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Disk Reverberation Mapping with Rubin to Probe AGN Disk Structure

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Rubin will soon dramatically increase the monitoring of active galactic nuclei (AGN), potentially unlocking the ability to perform disk reverberation mapping (RM) over a wide range of black hole masses, luminosities, and redshifts. I will present a numerical and observational approach to studying the structure and internal physics of quasar accretion disks using two types of disk RM. The first is the traditional continuum RM, which measures lags in the variability of quasar light curves from high to low frequency wave bands on the light-crossing time scale due to the reprocessing of light in different temperature regions of the disk. Multi-frequency radiation magnetohydrodynamic codes make it possible to directly simulate the reprocessing of light by a quasar disk. I will present multi-waveband light curves from new radiation Athena++ simulations and discuss how they can be compared to observations to better understand reprocessing. I will also discuss a second type of lag, the "long negative lag."The long negative lag occurs when fluctuations in the outer UV/optical region of the disk are accreted inward on the longer inflow timescale leading variability from these fluctuations in high frequency bands to lag the corresponding variability at low frequency. Because the inflow rate, unlike the speed of light, also depends on disk properties, long lags can provide additional information about disk structure. Rubin's high cadence and long baseline make it ideal for detecting more long negative lags. I will present the latest in my search for long negative lag candidates in current long baseline AGN light curves.

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