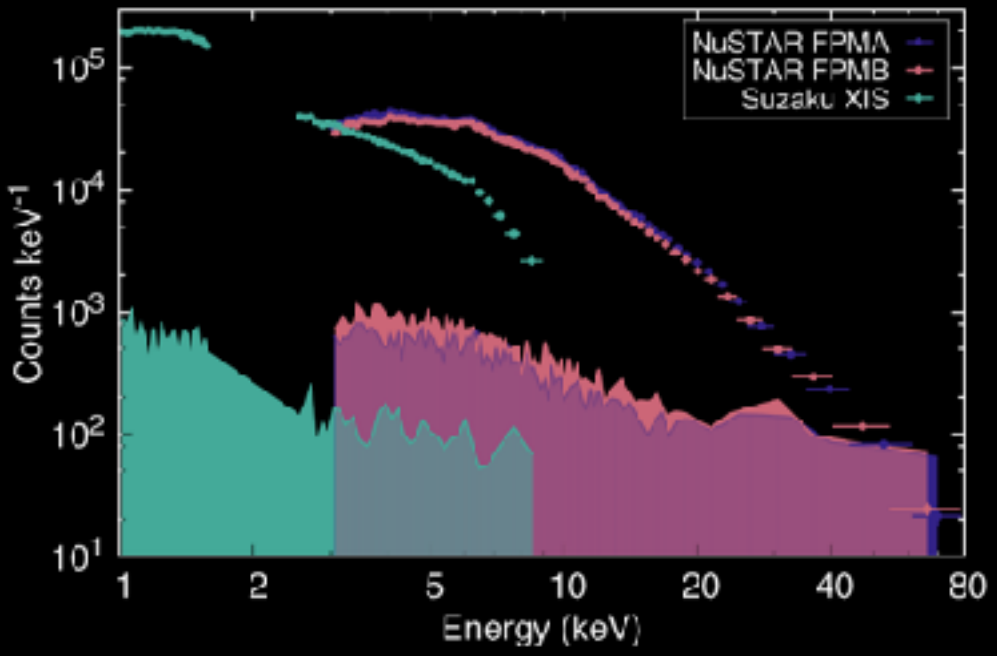
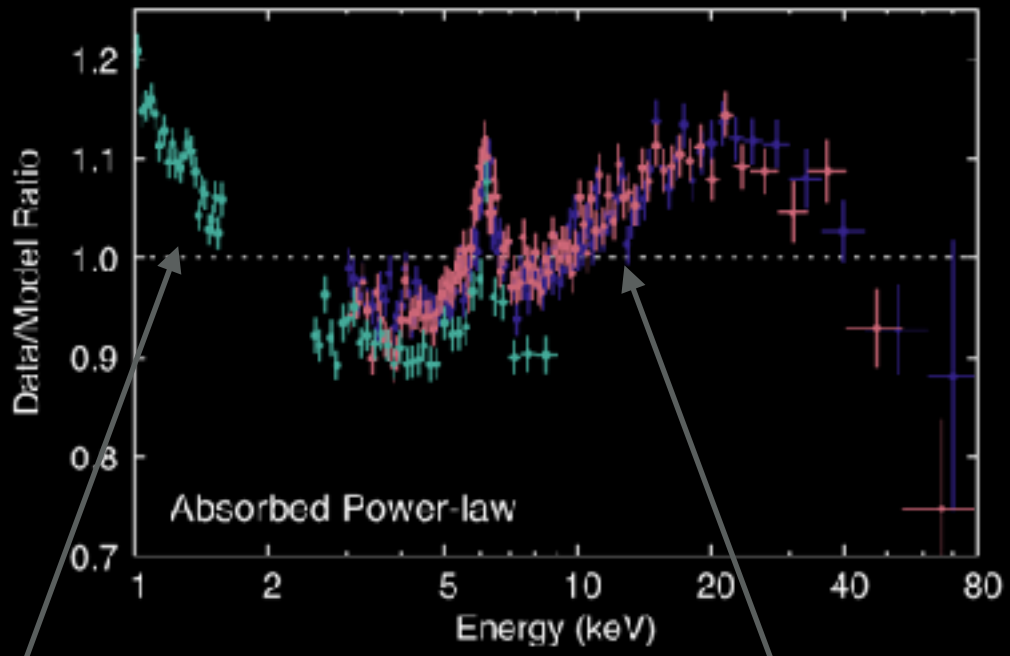
The Soft Excess in Active Galactic Nuclei

The Soft Excess in the AGN Mrk 509

Suzaku and *NuSTAR* simultaneous exposure of **Mrk 509**





Soft-excess emission

Strong reflection signatures

García et al. (2019)

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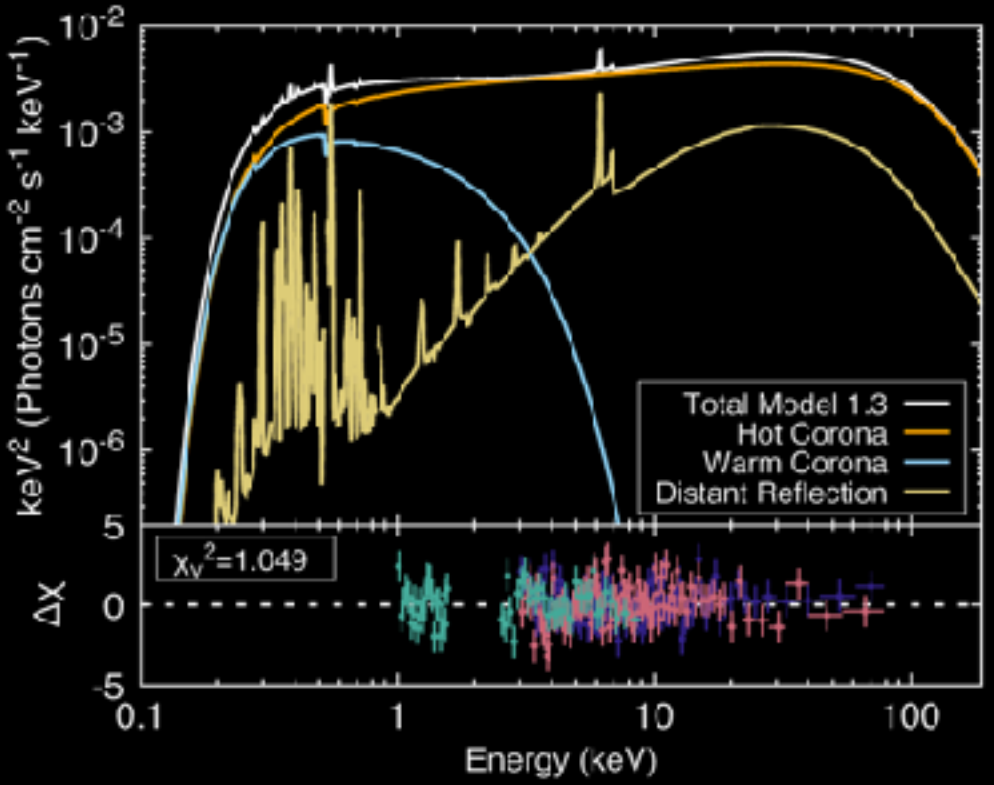
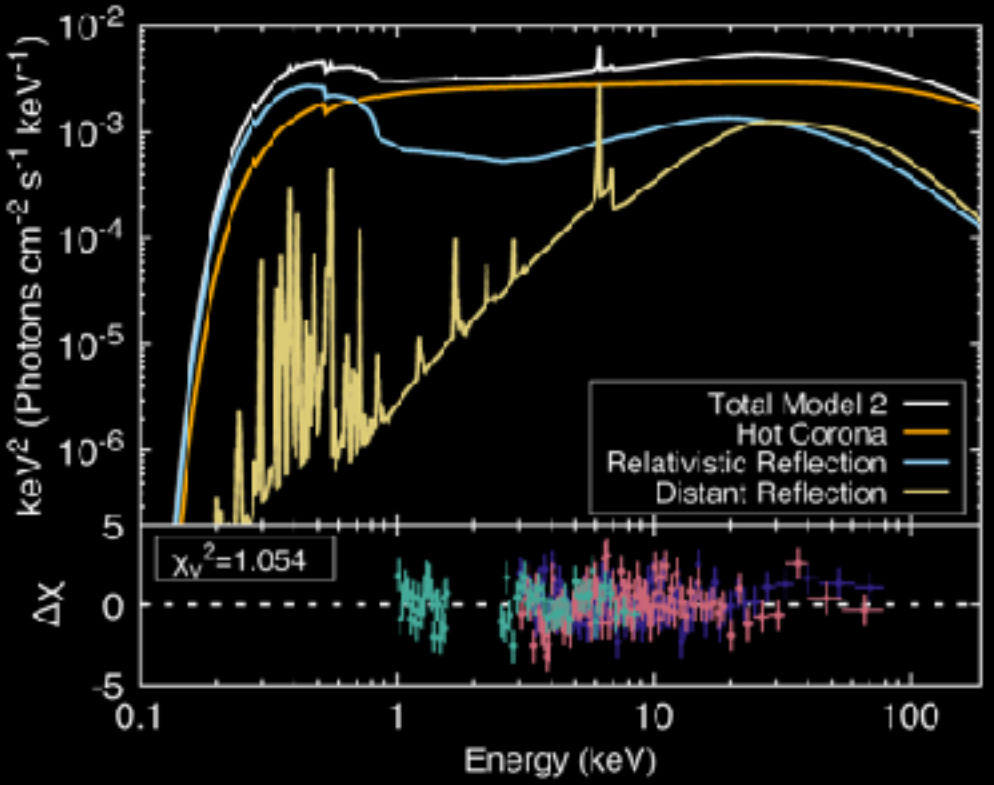
Warm Corona



Relativistic Reflection



- The warm corona model neglects photoelectric opacity effects, likely to imprint large absorption features
- Relativistic reflection at high density properly reproduces the soft excess

García et al. (2019)

Challenges for Modelers

We need to explain:

- The changes (or lack thereof) of the Fe K emission (or the reflection spectra) across state transitions
- Hard lags: How does the corona changes the frequency?
- Type-C and B QPOs: frequency correlation with other parameters
- The evolution of the high-energy cutoff in the Comptonized emission (is it a proxy for the coronal temperature?)
- Changes in the RMS (?)
- The constancy of Gamma during the rise of the hard state
- If the type B QPO is associated with the jet, and their are clearly related with type C, how does that work in the lense-tirring model?

Relevant Observables

- QPOs
- Hard and soft lags
- Reflection features
- Coronal features
- Disk features