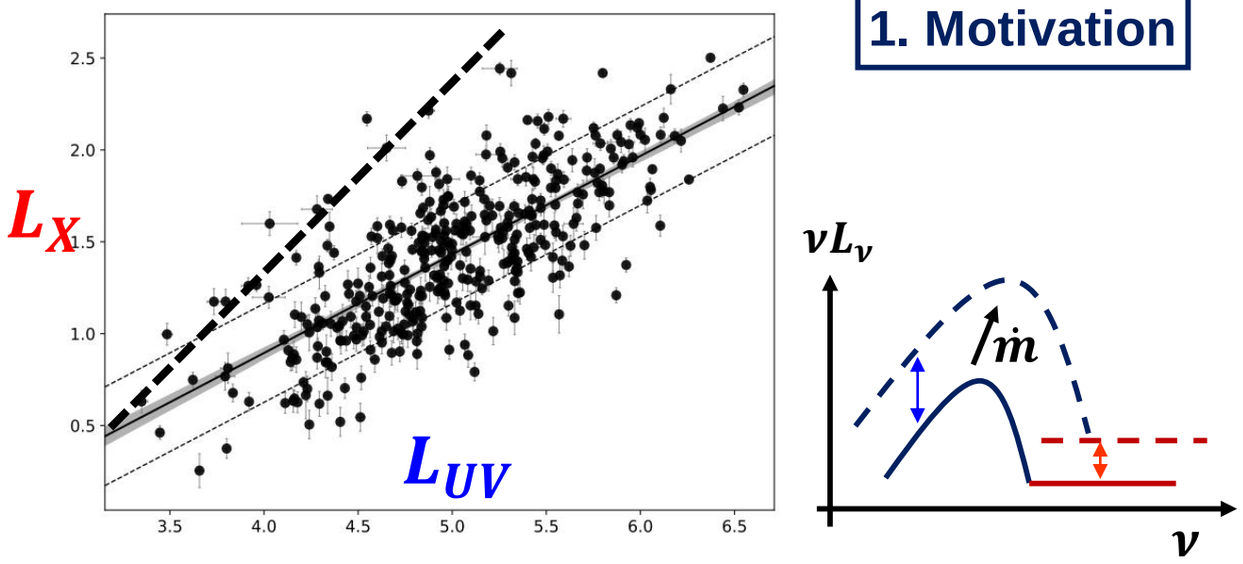
Testing the disk-corona interplay in AGN

R. Arcodia

R.Arcodia, A. Merloni, K. Nandra, G. Ponti

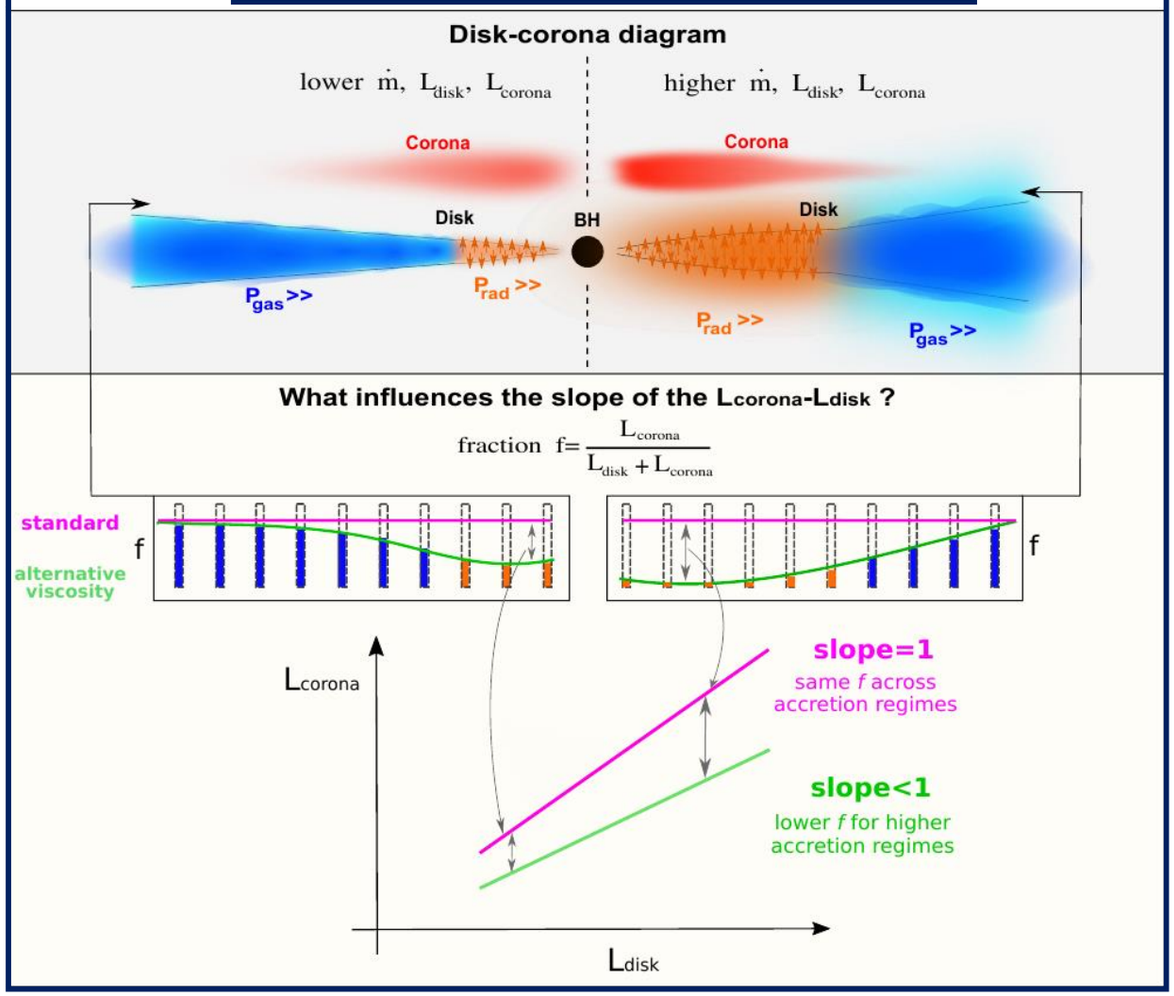
Max-Planck Institute for Extraterrestrial Physics, Munich

1. Motivation

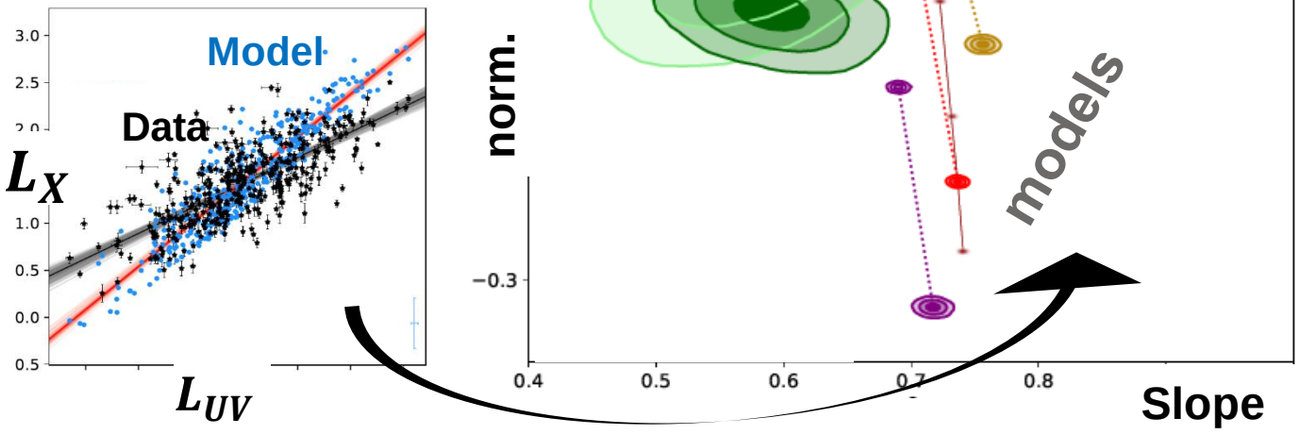


- Widely used but without a conclusive explanation
- Its slope<1 suggests a regulating mechanism: going from low to high $\dot{m}$, L_X increases less than L_{UV}

2. Model prediction: slope < 1



3. Observational test



- Obs. sources modeled one by one
- Match in slope, normalization and scatter of $L_X - L_{UV}$

Conclusions

- $L_X - L_{UV}$ is ideal to test disk-corona models
- Our model can explain slopes < 1
- Tension in the strength of the X-ray emission, that can be relaxed with high-spin

Arxiv:1907.10069

Testing the disk-corona interplay in AGN

R. Arcodia

https://github.com/rarcodia/DiskCoronasim

Disk-corona model

Prescriptions from the standard accretion theory, with:

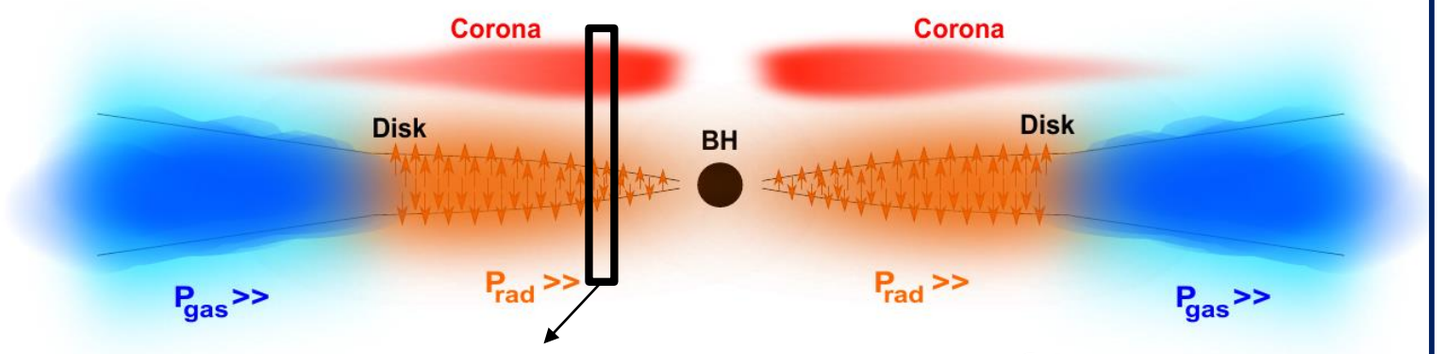
- **Generalised viscosity law:**

$$\tau_{r\varphi} \propto P_{gas}^{\boldsymbol{\mu}} P_{tot}^{1-\boldsymbol{\mu}}$$

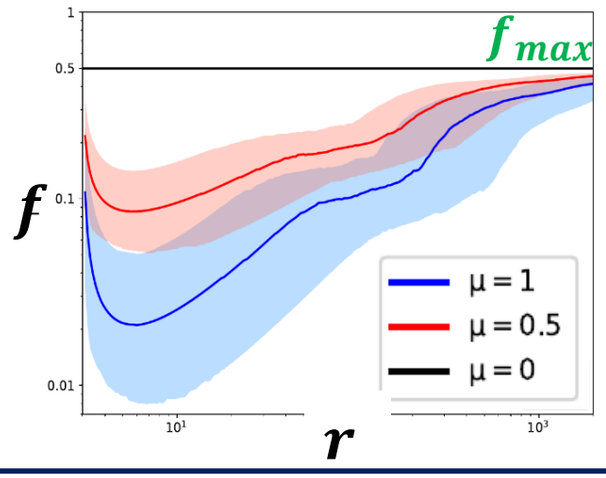
- **X-ray corona:**

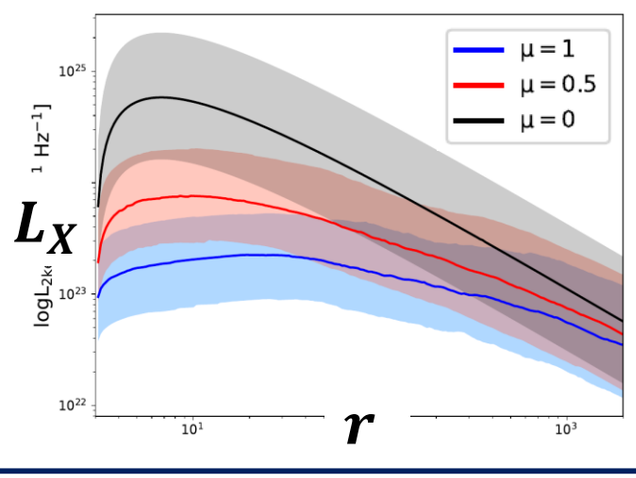
$$f = \frac{Q_{cor}}{Q_{accr}} = \boldsymbol{f_{max}} \left(1 + \frac{P_{rad}}{P_{gas}}\right)^{-\boldsymbol{\mu}/2}$$

- **Opacities** from stellar tables



Radial profiles: $\boldsymbol{P, \rho, T, h, f}$ → $\boldsymbol{L_X \propto f Q_{accr}}$, $\boldsymbol{L_{UV}}$ **multicolor BB**





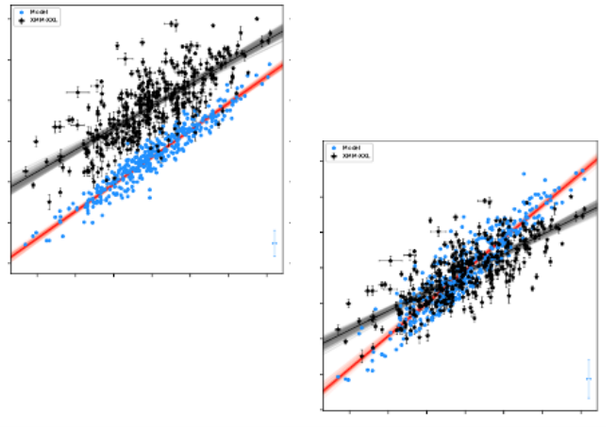
Methodology

1. Take a sample

2. Fix: $m, \dot{m}, \Gamma_x$; f_{max} μ

3. Compute mock $\boldsymbol{L_X, L_{UV}}$

4. Compare data and mock $\boldsymbol{L_X - L_{UV}}$ $(\forall f_{max}, \mu)$



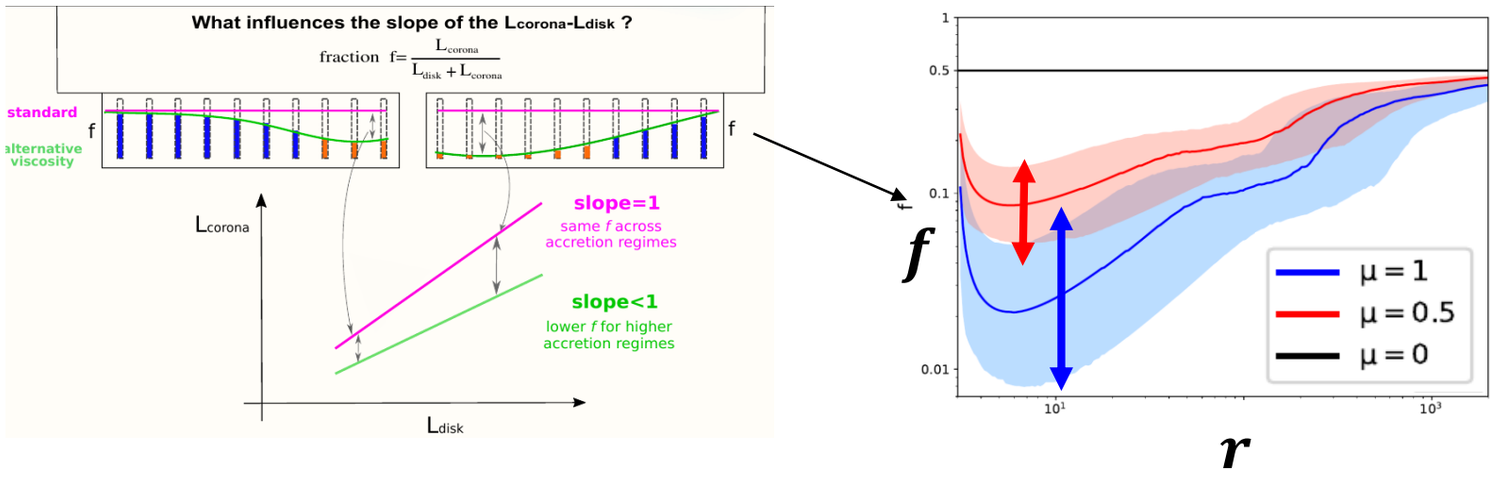
Testing the disk-corona interplay in AGN

R. Arcodia

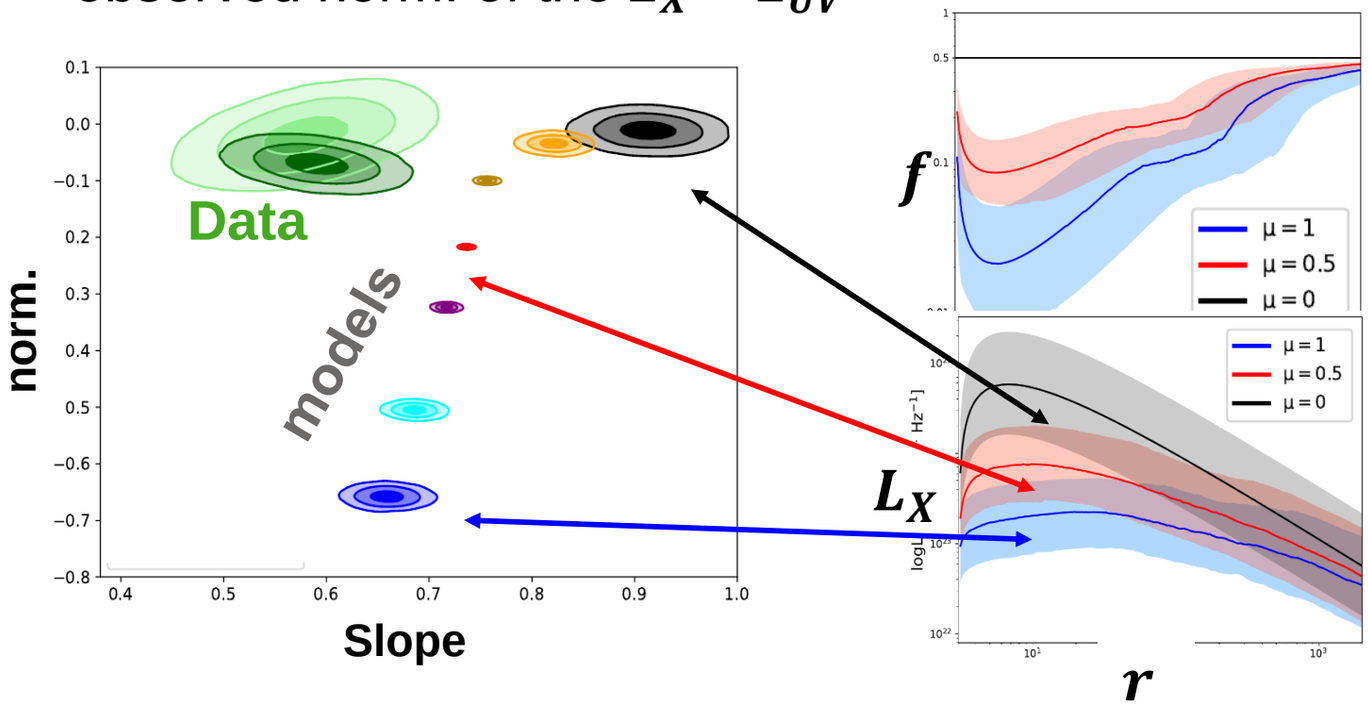
Arxiv:1907.10069

Results

1. A slope < 1 of the $L_X - L_{UV}$ is reproduced by alternative accretion prescriptions (e.g. $\tau_{r\varphi} \propto \sqrt{P_{gas} P_{tot}}$)



2. if spin=0 is assumed, models that reproduce the slope yield X-rays that are too weak w.r.t to the observed norm. of the $L_X - L_{UV}$



3. Outflowing coronae or a more realistic high-spinning BH population significantly relax the tension in the strength of the X-ray emission