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The X-ray-UV Luminosity relation of AGNs revisited

In this work we will scrutinize the universality of the well-known non-linear relation between the UV and X-ray luminosity of AGNs. The LX-LUV correlation provides insights on the energy generating mechanisms and structural characteristics of AGNs, but it has also been proposed as a cosmological probe, under the assumption that it is redshift independent. However, recent works on the subject report a possible evolution of the relation, with an unclear yet interpretation. We revisit the LX-LUV correlation, based on the latest SDSS QSO catalog combined with new X-ray observations from the German eRosita DR1 (ERASS1) and archival XMM-Newton data. We develop a novel hierarchical Bayesian model, which accounts for the Poisson nature of the X-ray observations and allows a uniform treatment of upper limits and non-detections. The complex likelihood of the problem is efficiently sampled by the Hamiltonian Markov Chain Monte Carlo code STAN to yield robust constraints on the correlation and its possible evolution. Moreover, we will explore the possible imprints of interesting AGN subsets on the UV/X-ray correlation, i.e., via their deviation from the correlation of the average population. These populations include, e.g., AGN outflows, possibly linked to systems that show radio emission or reddened optical continua, and X-ray weak AGNs.

Author: Dr CHIRA, Maria (IAASARS, National Obs. Athens)

Co-authors: Dr RUIZ, Angel (IAASARS, National Obs. Athens); Dr GEORGAKAKIS, Antonis (IAASARS, National Obs. Athens)

Presenter: Dr CHIRA, Maria (IAASARS, National Obs. Athens)

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