Notes for Edelson et al. 2015 "SPACE TELESCOPE AND OPTICAL REVERBERATION MAPPING PROJECT. II. SWIFT AND HST REVERBERATION MAPPING OF THE ACCRETION DISK OF NGC 5548"

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1. ARTICLE

Variability studies, along with gravitational microlensing can be used to probe the inner region of AGN. The black hole is surrounded by a small and hot ($10^9 K$) spherical corona and a flat accretion disk which is so large relative to the corona that the corona is point like to it. The accretion process also heats up the corona, which then can emit to heat up the accretion disk as an extra external heating source other than direct heating from the accretion process. Reverberation mapping of the accretion disk could allow us to constrain the temperature structure of the disk and test the standard accretion disk models. An HST light curve is compared with swift light curves and it shows that there is a tendency for peak lags to increase with wavelength and UV/optical correlation is strong while X-ray/UV is much weaker correlated.

The uncertainty in the interband lag is found by using FR/RSS, which is "a model-independent Monte Carlo technique that attempts to deal with both flux uncertainties in individual measurements and uncertainties due to sampling of the time series. In "RSS," for a light curve of N data points, one randomly selects N data points without regard to whether a data point has been previously selected or not. Thus, approximately $\frac{1}{e}$ of the original points in the light curve are not selected in a given realization, and the remaining points are selected one or more times. For data points selected n times in a given realization, the uncertainty associated with the data point is reduced by n$-$1 2. "FR" consists of altering the observed flux by random Gaussian deviates whose standard deviation is equal to the flux uncertainty on the data point."

The standard accretion disk model predicts a relationship between time lag and wavelength so the model is done by fitting the function $\tau = A + B((\frac{\lambda}{\lambda_0})^C - 1)$, where the A=0 and C=4/3 are fixed, B is a measure of the size of the disk at $\lambda = 1367 AA$ the HST reference wavelength. This form will be same whether the disk is internally (friction) or externally (corona) heated and is for a flat disk. The corona could also be distributed across the disk or the disk could be warped, though this does not seem to be the case.