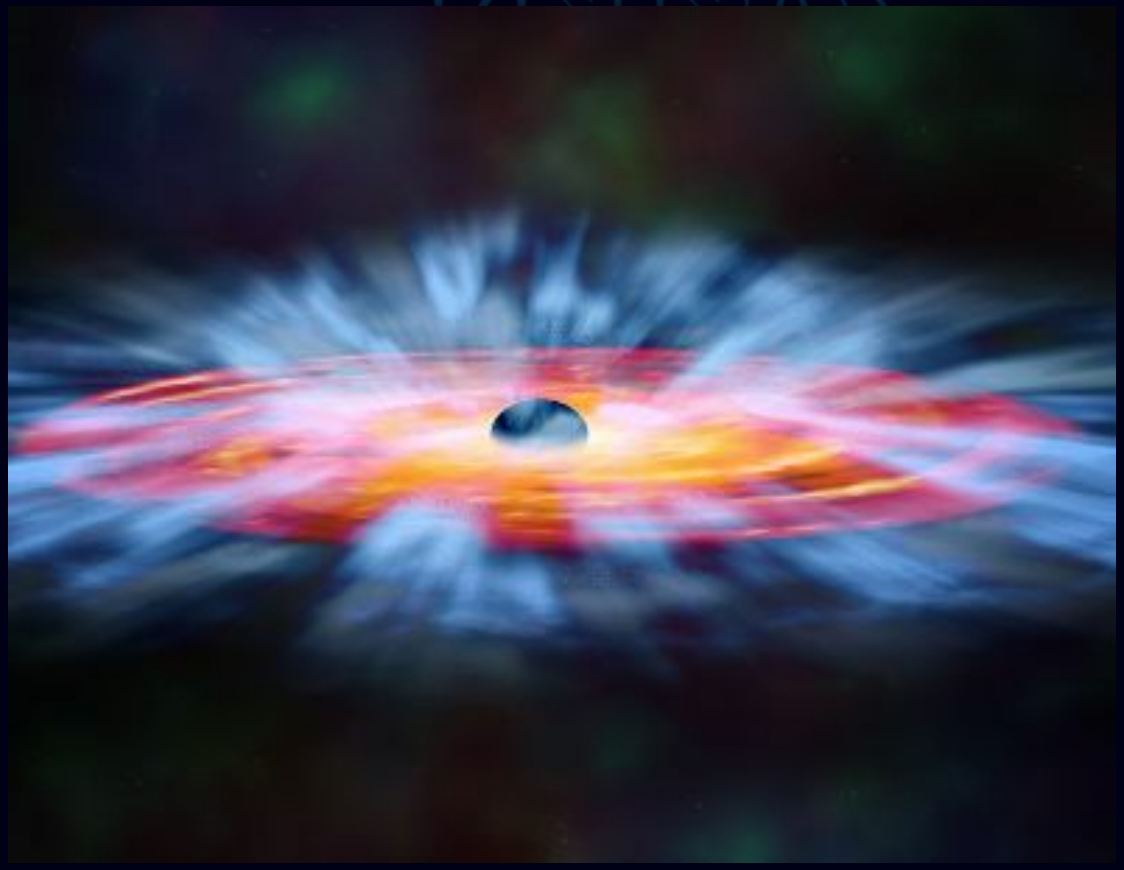
Constraining the wind-shield scenario in PG 2112+059



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Outline:

(1) why quasar winds are important?

(2) BAL quasars in X-rays

(3) Constraining the wind-shield scenario in PG 2112+059

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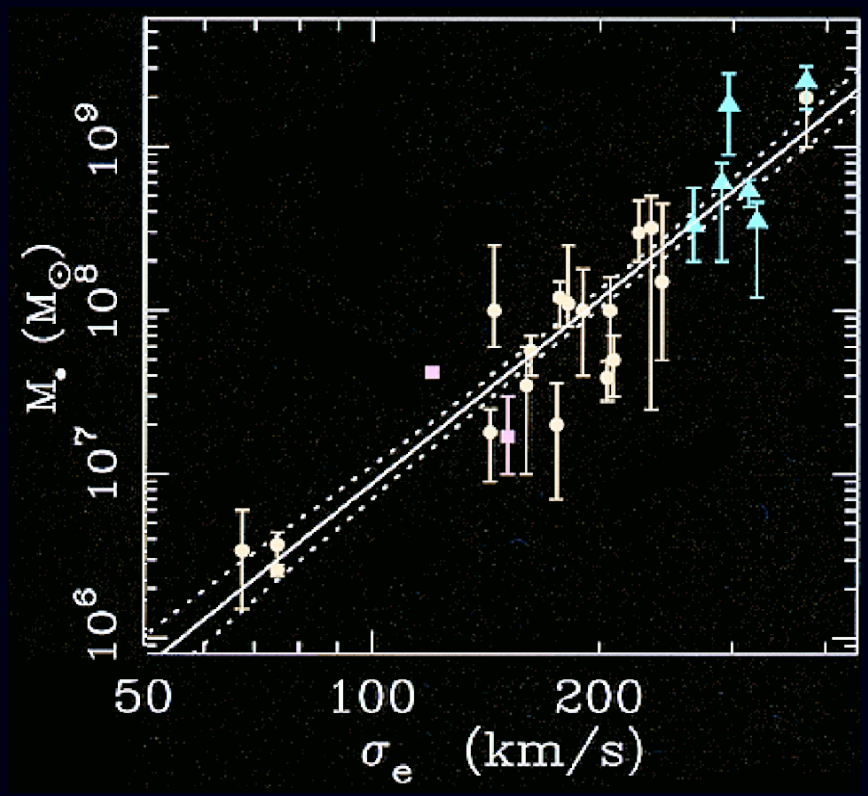
Background

- The region around a super-massive black hole can give rise to energetic outflows.
- Outflows can propagate into the host galaxy and shut down star formation.
- Broad absorption line (BAL) quasars present evidence of outflows in their spectra.

AGN outflows

They could an important source of feedback to channel energy from the accretion process (near to the black-hole) to the host galaxy.

M_{BH}-σ



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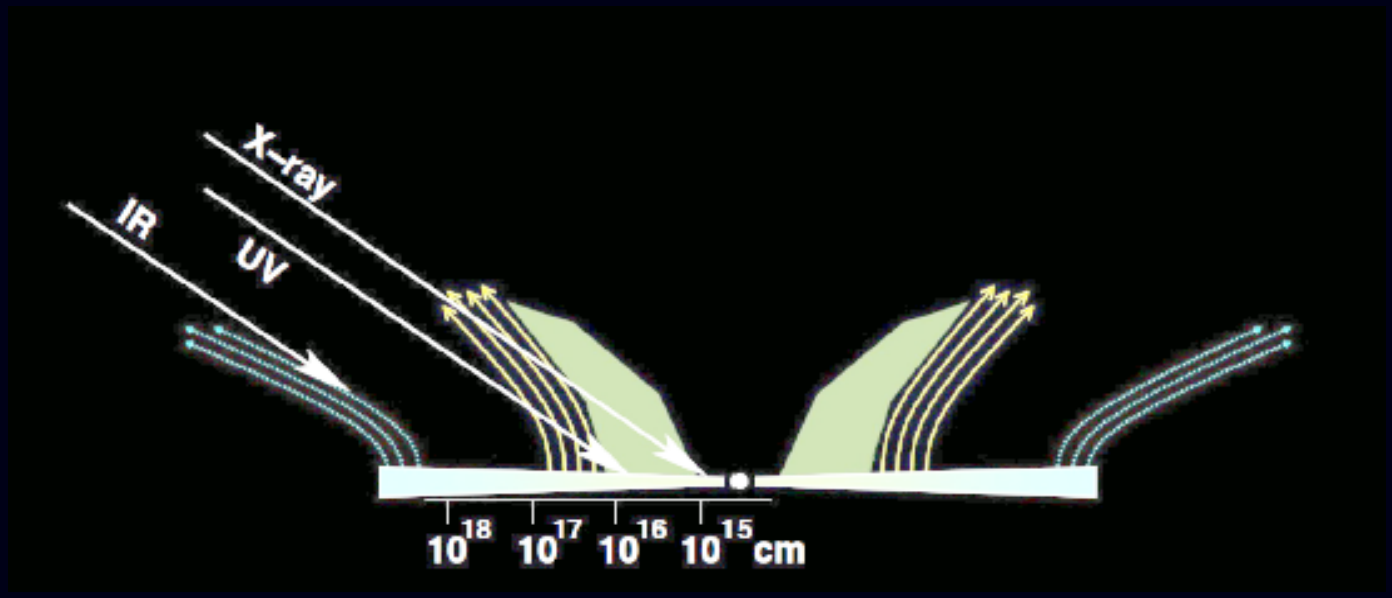
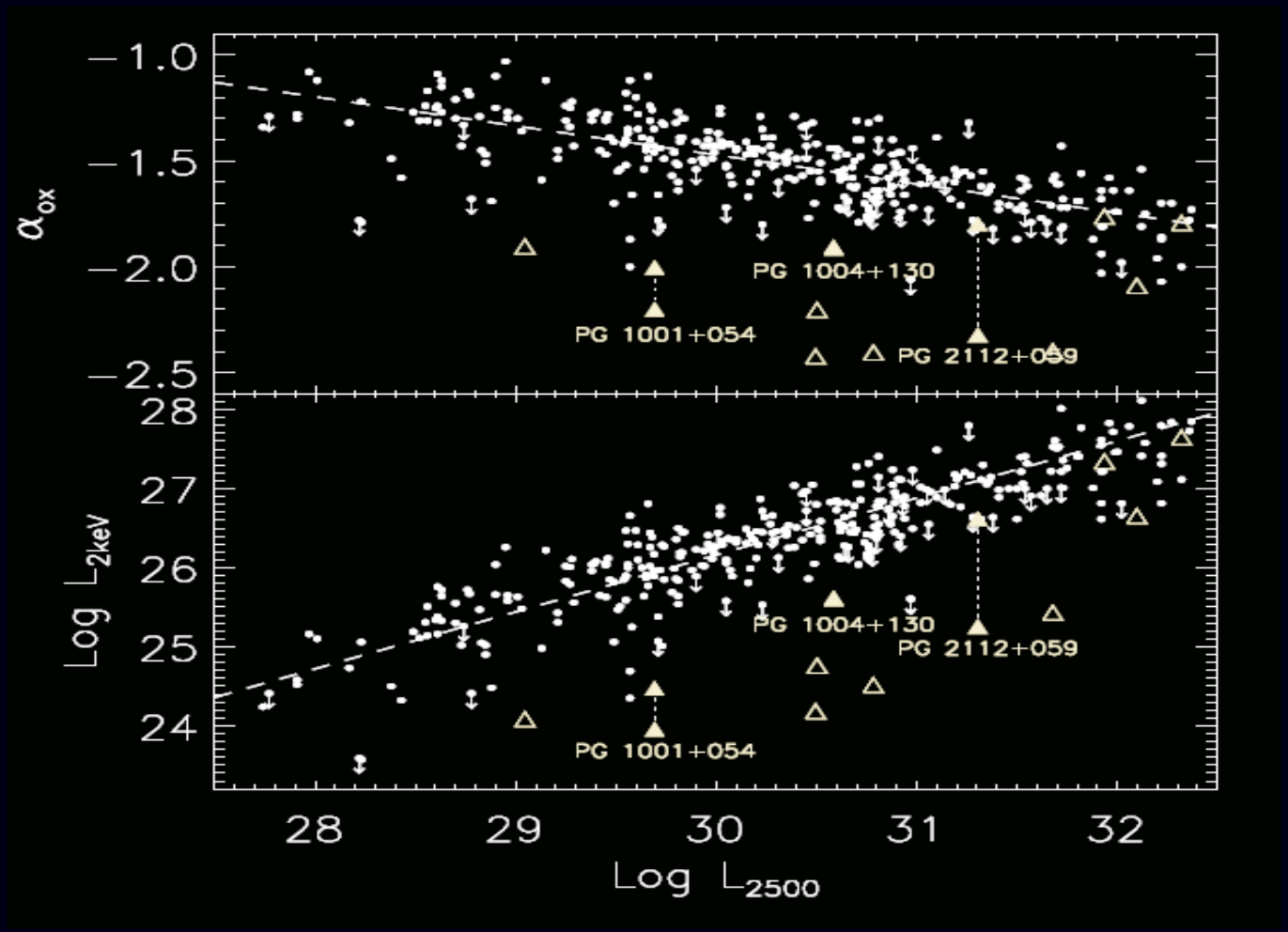
BAL QUASAR PICTURE IN X-RAYS



Gallagher & Everett (2004)

- The shielding region: absorber close to the BH. It prevents the central source emission to over-ionize the gas responsible of BAL features in UV. It can produce variations in the X-ray continua.

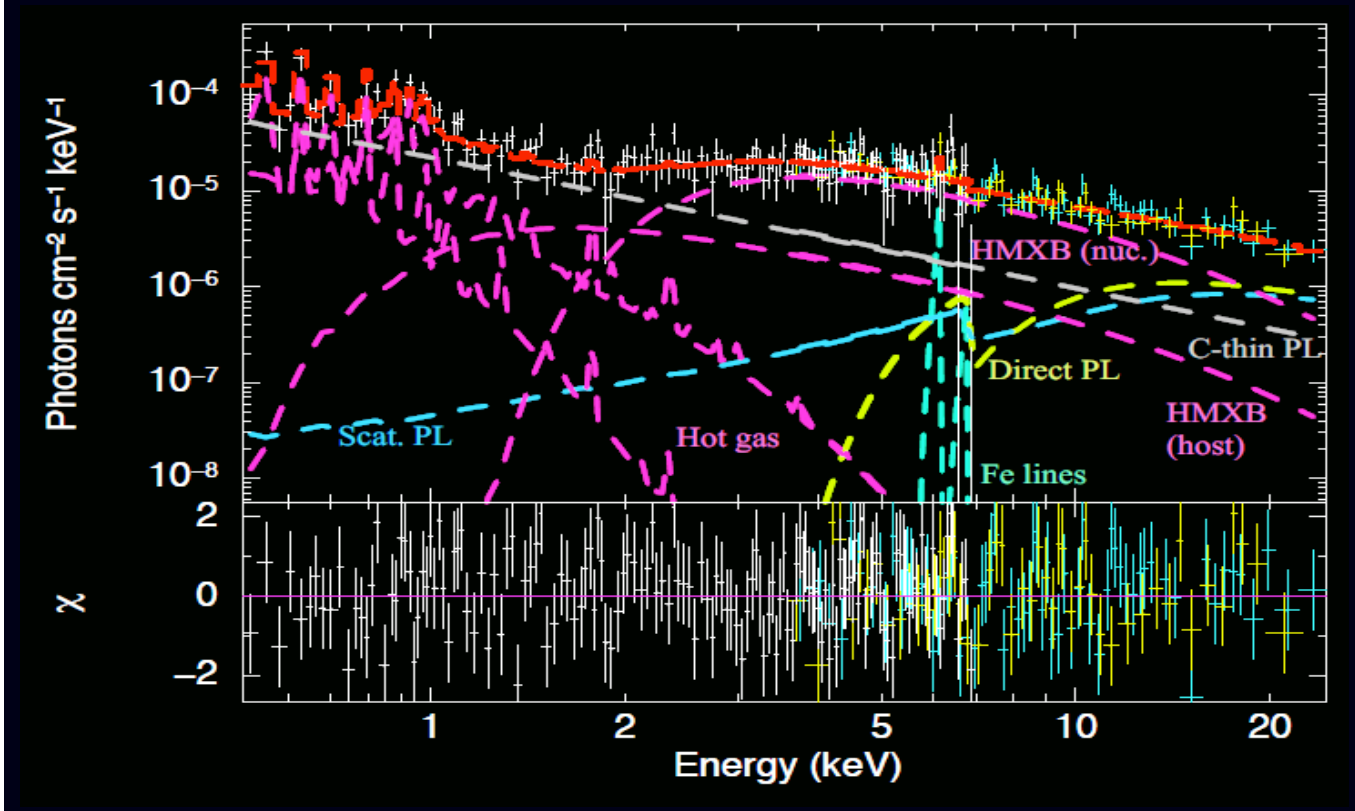
BAL quasars are X-ray weak



Saez et al. 2012

What is producing the X-ray weakness? Nustar Observations of BAL quasars

- Hard X-ray in BAL quasars show in some cases evidence of absorption. However in many cases the X-ray weakness can NOT be attributed entirely to absorption.



Mrk231 with nuSTAR (Teng et al 2013.)

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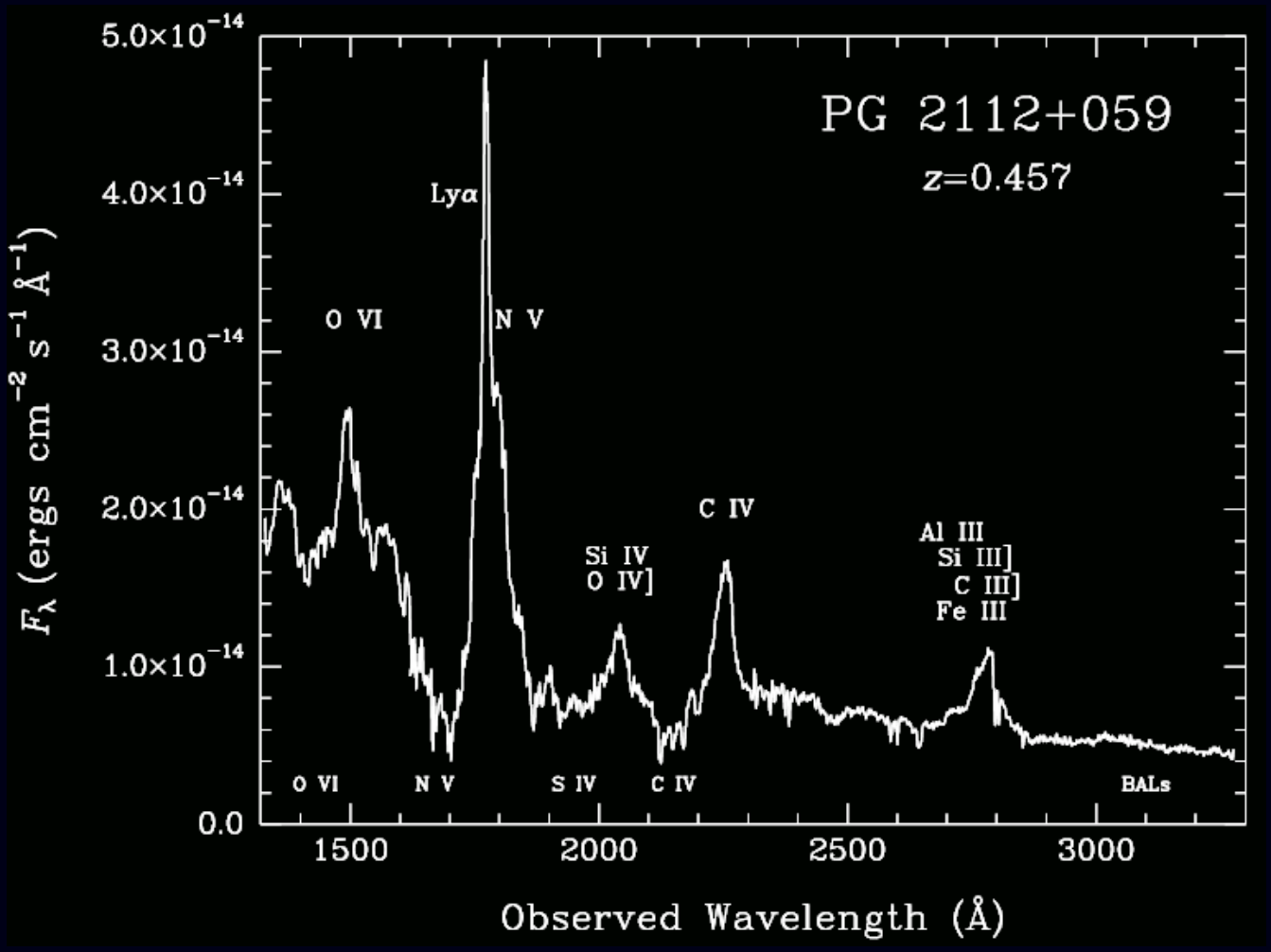
The BAL QUASAR PG 2112+059 in UV (HST)

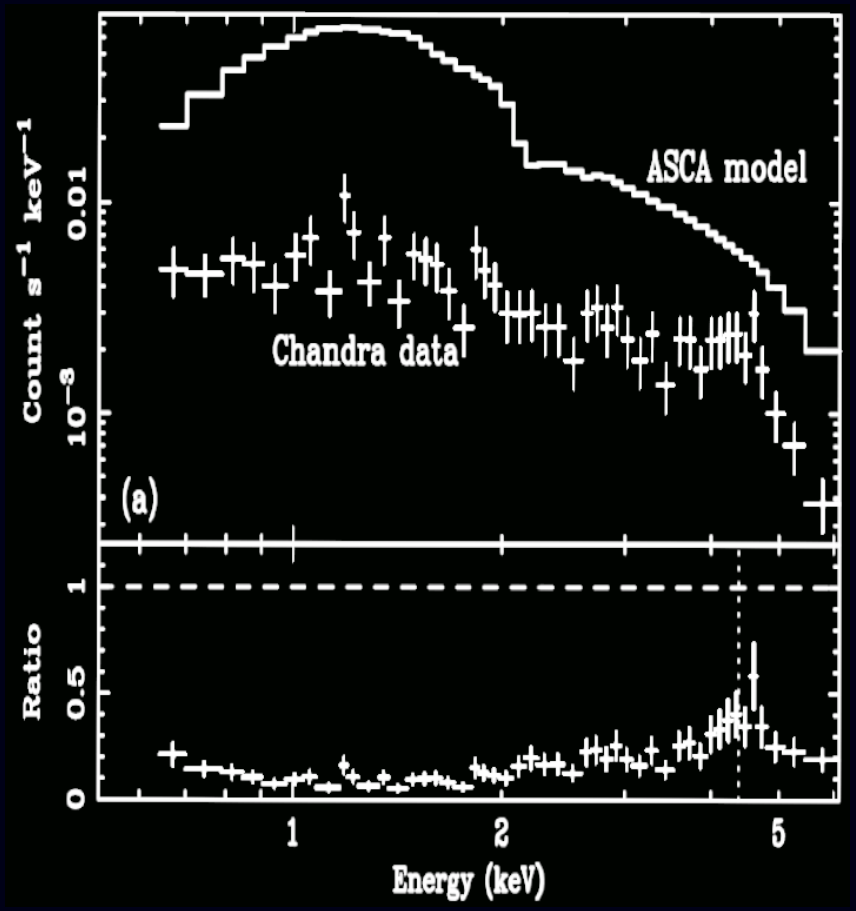


Gallagher et al. (2001)

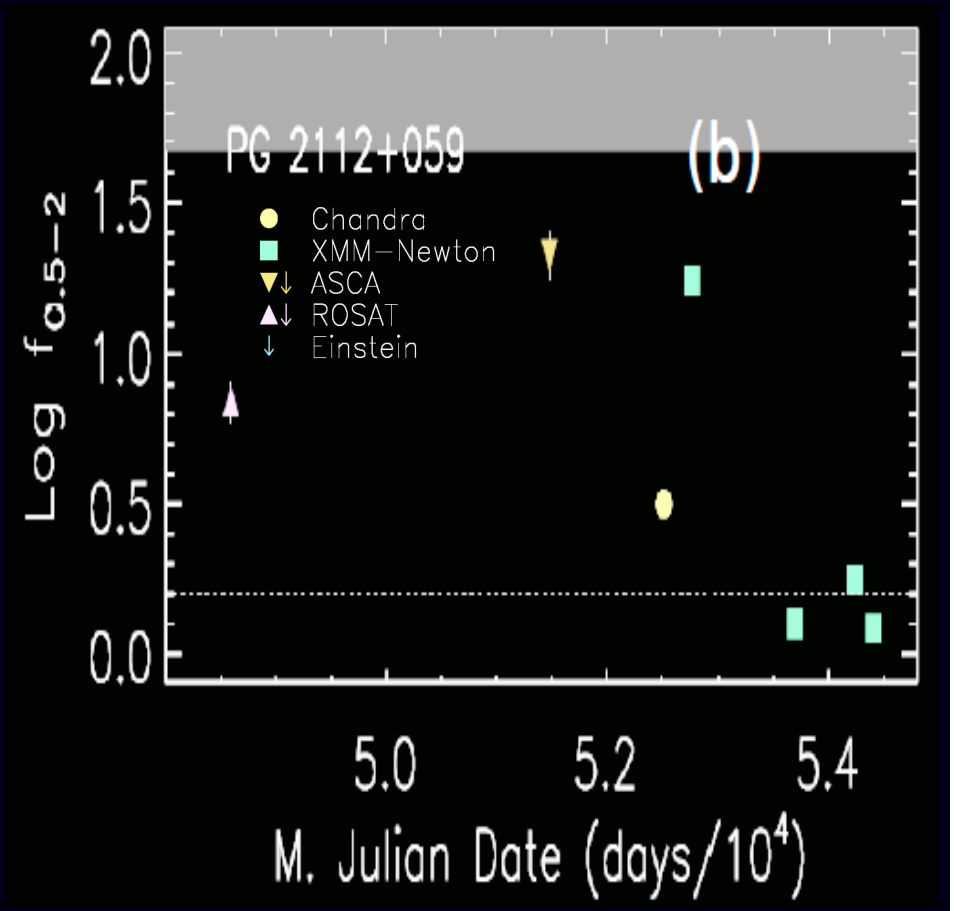
PG 2112+059 (z=0.466)

- Recorded X-ray observations from 1991 to 2007.
- The X-ray emission shows variability in an important fraction (>1/2) of the observations.
- The minimum observed time scale of variability is ~6 months.
- There is direct evidence of absorption in the brightest state ($N_H \sim 10^{22}$ cm^{-2}). The evidence of an absorber is indirect in fainter states.

History of dramatic X-ray variability in PG 2112+059



Gallagher et al. 2004



Saez et al. 2012

Chandra-HST observations

- Two new sets of Chandra-HST (PI: Cristian Saez) observations and one set of Chandra-HST performed in 2002 (3 sets in total).
- Each new sets consist of a ~20ks Chandra observation and a 840s HST G230L spectrum.
- A set of a Chandra-HST consist in a Chandra observation with a contemporary HST observation (within 2 weeks).
- Each new set of Chadra-HST will be separated by a period of at least 6 months.

Goal of the new observations

- It is expected given that this source is highly X-ray variable to see X-ray variability between observations.
- The changes in X-ray fluxes should have an effect on the ionization state of the UV wind.
- Our plan in to assess the state (dynamics and physics) of the UV wind (in each observation time) through the HST observations.
- We will aim to check the connection of changes X-ray emission and the wind properties (in UV).

Preliminary results.
NEW CHANDRA observation: