Contribution ID: **44** Type: **not specified**

The universal optical power spectrum of Active Galactic Nuclei

Tuesday, 23 July 2024 14:25 (20 minutes)

Quasars optical variability gives us clues to understand the accretion disc around supermassive black holes, which are responsible for the emission in this band and also for at least part of its variability. We can expect variability properties to correlate with the main physical properties of the accreting black hole, i.e. its mass and accretion rate. Specifically, we aim at establishing the dependence of variability properties, such as characteristic timescales (T_b) and amplitude of the variability on black hole mass and accretion rate, controlling for the restframe wavelength of emission. We selected the g-band light curves for 4770 objects from the Zwicky Transient Facility archive that fall into a narrow redshift bin, but cover a wide range of accretion rates in Eddington units(REdd) and black hole masses (M). With these, we found a clear dependence of T_b on REdd, on top of the known dependence of T_b on mass. In our fits, $T_b \propto M^{0.65} REdd^{0.35}$, scaling T_b to the orbital timescale of the ISCO, T_{ISCO}, results approximately in $T_b/T_{ISCO} \propto$ (REdd/M)$^{0.35}$. In the standard thin disk model, (REdd/M) $\propto T_{max}^4$, where T_{max} is the maximum disk temperature, so that T_b/T_{ISCO} appears to scale approximately with the maximum temperature of the disc. The observed values of T_b are about 10 times the orbital time at the light-weighted average radius of the disc region emitting in the (observer frame) g-band. The different scaling of the break frequency with M and REdd shows that the shape of the variability power spectrum cannot be solely a function of the quasar luminosity, even for a single rest-frame wavelength. This work is presented in Arévalo et al. 2024 (A&A 68, 133). In this talk I will extrapolate these results to predict the level of variability expected for AGN of different masses, accretion rates and redshifts in the deeper light curves of the Vera Rubin LSST.

Funding request, please specify

Primary authors: Dr LÓPEZ NAVAS, Elena; Dr CHURAZOV, Eugene (MPA); Dr HERNANDEZ GARCÍA, Lorena (Universidad de Valparaiso); AREVALO, Patricia (Universidad de Valparaiso); Dr SÁNCHEZ-SÁEZ, Paula (ESO); Prof. LIRA, Paulina (Universidad de Chile); Ms PATEL, Priyanjali (Universidad de Chile); Mr BERNAL, Santiago (Universidad de Valparaiso)

Presenter: AREVALO, Patricia (Universidad de Valparaiso)

Session Classification: AGN vabiability