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Exploring black hole scaling relations via the ensemble variability of active galactic nuclei

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One of the most influential relations in extragalactic astrophysics is the one that links the stellar-mass component of galaxies (Mstar) to the masses of the supermassive black holes (MBH) at their centres. Observational constraints on the shape, normalisation and redshift evolution of the Mstar-MBH relation provide important clues on the co-evolution of galaxies and their supermassive black-holes. Unfortunately, measuring the Mstar-MBH relation, particularly at higher redshifts, is challenging and prone to systemics. In this contribution I will present a new method that provides a handle on the Mstar-MBH relation by modelling the ensemble variability of X-ray selected AGN samples. A key ingredient of the method is the modelling strategy that links, for the first time, the demographics of AGN to the physics of the stochastic flux variations of accretion flows and allows the interpretation of the variability properties of AGN populations. I will demonstrate the predictive power of the model by comparing in a forward manner with observational measurements of the ensemble excess variance of X-ray AGN in the Chandra Deep Field South. I will also discuss future prospects for joint constraints on both models of AGN variability and the Mstar-MBH relation as a function of redshift.

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