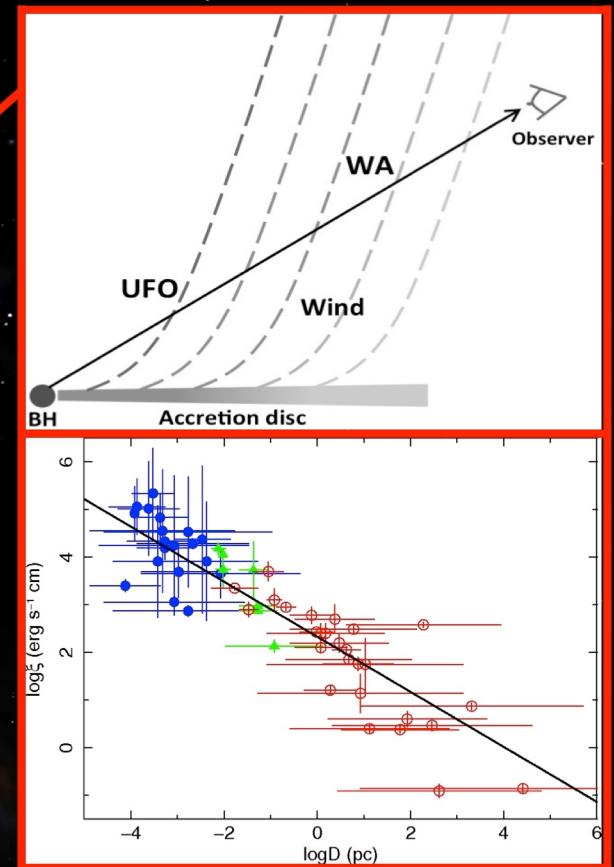




- Unification as large-scale, multi-phase AGN outflow
- UFOs inner/faster part of the flow. Interaction with ISM at large distances
- Density $n \sim r^{-1.4}$, conical/bipolar geometry; velocity $v_{\text{out}} \sim r^{-1/2}$, escaping wind
- UFO mechanical power $\gg 0.5\% L_{\text{bol}}$, \gg minimum for AGN feedback (e.g., Di Matteo et al. 2005; Hopkins & Elvis 2010; Wagner et al. 2013)
- High ionization and velocity. Acceleration through Compton scattering (King & Pounds 2003; King 2010) and/or MHD (Ohsuga et al. 2009; Fukumura et al. 2010; Kazanas et al. 2012)



Unification of X-ray winds in Seyfert galaxies



Thank you for your attention